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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
14/620,913	02/12/2015	Geofence Data Access Controls LLC	GDAC-7	11052

Acknowledgement of Loss of Entitlement to Entity Status Discount

The entity status change request below filed through Private PAIR on 01/26/2016 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

X Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/Robert S. Babayi/
Name:	Robert S. babayi
Registration Number:	33471

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

ROBERT S. BABAYI
3208 Q. STREET, NW
WASHINGTON DC 20007

MAILED
JUN 26 2015
OFFICE OF PETITIONS

In re Application of
Darrell Diem
Application No. 14/620,913
Filed: February 12, 2015
Attorney Docket No. GDAC-7

DECISION ON PETITION
TO MAKE SPECIAL UNDER
37 CFR 1.102(c)(1)

This is a decision on the petition under 37 CFR 1.102(c)(1), filed February 12, 2015, to make the above-identified application special based on applicant's age as set forth in M.P.E.P. § 708.02, Section IV.

The petition is **GRANTED**.

A grantable petition to make an application special under 37 CFR 1.102(c)(1) and MPEP § 708.02, Section IV: Applicant's Age must be accompanied by evidence showing that at least one of the applicants is 65 years of age, or more, such as a birth certificate or a statement by applicant. No fee is required.

The instant petition includes a statement from a registered practitioner that he has evidence that the inventor Darrell Diem is 65 years of age or more. Accordingly, the above-identified application has been accorded "special" status.

The application is being forwarded to the Technology Center Art Unit 2434 for action on the merits to commensurate with this decision.

Telephone inquiries concerning this decision should be directed to Joy Dobbs at 571-272-3001. All other inquiries concerning either the examination or status of the application should be directed to the Technology Center.

/SDB/
Sherry D. Brinkley
Lead Paralegal Specialist
Office of Petitions

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/620,913	06/30/2015	9071931	GDAC-7	7589

98699 7590 06/10/2015

Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Darrell Diem, Madison, AL;
Geofence Data Access Controls LLC, Huntsville, AL;

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/620,913	02/12/2015	Darrell Diem	GDAC-7

CONFIRMATION NO. 7589

PUBLICATION NOTICE

OC000000075549857

98699
Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

Title:LOCATION TRACKING SYSTEM WITH INTERFACES FOR SETTING GROUP ZONES, EVENTS AND ALERTS BASED ON MULTIPLE LEVELS OF ADMINISTRATIVE PRIVILEGES

Publication No.US-2015-0156608-A1
Publication Date:06/04/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Receipt date: 02/12/2015

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14620913 - GAU: 2434
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	
	Examiner Name	
	Attorney Docket Number	GDAC-7

	64	7460020		2008-12-02	Reyes et al.	
	65	7469139		2008-12-23	Van de Groenendaal	
	66	6691032		2004-02-10	Irish et al.	
	67	7138913		2006-11-21	Mackenzie et al.	
	68	7164986		2007-01-16	Humphries et al.	
	69	5982281		1999-11-09	~~Hoyt~~ Layson, Jr.	

Change(s) applied to document, /P.H./ 5/29/2015

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code1	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20070060108	A1	2007-03-15	East et al.	
	2	20070087828	A1	2007-04-19	Robertson	
	3	20070149208	A1	2007-06-28	Syrbe et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T./

Receipt date: 02/12/2015

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)	Application Number	14620913 - GAU: 2434
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	
	Examiner Name	
	Attorney Docket Number	GDAC-7

	53	7102510		2006-09-05	Boling et al.	
	54	6838998		2005-01-04	Brown et al.	
	55	6243039		2001-06-05	Elliot	
	56	7283827		2007-10-16	Meadows et al.	
	57	7219234		2007-05-15	Ashland et al.	
	58	7533157		2009-05-12	Hu et al.	
	59	6363411		2002-03-26	Dugan et al.	
	60	7577667		2009-08-18	Hinshaw et al.	
Change(s) applied to document, /P.H./ 5/29/2015	61	5263158		1993-11-16	~~Frederick~~ Janis	
	62	7027808		2006-04-11	Wesby	
	63	7277018		2007-10-02	Reyes et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T./

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NOTICE OF ALLOWANCE AND FEE(S) DUE

98699 7590 05/22/2015

Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

EXAMINER	
TABOR, AMARE F	
ART UNIT	PAPER NUMBER
2434	

DATE MAILED: 05/22/2015

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/620,913	02/12/2015	Darrell Diem	GDAC-7	7589

TITLE OF INVENTION: LOCATION TRACKING SYSTEM WITH INTERFACES FOR SETTING GROUP ZONES, EVENTS AND ALERTS BASED ON MULTIPLE LEVELS OF ADMINISTRATIVE PRIVILEGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	08/24/2015

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

98699 7590 05/22/2015

Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/620,913	02/12/2015	Darrell Diem	GDAC-7	7589

TITLE OF INVENTION: LOCATION TRACKING SYSTEM WITH INTERFACES FOR SETTING GROUP ZONES, EVENTS AND ALERTS BASED ON MULTIPLE LEVELS OF ADMINISTRATIVE PRIVILEGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	08/24/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
TABOR, AMARE F	2434	726-004000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
   - ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
   - ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
   (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
   (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
   1 ____________________
   2 ____________________
   3 ____________________

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
   PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.
   (A) NAME OF ASSIGNEE
   (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
   - ❑ Issue Fee
   - ❑ Publication Fee (No small entity discount permitted)
   - ❑ Advance Order - # of Copies ____________

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
   - ❑ A check is enclosed.
   - ❑ Payment by credit card. Form PTO-2038 is attached.
   - ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number ________ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
   - ❑ Applicant certifying micro entity status. See 37 CFR 1.29
     NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
   - ❑ Applicant asserting small entity status. See 37 CFR 1.27
     NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
   - ❑ Applicant changing to regular undiscounted fee status.
     NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature ____________________ Date ____________________

Typed or printed name ____________________ Registration No. ____________________

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/620,913	02/12/2015	Darrell Diem	GDAC-7	7589

98699 7590 05/22/2015

Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

EXAMINER	
TABOR, AMARE F	
ART UNIT	**PAPER NUMBER**
2434	

DATE MAILED: 05/22/2015

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/620,913	Applicant(s) DIEM, DARRELL	
	Examiner AMARE F. TABOR	Art Unit 2434	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 04/29/2015.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on______.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are 2-27. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. ______ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date 05/13/205 .
5. ☒ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/AMARE F TABOR/
Primary Examiner, Art Unit 2434

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

1. This is in response to Amendments and REMARKS filed on 04/29/2014.

2. Claims 2-27 are pending.

Response to Arguments

3. Previous rejections/objections of the pending claims over prior arts of record have been withdrawn in light of applicant's arguments.

Allowable Subject Matter

4. Claims 2-27 are allowed.

No reason for allowance is needed as the record is clear in light of further search conducted, applicant’s arguments filed on 04/29/2014, and electronic terminal disclaimer filed and approved on 05/13/2015.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMARE F. TABOR whose telephone number is (571)270-3155. The examiner can normally be reached on Mon-Fri 8:00a.m. to 5:00p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, KAMBIZ ZAND can be reached on (571) 272-3811. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AMARE F TABOR/
Primary Examiner, Art Unit 2434

Examiner-Initiated Interview Summary	**Application No.** 14/620,913	**Applicant(s)** DIEM, DARRELL	
	Examiner AMARE F. TABOR	**Art Unit** 2434	

All participants (applicant, applicant's representative, PTO personnel):

(1) *AMARE F. TABOR*. (3)_____.

(2) *Robert Babayi, Registration No.: 33,471*. (4)_____.

Date of Interview: *13 May 2015*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: *n/a*.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *2-27*.

Identification of prior art discussed: *n/a*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Examiner has contacted applicant's representative to file terminal disclaimer with respect to patented parent cases (i.e., USP 7525425, 8149113, 8223012, 8493207, 8717166 and 9003499).

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/AMARE F TABOR/ Primary Examiner, Art Unit 2434	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-07

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Examiner Initial*	Cite No	Patent Number	Kind Code1	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6691032		2004-02-10	Irish et al.	
	2	6968179		2005-11-22	De Vries, Jean Pierre	
	3	6716101		2004-04-06	Meadows et al.	

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	1	20050113123	A1	2005-05-26	Torvinen, Marko	
	2	20020177435	A1	2002-11-28	Jenkins et al.	
	3	20020094787	A1	2002-07-18	Avnet et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-07

	4	20040203951	A1	2004-10-14	Mazzara et al.	
	5	20080122871	A1	2008-05-29	Guday; Shai	
	6	20100214111	A1	2010-08-26	Schuler et al.	

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	1	United State Office Action issued in Application No. 14/629,355 dated May 08, 2015	☐
	2	United State Office Action issued in Application No. 14/629,343 dated May 07, 2015	☐
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Receipt date: 05/12/2015	Application Number	14620913 14620913 - GAU: 2434
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-07

EXAMINER SIGNATURE			
Examiner Signature	/Amare Tabor/	Date Considered	05/13/2015
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	14/620913	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:43
L2	1	(DIEM-DARRELL DIEM-DARRELL-$).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:44
L3	32	(DIEM-DARRELL DIEM-DARRELL-$).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:44
L4	12	(PERDIEM PERDIEM-$ GEOFENCE GEOFENCE-$ GEOFENCE-DATA-ACCESS-CONTROLS-$).as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:46
L5	11	(2 3 4) and (location and zone).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:47
L6	11	(2 3 4) and (location and zone and event).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:48
L7	11788	726/4.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:49
L8	0	(2 3 4) and (alert$).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:50
L9	0	7 and (((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone same event).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:53
L10	3	7 and (((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 11:53

L11	99236	(H04L63/105,104,107 G06Q10/00 H04W4/02,08 H04L67/24,22,18).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:01
L12	99236	(H04L63/105 H04L63/104 H04L63/107 G06Q10/00 H04W4/02 H04W4/08 H04L67/24 H04L67/22 H04L67/18).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:02
L14	89	12 and (((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:03
L16	0	12 and (((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone same (admin$ with privilege)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:22
L18	0	14 and (admin$ with privilege).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:23
L23	0	(((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone same (admin$ with privilege)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:27
L24	0	((((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone) and (admin$ with privilege)).clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:27
L25	24	("6691032" "6968179" "6716101" "20050113123" "20020177435" "20020094787" "20040203951" "20080122871" "20100214111").pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/05/13 12:30
L26	9	("6691032" "6968179" "6716101" "20050113123" "20020177435" "20020094787" "20040203951" "20080122871" "20100214111").pn.	US-PGPUB; USPAT	OR	ON	2015/05/13 12:30

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L19	4206	726/4.ccls.	USPAT; UPAD	OR	ON	2015/05/13 12:24
L20	13555	(H04L63/105,104,107 G06Q10/00 H04W4/02,08 H04L67/24,22,18).cpc.	USPAT; UPAD	OR	ON	2015/05/13 12:24
L21	46	(19 20) and (((mobile wireless portable cellullar) with ("ID" identif$7) with location) same zone).clm.	USPAT; UPAD	OR	ON	2015/05/13 12:24
L22	0	21 and (admin$ with privilege).clm.	USPAT; UPAD	OR	ON	2015/05/13 12:25

5/ 13/ 2015 12:34:02 PM
C:\ Users\ atabor\ Documents\ EAST\ Workspaces\ 14-620913 Allowance.wsp

Issue Classification	**Application/Control No.**	**Applicant(s)/Patent Under Reexamination**
	14620913	DIEM, DARRELL
	Examiner	**Art Unit**
	AMARE F TABOR	2434

CPC

Symbol			Type	Version
H04W	4 /	02	F	2013-01-01
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CPC Combination Sets

Symbol			Type	Set	Ranking	Version
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NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 26	
/AMARE F TABOR/ Primary Examiner.Art Unit 2434 (Primary Examiner) (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14620913	DIEM, DARRELL
	Examiner	**Art Unit**
	AMARE F TABOR	2434

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
726	4

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

INTERNATIONAL CLASSIFICATION									
CLAIMED					NON-CLAIMED				
G	0	6	F	15 / 16 (2006.01.01)					

NONE (Assistant Examiner) (Date)	Total Claims Allowed: 26	
/AMARE F TABOR/ Primary Examiner.Art Unit 2434 (Primary Examiner) (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14620913	DIEM, DARRELL
	Examiner	**Art Unit**
	AMARE F TABOR	2434

☐ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☒ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1	16	17												
1	2	17	18												
2	3	18	19												
3	4	19	20												
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9	10	25	26												
10	11	26	27												
11	12														
12	13														
13	14														
14	15														
15	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 26	
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CONTENT TYPE
- Conference Publications (14)
- Journals & Magazines (3)
- Standards (1)

PUBLICATION YEAR
Single Year | Range
2000 – 2014
From: 2000
To: 2014

AUTHOR
Search for Author
- Wang, Xin (2)
- Xiang, Xiaojing (2)
- Gerla, Mario (1)
- Wang, Kuochen (1)
- Andersson, Mats (1)
- Yang, Yuanyuan (1)
- Schulte, K. (1)
- Schwiebert, Loren (1)
- Khalil, Ibrahim (1)
- Cosic, Irena (1)
- Chen, J. M. (1)

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18 Results returned

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Intelligent location tracking strategy in PCS
Wang, K. ; Liao, J.-M. ; Chen, J.-M.
Communications, IEE Proceedings-
Volume: 147 , Issue: 1
DOI: 10.1049/ip-com:20000227
Publication Year: 2000 , Page(s): 63 - 68
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IET JOURNALS & MAGAZINES
| Quick Abstract | PDF (280 KB)

Comparison and Analysis of Secure Mobile Architecture (SMA) and Evolved Packet System
Pellikka, J. ; Skowron, M. ; Gurtov, A.
Vehicular Technology Conference (VTC Spring), 2011 IEEE 73rd
DOI: 10.1109/VETECS.2011.5956380
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| | Quick Abstract | PDF (200 KB) | HTML

Location aware efficient multicasting protocol with state information
Shrividhya, P.
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Volume: 4

SEARCH HISTORY

Search History is available using your personal IEEE account.

STANDARDS DICTIONARY TERMS

- channel
- authentication
- authorization
- link
- encapsulation
- mp
- pc
- ds
- md

Browse Standards Dictionary

Fang, Qiang (1)
Duchêne, Jacques (1)
Brockmeyer, Monica A. (1)
Evans, M. (1)
Zeadally, Sherali (1)
Patino, Luis (1)
Suti, Fahim (1)
Snoussi, Hichem (1)
Gurtov, Andrei (1)
Flizikowski, Adam (1)
Lee, Uichin (1)
Vieira, Luiz Filipe M (1)
Mowafi, Yaser (1)
Miraoui, Abdelkader (1)

AFFILIATION

PUBLICATION TITLE

PUBLISHER

CONFERENCE LOCATION

STANDARD STATUS

DOI: 10.1109/ICECTECH.2011.5941857
Publication Year: 2011 , Page(s): 61 - 65
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| Quick Abstract | PDF (292 KB) | HTML

A Chain-Based Relocation Approach to Maintain Connectivity with a Center of Interest
Korbi, I.E. ; Zeadally, S. ; Jumira, O.
Computational Science and Engineering (CSE), 2012 IEEE 15th International Conference on
DOI: 10.1109/ICCSE.2012.40
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Phero-trail: a bio-inspired location service for mobile underwater sensor networks
Vieira, L.F.M. ; Uichin Lee ; Gerla, M.
Selected Areas in Communications, IEEE Journal on
Volume: 28 , Issue: 4
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Stateless Multicasting in Mobile Ad Hoc Networks
Xiaojing Xiang ; Xin Wang ; Yuanyuan Yang
Computers, IEEE Transactions on
Volume: 59 , Issue: 8
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Miraoui, A. ; Mabrouk, K. ; Snoussi, H. ; Amerhaye, A. ; Duchene, J.
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A mobile web grid based physiological signal monitoring system
Fahim Sufi ; Khalil, I. ; Qiang Fang ; Cosic, I.
Information Technology and Applications in Biomedicine, 2008. ITAB 2008. International Conference on
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Computing, Communication and Applications (ICCCA), 2012 International Conference on
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Publication Year: 2013 , Page(s): 157 - 162
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Low-Cost Mobile GPS Tracking Solution
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Business Computing and Global Informatization (BCGIN), 2011 International Conference on
DOI: 10.1109/BCGIn.2011.136
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IEEE Std 802.11-2012 (Revision of IEEE Std 802.11-2007) - Redline
Publication Year: 2012 , Page(s): 1 - 5229
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Efficient data aggregation middleware for wireless sensor networks
Kumar, M. ; Schwiebert, L. ; Brockmeyer, M.
Mobile Ad-hoc and Sensor Systems, 2004 IEEE International Conference on
DOI: 10.1109/MAHSS.2004.1392214
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| | Quick Abstract | PDF (559 KB) | HTML

Activity recognition and localization on a truck parking lot
Andersson, M. ; Patino, L. ; Burghouts, G.J. ; Flizikowski, A. ; Evans, M. ; Gustafsson, D. ; Petersson, H. ; Schutte, K. ; Ferryman, J.
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DOI: 10.1109/ECS.2014.6892757
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| | > Quick Abstract | PDF (1155 KB) | HTML

Alert Me Please: The implementation of an intelligent-time-mangement social application
Sinnjakroth, P. ; Sarasuk, V. ; Musikasintorn, P. ; Thumrongsuttipan, T. ; Hoonlor, A.
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DOI: 10.1109/ICT-ISPC.2014.6923235
Publication Year: 2014 , Page(s): 135 - 138
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/620,913	02/12/2015	Darrell Diem	GDAC-7	7589

TITLE OF INVENTION: LOCATION TRACKING SYSTEM WITH INTERFACES FOR SETTING GROUP ZONES, EVENTS AND ALERTS BASED ON MULTIPLE LEVELS OF ADMINISTRATIVE PRIVILEGES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	08/24/2015

EXAMINER	ART UNIT	CLASS-SUBCLASS
TABOR, AMARE F	2434	726-004000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
   - ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
   - ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
   (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
   (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

   1 Robert S. Babayi
   2 ______
   3 ______

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE
PerdiemCo LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY)
Marshall, Texas

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies ______

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number ______ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ Applicant certifying micro entity status. See 37 CFR 1.29
- ☐ Applicant asserting small entity status. See 37 CFR 1.27
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Robert S Babayi/ Date 5-22-2015

Typed or printed name Robert S. Babayi Registration No. 33471

Electronic Patent Application Fee Transmittal

Application Number:	14620913
Filing Date:	12-Feb-2015
Title of Invention:	LOCATION TRACKING SYSTEM WITH INTERFACES FOR SETTING GROUP ZONES, EVENTS AND ALERTS BASED ON MULTIPLE LEVELS OF ADMINISTRATIVE PRIVILEGES
First Named Inventor/Applicant Name:	Darrell Diem
Filer:	Robert S. Babayi
Attorney Docket Number:	GDAC-7

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**480**

Electronic Acknowledgement Receipt

EFS ID:	22421224
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	LOCATION TRACKING SYSTEM WITH INTERFACES FOR SETTING GROUP ZONES, EVENTS AND ALERTS BASED ON MULTIPLE LEVELS OF ADMINISTRATIVE PRIVILEGES
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	22-MAY-2015
Filing Date:	12-FEB-2015
Time Stamp:	02:52:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$480
RAM confirmation Number	6953
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	GDAC_Issue_Fee.pdf	170898 48418d81a7c8b4fd3f2780fab7a9f9d344d14e35	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30860 5d446fc47418396c384b0c814fc52a07c2d8abff	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	201758		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	14620913
Filing Date	12-Feb-2015
First Named Inventor	Darrell Diem
Attorney Docket Number	GDAC-7
Title of Invention	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
GEOFENCE DATA ACCESS CONTROLS LLC	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

7525425

8149113

8223012

8493207

8717166

9003499

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

(◉) Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

( ) I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicant claims the following fee status:

(◉) Small Entity

( ) Micro Entity

( ) Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

(◉) An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Registration Number 33471

( ) A sole inventor

( ) A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application

( ) A joint inventor; all of whom are signing this request

Signature	/Robert S. Babayi/
Name	Robert S. Babayi

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	14620913
Filing Date:	12-Feb-2015
Title of Invention:	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges
First Named Inventor/Applicant Name:	Darrell Diem
Filer:	Robert S. Babayi
Attorney Docket Number:	GDAC-7

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Statutory or Terminal Disclaimer	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
	Total in USD ($)			**160**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 14620913

Filing Date: 12-Feb-2015

Applicant/Patent under Reexamination: Diem et al.

Electronic Terminal Disclaimer filed on May 13, 2015

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt

EFS ID:	22332659
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	13-MAY-2015
Filing Date:	12-FEB-2015
Time Stamp:	12:17:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$160
RAM confirmation Number	9269
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Electronic Terminal Disclaimer-Filed	eTerminal-Disclaimer.pdf	35702 dc8b064fa8372585197a3f53764009fc29bd6efc	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30869 f3d30a4526b8ff5830eebf007a28b5f6bbd6e2ba	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	66571	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-07

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code1	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6691032		2004-02-10	Irish et al.	
	2	6968179		2005-11-22	De Vries, Jean Pierre	
	3	6716101		2004-04-06	Meadows et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code1	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20050113123	A1	2005-05-26	Torvinen, Marko	
	2	20020177435	A1	2002-11-28	Jenkins et al.	
	3	20020094787	A1	2002-07-18	Avnet et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Application Number		14620913
	Filing Date		2015-02-12
	First Named Inventor	Darrell Diem	
	Art Unit		2434
	Examiner Name	AMARE F TABOR	
	Attorney Docket Number		GDAC-07

	4	20040203951	A1	2004-10-14	Mazzara et al.	
	5	20080122871	A1	2008-05-29	Guday; Shai	
	6	20100214111	A1	2010-08-26	Schuler et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number3	Country Code2 i	Kind Code4	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T5
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	United State Office Action issued in Application No. 14/629,355 dated May 08, 2015	☐
	2	United State Office Action issued in Application No. 14/629,343 dated May 07, 2015	☐
	3	United State Office Action issued in Application No. 14/629,347 dated May 05, 2015	☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-07

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.			

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-07

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Robert S. Babayi/	Date (YYYY-MM-DD)	2015-05-12
Name/Print	Robert S. Babayi	Registration Number	33471

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	22326649
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	12-MAY-2015
Filing Date:	12-FEB-2015
Time Stamp:	17:23:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	GDAC_07_IDS_Increment_3.pdf	612746 133027388a62953c23f375ce2bce88758116a383	no	5

Warnings:

Information:

2	Non Patent Literature	Correspondence_05-11-2015_17_39_39.pdf	282442 5bbf8744dab10546eb57f5015450e8fa75f3f38c	no	8
Warnings:					
Information:					
3	Non Patent Literature	Correspondence_05-07-2015_11_39_48.pdf	282361 e111a2c2a63ce51cf273bbfb18043b01f8ae4555	no	8
Warnings:					
Information:					
4	Non Patent Literature	Correspondence_05-05-2015_13_43_51.pdf	620506 949fe8c304451a3d87fb3a37ee595b65382973e5	no	20
Warnings:					
Information:					
		Total Files Size (in bytes):	1798055		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Darrell Diem

Art Unit: 2139

Application No: 14/620,913

Examiner: Amare F Tabor

Confirmation No: 7589

Filed: 02-12-2015

Atty. Docket No: GDAC-7

Customer No: 98699

For: System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

PATENT TRADEMARK OFFICE

AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

In response to the Office Action dated **April 23, 2015**, please amend the above-identified patent application as follows:

Amendments to the Claims are reflected in on page 2 of this paper.

Remarks begin on page 6 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Cancelled)

2. (Original) A location tracking system comprising:

one or more servers capable of communicating with a plurality of mobile devices, each mobile device is associated with an identification (ID) and at least one location information source that provides location information for the mobile device;

the one or more servers configured to:

define first level administrative privileges to protect privacy of a group of multiple mobile devices;

define second level administrative privileges to control conveyance of information regarding the group;

check the first level administrative privileges before adding a mobile device to the group;

provide one or more interfaces for setting a zone, an event, and an alert for the group;

receive a request to set a zone for the group, the zone having a boundary that is independent of where the group's mobile devices are located;

receive a request to set an event for the group;

receive a request to set an alert for the group, the request identifying a recipient of the alert;

check the second level administrative privileges before setting a zone, an event, or an alert for the group;

store the group’s zone, event and alert in one or more databases;

receive IDs and location information for the multiple mobile devices in the group;

compare the IDs and location information with the group's zone and event to determine whether to send the group’s alert; and

cause the group’s alert to be sent.

3. (Currently amended) The system of claim ~~1~~ 2, the one or more servers configured to:

receive a request to set a second zone for the group;

receive a request to set a second event for the group;

store the group’s second zone and second event in the database; and

compare the mobile device’s location information with the group’s second zone and second event to determine whether to send an alert.

4. (Currently amended) The system of claim ~~1~~ 2, where the one or more interfaces are user interfaces.

5. (Currently amended) The system of claim ~~1~~ 2, where the one or more interfaces comprise an interface for adding a mobile device to the group.

6. (Currently amended) The system of claim ~~3~~ 4, where the one more user interfaces comprise a user interface for adding the mobile device to the group.

7. (Currently amended) The system of claim 4, where the one or more servers control access to the one or more user interfaces for adding a mobile device to the group.

8. (Currently amended) The system of claim ~~1~~ 2, where the one or more servers control access to the interfaces.

9. (Currently amended) The system of claim ~~1~~ 2, where the ID is a serial number.

10. (Currently amended) The system of claim ~~1~~ 2, where the ID is an email address.

11. (Currently amended) The system of claim ~~1~~ 2, where the ID is a phone number.

12. (Currently amended) The system of claim ~~1~~ 2, where the ID is a name.

13. (Currently amended) The system of claim ~~1~~ 2, where the alert is an email.

14. (Currently amended) The system of claim ~~1~~ 2, where the alert is a text message.

15. (Currently amended) The system of claim ~~1~~ 2, where the alert is a device notification.

16. (Currently amended) The system of claim ~~1~~ 2, where the alert is phone call.

17. (Currently amended) The system of claim ~~1~~ 2, where the location information of the mobile device is determined by GPS.

18. (Currently amended) The system of claim ~~1~~ 2, where the location information of the mobile device is determined by RFID.

19. (Currently amended) The system of claim ~~1~~ 2, where the location information of the mobile device is determined by NFC.

20. (Currently amended) The system of claim ~~1~~ 2, where the first level administrative privileges are defined for a customer account.

21. (Currently amended) The system of claim ~~1~~ 2, where the second level administrative privileges are defined for a customer account.

22. (Currently amended) The system of claim ~~1~~ 2, where the first level administrative privileges are checked at a log-in.

23. (Currently amended) The system of claim ~~1~~ 2, where the second level administrative privileges are checked at a log-in.

24. (Currently amended) The system of claim ~~1~~ 2, where the first level administrative privileges are checked when a mobile device is added to the group.

25. (Currently amended) The system of claim ~~1~~ 2, where the second level privileges are checked when setting a zone, an event, or an alert for the group.

26. (Currently amended) The system of claim ~~1~~ 2, where the one or more servers sends the alert.

27. (Currently amended) The system of claim ~~1~~ 2, where the one or more servers cause another server to send the alert.

REMARKS

Claims 3-5 and 8-27 stand objected for informalities, which are corrected as currently amended to overcome the objection. Undersigned thanks the examiner for pointing out the inadvertent typographical error. Claims 2-27 remain in the application.

Examiner Interview

The undersigned wishes to thank the Examiner for the courtesy of the in-person Examiner Interview on April 28th 2015 at the USPTO, where the undersigned pointed out the patentability of claim 2 over cited prior art.

Pre-AIA Status

The Action states that present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA. (Emphasis added) According to the filed Application Data Sheet, however, the Application claims priority to applications filed prior to March 16, 2013. It is respectfully submitted that the Application should be examined under Pre-AIA first-to-invent rules.

Information Disclosure Statements

The undersigned wishes to thank the Examiner for considering the Information Disclosure Statements filed on 2/13 and 2/14/15. The undersigned respectfully requests that the Examiner consider the IDS filed on 4/14/2015.

Obviousness Rejection

Claims 2-8, 10-17, and 20-27 stand rejected under 35 U.S.C. 103 as being unpatentable over "Troy" et al. (US 2003/0142797 A1) in view of "Carter" et al. (US 2006/0020459). This rejection is respectfully traversed for the following reasons.

As explained during the Interview, claim 2 is directed to a location tracking system for groups (or subgroups) of mobile devices that allows the setting of zones, events, and alerts for a group (or subgroup) of mobile devices. Claim 2 requires the system to have multiple levels of administrative privileges, where the first level protects the privacy of a group, and the second level controls the conveyance of information regarding the group. According to claim 2, the one or more servers provide interfaces for setting zone, event, and alert for the group. Claim 2 requires checking the first level before adding a mobile device to a group, and checking the second level before setting the zone, event, or alert for the group.

If, for example, the location tracking system is used by a parent to track his or her children, the first level protects the family's privacy by assuring that a stranger cannot add the parent's children to another group. Next, the second level controls the conveyance of information about the family. For example, the second level may permit the parent, but not a child, to set zones, events, and alerts for the family. The parent may set, for example, a zone for his or her children (e.g., home, school, work); an event (e.g., leaving school, arriving at home); and an alert (e.g., an email sent to another parent, a text message sent to a caregiver).

In another example, if the location tracking system is used by a company to track a fleet of vehicles, the first level protects the company's privacy by assuring that a competitor cannot add the company's vehicles to another group. Next, the second level controls the conveyance of information about the fleet. For example, the second level may permit a company administrator, but not a driver, to set zones, events, and alerts for the fleet. The administrator may set, for example, a zone for its fleet (e.g., parking lot, warehouse, state line, delivery address); an event (e.g., leaving parking lot or state boundary, arriving at delivery address); and an alert (e.g., an email sent to a manager, a phone call made to police, or a text message sent to a customer).

According to claim 2, the one or more or more servers receive IDs and location information for the multiple mobile devices in the group and compare the IDs and location information with the group's zone and event to determine whether to send the group's alert. For this reason, claim 2 requires location information sources for tracking the mobile devices (e.g., a family's smartphones or a fleet's vehicles) and sending alerts based on the zone, event and alert for the group.

For the reasons above, it is respectfully submitted that as further explained below, neither Troy, nor Carter, nor the combination of Troy and Carter teach or suggest the limitations of claim 2. Troy discloses a notification system without any teaching or suggestion for locating or tracking mobile devices. Indeed, the Action concedes that Troy does not explicitly disclose receiving location information for the multiple mobile devices in the group (Action, page 7). For meeting claim 2's requirement for "a plurality of mobile devices" with "at least one location information source that provides location information for the mobile device," the Action cites Troy par. [0037], which states "users may connect to the system by using various client devices 1205, such as a PC, PDA, digital cell phone, etc." As best understood, the Action characterizes Troy's "client devices" as mobile devices associated with location information sources. However, to the extent any mobile device is disclosed in Troy, such mobile device may provide communication channels, but does not provide mobile device location information, as required by claim 2. Troy states "the person can then personalize his/her registration to indicate one or more preferred communication channels 905, such as email, fax, telephone, cell phone, wireless PDA, text message, Internet webpage, and mail." (Emphasis added). Troy, claim 2, requires "the communication channels are selected from the group consisting of email, fax, telephone, cell phone, wireless PDA, text message, Internet webpage, database, chat, teleconference and mail." (Emphasis added). Troy provides no teaching or suggestion for relating mobile device communication channels with mobile device location information sources. Claim 2 expressly requires "each mobile device is associated with ... at least one location information source that provides location information for the mobile device" in a group. This is not taught or suggested in Troy.

Troy describes "a section of the webpage in which the sender can enter the location of the crime and associated keywords 335 in order to make searching and distribution easier" (Troy, par. [0027]). It is respectfully submitted that even under the broadest reasonable interpretation (the BRI), "crime location" as disclosed in Troy cannot be construed to meet the claimed requirement for "location information source that provides location information for the mobile device," as in claim 2. Troy does not teach or suggest any relationship between location of a crime and location of a mobile device. According to Troy par. [0025], a number of events trigger "crime alerts, school alerts, neighborhood alerts, business alerts, wanted fugitive alerts, missing persons information, unsolved crime notices, crime prevention tips, general notices, local events information, advocate information, crime statistics, safety catalog product information, etc." There is, however, no relationship in the cited section between such events, which trigger these alerts, and locations of mobile devices. Indeed, the Action correctly concedes that Troy does not disclose comparing "the IDs and location information with the group's zone and event to determine whether to send the group's alert; and cause the group's alert to be sent." (Action, page 7). This is because Troy discloses, at most, receiving event information identified by someone at some point in time after the event occurs, but not mobile device locations. Because Troy does not receive location information of the group of communication channel mobile devices and does not teach or suggest setting a zone and event for a group of mobile devices, it cannot compare such location information with such settings to determine whether to send the group's alert.

For meeting the claimed requirements for multiple levels of administrative privileges, the Action cites: 1) Troy par. [0026], which states "*across the system's areas such restrictions of activities may be controlled through security measures. For example, notification messages stored on the database, message boards, chat rooms, webpages, teleconferences, video-conferences and the like can all be secured so that only authorized users are granted access to them)]"* and 2) Troy par. [0027], which states "*the sender may customize the alert by choosing an expiration date 325 as well as whether the alert (as it is stored in the database) will be viewable by the public or only by certain persons 330)]"* However, one finds no teaching or suggestion in the cited sections regarding control of conveyance of any information about mobile devices as a group, let alone defining a second level administrative privilege to control such conveyance, as expressly required by Claim 2. Indeed, nothing in the cited section teach or suggest applying multiple levels of administrative privileges to a group of mobile devices.

For "checking the first level administrative privileges before adding a mobile device to the group," the Action cites Troy par. [0034], which states "*individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias. If the person is affiliated with a law enforcement agency, he or she may enter a badge number 815. This will enable them to be reviewed and potentially granted rights such as being able to submit and distribute crime alerts. If the person represents a business, then he/she can request to receive business crime alerts 820. Otherwise, the person can request the types of alerts to receive 825)]*;" Again, nothing in the cited section teaches or suggest adding mobile devices to the group of mobile devices, let alone checking a first level administrative privilege before adding a mobile device.

For "providing one or more interfaces for setting a zone, an event and an alert for the group," the Acton states "*[see FIG.4A, where Interface is disclosed. See also par.0034 of Troy, individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias]."* However, there is no mention of a zone, event or alert in the cited section. In fact, Troy does not meet this claim requirement because there is no teaching or suggestion in Troy regarding setting an event for the group of mobile devices, let alone checking the second level administrative privileges for such setting as required by claim 2. It also follows that

Troy does not teach or suggest receiving a request to set an event for the group as required by claim 2.

For "receiving a request to set a zone for the group, the zone having a boundary that is independent of where the group's mobile devices are located, the Action states *"[see FIG.4A, where Troy discloses address, city, state, zip/postal code]"* In fact, Troy does not receive a request to set a zone for the group of its mobile devices. Instead, Troy describes user interfaces for sending and receiving messages, including interfaces for registering users, entering messages, and configuring message formats and distribution groups. According to Troy par. [0027], "the distribution may be limited to receivers within the same ZIP code, the same city, etc. In some embodiments, the template allows for another type of geographic descriptor to be entered, such as a neighborhood name, a local landmark, a school name, etc. Or, some systems allow the geographic limitation to be implemented through a receiver group." As such, zones in Troy are set for message distribution or receivers groups, but not for a group of mobile devices. Because Troy does not teach or suggest a group's zone, event and alert, it fails to teach or suggest storing them, as required by claim 2.

For "receiving a request to set an event for the group; receive a request to set an alert for the group, the request identifying a recipient of the alert, the Action cites par. [0027] of Troy, which state "*a webpage in which a crime alert is created. At the top of the webpage, the sender enters the headline to be associated with the crime alert 305. Next, page names to display under the "My Links" 315 and page names to display within the Crime Prevention Group section 315. There is a field provided for entry of the details of the crime alert 320 as well as a description of the suspect 410. The sender may customize the alert by choosing an expiration date 325 as well as whether the* *alert (as it is stored in the database) will be viewable by the public or only by certain persons 330)]."* Once again, there is no relationship in the cited section between creating a "crime alert" and locations of the mobile devices of Troy. Because there is no teaching suggestion in Troy regarding setting an event for the group of mobile devices, it follows that Troy does not teach or suggest receiving a request to set an event for the group as required by claim 2.

For "check the second level administrative privileges before setting a zone, an event, or an alert for the group," the Action cites Troy par.0024, which states "*users of the present invention's system fall into a variety of types. Some of these types can be authorized as senders. Others are only authorized to receive notices and/or to view a portion of the system. In one embodiment of the invention, users are assigned as: system administrators, law enforcement agent officers, public safety department leaders, group administrators (such as crime prevention group leaders, school district group leaders, etc.), advocates, business users, neighborhood captains, registered users, and non-registered users. Of course, additional categorization of users is possible*)]." It is respectfully submitted that there is no mention of group of mobile devices in the cited section. As stated above, there is no teaching suggestion in Troy regarding setting an event for the group of mobile devices, let alone checking the second level administrative privileges for such setting as required by claim 2.

Claim 2 requires defining a first level administrative privilege to protect privacy of a group of multiple mobile devices. Once again, the only grouping of mobile devices in Troy is as a group of mobile devices that operate as communication channels. However, claim 2 also requires defining a second level administrative privilege to control conveyance of information regarding the group of mobile devices.

Based on the foregoing, Troy fails to teach or suggest one or more servers that define first level administrative privileges to protect privacy of a group of multiple mobile devices associated with location information sources; define second level administrative privileges to control conveyance of information regarding the group; check the first level administrative privileges before adding a mobile device to the group; provide one or more interfaces for setting a zone, an event, and an alert for the group; receive a request to set a zone for the group; receive a request to set an event for the group; receive a request to set an alert for the group; check the second level administrative privileges before setting a zone, an event, or an alert for the group; and store the group's zone, event and alert in one or more databases.

The Action argues that it would have been obvious "to modify the system of Troy by incorporating the teachings of Carter for the benefit of verifying users and deliver alert information based on the verification (i.e., phone number) and location information of the user." Carter, however, discloses a system and method for immigration tracking and intelligence (Carter, title). According to Carter par. [0119], "if a client calls from a GPS enabled-phone, Webportal software 130 compares data received from the phone to database of client records 134, logs the call in the client logs 136, and also tracks the client's movement on a map tracker 142 based on the received GPS interval data." In light of the forgoing, it is respectfully submitted that the cited prior art of record teaches away from modifying the system in Troy to incorporate Carter because the systems in Troy and Carter are incompatible. Troy is a notification system where the location of the missing person is unknown, and there is no location information source for locating the missing person (otherwise, the person would not be missing). Carter, on the other hand, is a surveillance/intelligence system for a person-of-interest. It would be counterintuitive to combine Carter's surveillance/intelligence system, which by nature keeps information about a person secret, with Troy's "location-less" notification system that disseminates/publicizes information about the person.

Troy and Carter not only teach away from being combined with each other, Carter defeats the expressed needs and objectives of Troy. For example, Troy, par. [0004] describes a need for "an easy to use system that can be used by such groups to <u>publicize</u> their work and to alert groups of important crime and crime prevention information." Furthermore, Troy, par. [0003] describes a need for "a system that would collect crime and similar information, and then disseminate it to the various applicable agencies." If, however, a person's location is determined using Carter, then the person is no longer missing, and there is no need for public notifications.

Even if Carter could be combined with Troy, it does not remedy the deficiencies in Trey discussed above. Like Troy, Carter fails to teach or suggest one or more servers configured to:

> define first level administrative privileges to protect privacy of a group of multiple mobile devices;
>
> define second level administrative privileges to control conveyance of information regarding the group;
>
> check the first level administrative privileges before adding a mobile device to the group;
>
> provide one or more interfaces for setting a zone, an event, and an alert for the group;

receive a request to set a zone for the group, the zone having a boundary that is independent of where the group's mobile devices are located;

receive a request to set an event for the group;

receive a request to set an alert for the group, the request identifying a recipient of the alert;

check the second level administrative privileges before setting a zone, an event, or an alert for the group;

store the group's zone, event and alert in one or more databases;

receive IDs and location information for the multiple mobile devices in the group;

compare the IDs and location information with the group's zone and event to determine whether to send the group's alert; and

cause the group's alert to be sent.

Conclusion

Having overcome the obviousness rejection of claim 2, it is respectfully submitted that rejection of claims depending on claim 2 have been overcome. It is respectfully submitted that all pending claims are now in allowable form. Early issuance of a Notice of Allowance is respectfully submitted. If the Examiner is of the opinion that the prosecution of this application would be advanced by a personal interview, the Examiner is invited to telephone undersigned counsel to arrange for such an interview.

Dated: April 28, 2015

Respectfully submitted,

By: / Robert S. Babayi /
Robert S. Babayi
Registration No.: 33,471

(703) 587-3803 (Mobile)
Attorney/Agent For Applicant

Electronic Acknowledgement Receipt

EFS ID:	22210124
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	29-APR-2015
Filing Date:	12-FEB-2015
Time Stamp:	18:36:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	Response_Nonfinal.pdf	153518 778c7761797c11d6b3c3801fccda4e4957b16916	no	17

Warnings:

Information:

Total Files Size (in bytes):	153518

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/620,913	Filing Date 02/12/2015	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 04/29/2015	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	x $40 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	x $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/ANGELONA JONES/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/620,913	02/12/2015	Darrell Diem	GDAC-7	7589

98699 7590 04/23/2015

Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

EXAMINER
TABOR, AMARE F

ART UNIT	PAPER NUMBER
2434	

NOTIFICATION DATE	DELIVERY MODE
04/23/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

robert@babayilaw.com
robert@vectoriplaw.com

Office Action Summary	Application No. 14/620,913	Applicant(s) DIEM, DARRELL	
	Examiner AMARE F. TABOR	Art Unit 2434	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/13/2015*.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *2-27* is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
6)☐ Claim(s) _____ is/are allowed.
7)☒ Claim(s) *2-27* is/are rejected.
8)☐ Claim(s) _____ is/are objected to.
9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.
11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.
3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

2. Information Disclosure Statements ("IDS") filed on 02/13 and 02/14/15 are considered.

Claim Status

Claim 1 is (Cancelled)

Claims 2-27, filed on 02/13/2015 are presented for examination.

Claim Objections

3. Claims 3-5 and 8-27 are objected to because of the following informalities: The claims depend on claim 1, which is cancelled. The claims are examined as being dependent on claim 2. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

5. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2-8, 10-17 and 20-27 are rejected under 35 U.S.C. 103 as being unpatentable over "Troy" et al. (US 2003/0142797 A1) in view of "Carter" et al. (US 2006/0020459 A1).

Regarding Claim 2: Troy teaches a location tracking system comprising: one or more servers capable of communicating with a plurality of mobile devices, each mobile device is associated with an identification (ID) and at least one location information source that provides location information for the mobile device [(par. 0031 of Troy, *in one embodiment of the invention, crime alerts and business alerts are two of many types of notifications supported. Other types of notification messages may be:* ***affinity group alert,***

***community crime alert, community information message, community safety tip**, advocate notice, neighborhood watch alert, neighborhood watch group notice, fugitive information message, missing person information message, unsolved crime information, school message, neighborhood message, seniors message, health message, terrorism message and safety message (which may be for public safety or some other classification of safety)*) and (par. 0030 of Troy, *the embodiment of the business alert shown also includes fields whereby the sender can determine **a geographic coverage area based on a radial distance 505**. Since business alerts may be pertinent only to certain types of businesses, the template allows the sender to choose business categories to which the alert should be sent 510*) and (par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred communication channels 905, such as email, fax, **telephone, cell phone, wireless PDA, text message**, Internet webpage, and mail. This enables the system to send the person alerts in the form most convenient to the registrant*)];

the one or more servers configured to:

define first level administrative privileges to protect privacy of a group of multiple mobile devices [(par.0026 of Troy, ***across the system's areas such restrictions of activities may be controlled through security measures**. For example, notification messages stored on the database, message boards, chat rooms, webpages, teleconferences, video-conferences and the like can all be **secured so that only authorized users are granted access to them***)];

define second level administrative privileges to control conveyance of information regarding the group [(par.0027 of Troy, *the sender may customize the alert by choosing an expiration date 325 as well as* ***whether the alert (as it is stored in the database) will be viewable by the public or only by certain persons 330***)];

check the first level administrative privileges before adding a mobile device to the group [(par.0034 of Troy, *individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address.* ***Then login information is entered 810, including an email address, password, and message board alias****. If the person is affiliated with a law enforcement agency, he or she may enter a badge number 815. This will enable them to be reviewed and potentially granted rights such as being able to submit and distribute crime alerts. If the person represents a business, then he/she can request to receive business crime alerts 820. Otherwise, the person can request the types of alerts to receive 825*)];

provide one or more interfaces for setting a zone, an event, and an alert for the group [*see FIG.4A, where Interface is disclosed*. See also par.0034 of Troy, ***individuals and/or businesses may register with the system****. To sign up,* ***the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias***];

receive a request to set a zone for the group, the zone having a boundary that is independent of where the group's mobile devices are located [see *FIG.4A, where Troy discloses* ***address, city, state, zip/postal code***];

receive a request to set an event for the group; receive a request to set an alert for the group, the request identifying a recipient of the alert [(par.0027 of Troy, *a webpage in which a crime alert is created. At the top of the webpage,* ***the sender enters the headline to be associated with the crime alert 305****. Next,* ***page names to display under the "My Links" 315 and page names to display within the Crime Prevention Group section 315****.* ***There is a field provided for entry of the details of the crime alert 320 as well as a description of the suspect 410****. The sender may customize the alert by choosing an expiration date 325 as well as whether the alert (as it is stored in the database) will be viewable by the public or only by certain persons 330*)];

check the second level administrative privileges before setting a zone, an event, or an alert for the group [(par.0024 of Troy, *users of the present invention's system fall into a variety of types. Some of these types can be authorized as senders.* ***Others are only authorized to receive notices and/or to view a portion of the system****. In one embodiment of the invention, users are assigned as: system administrators, law enforcement agent officers, public safety department leaders, group administrators (such as crime prevention group leaders, school district group leaders, etc.), advocates, business users, neighborhood captains, registered users, and non-registered users. Of course, additional categorization of users is possible*)]; and

store the group's zone, event and alert in one or more databases [(par.0027 of Troy, *there is a field provided for entry of the details of the crime alert 320 as well as a description of the suspect 410.* ***The sender may customize the alert by***

choosing an expiration date 325 as well as whether the alert (as it is stored in the database) will be viewable by the public or only by certain persons 330*. Furthermore,* ***there is a section of the webpage in which the sender can enter the location of the crime and associated keywords 335 in order to make searching and distribution easier****. For example, the distribution may be limited to receivers within the same ZIP code, the same city, etc.*)].

Troy does not explicitly disclose receive IDs and location information for the multiple mobile devices in the group; compare the IDs and location information with the group's zone and event to determine whether to send the group's alert; and cause the group's alert to be sent. However, Carter, analogues art, discloses the above limitations as [(see par.0108 of Carter, ***triggering an alert based upon a change in a client's geographic location or based upon an impermissible calling location or the rate of change in location, 500****. The method includes first* ***determining a client's phone number at step 406 and comparing the phone number to the client's records at step 502****. After comparting* ***the phone number to the client's records the client's location is determined at step 512***) and (par.0109 of Carter, ***once the client's location has been determined****, the method includes determining whether or not the client changed locations 514. If the client's present location differs from the client's previous location (condition 518), the program proceeds to step 519 where the distance of the change is calculated by calculating the distance between the last known location of the client and the current location of the client. Also at step 519, the program calculates the rate of change by* *differentiating with respect to the time between callbacks. At step 519, the program also calculates the acceleration of the change in location by differentiating the relative rates of change between previous locations. The program then proceeds to step 520* ***where it determines if the change in location, the distance in the change, the rate of change and/or the acceleration comprises an alert condition. If so, the program moves to step 418, where an alert is sent****. If not, (condition 522) the condition is recorded in the client record database at step 410, then an alert is sent at step 418 and the location change is recorded in the client record database at step 410*)].

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the invention was made to modify the system of Troy by incorporating the teachings of Carter for the benefit of verifying users and deliver alert information based on the verification (i.e., phone number) and location information of the user.

Regarding Claim 3, Troy in view of Carter further teaches the system of claim 1, the one or more servers configured to: receive a request to set a second zone for the group; receive a request to set a second event for the group; store the group's second zone and second event in the database; and compare the mobile device's location information with the group's second zone and second event to determine whether to send an alert [(par.0009 of Troy, *a method for sending a message from a sender to a receiver may begin with the sender choosing what type of message to create. The message may then be* *created in a format matching the type of message chosen. If desired,* ***the sender may choose one or more groups to receive the message***). See also paragraph 108 and 109 of Carter]. The motivation to combine is the same as that of claim 2 above.

Regarding Claim 4, Troy in view of Carter further teaches the system of claim 1, where the one or more interfaces are user interfaces [*see FIG.4A, where Interface is disclosed*. See also par.0034 of Troy, ***individuals and/or businesses may register with the system****. To sign up,* ***the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias***].

Regarding Claim 5, Troy in view of Carter further teaches the system of claim 1, where the one or more interfaces comprise an interface for adding a mobile device to the group [*see FIG.4A, where Interface is disclosed*. See also par.0034 of Troy, ***individuals and/or businesses may register with the system****. To sign up,* ***the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias***].

Regarding Claim 6, Troy in view of Carter further teaches the system of claim 3, where the one more user interfaces comprise a user interface for adding the mobile device to the group [(par.0034 of Troy, ***individuals and/or businesses may register with the system****. To sign up,* ***the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias***). ***Also see the interface in fig. 4A***].

Regarding Claim 7, Troy in view of Carter further teaches the system of claim 4, where the one or more servers control access to the interface for adding a mobile device to the group [*see FIG.4A, where Interface is disclosed.* See also par.0034 of Troy, ***individuals and/or businesses may register with the system****. To sign up,* ***the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias***].

Regarding Claim 8, Troy in view of Carter further teaches the system of claim 1, where the one or more servers control access to the interfaces [*see FIG.4A, where Interface is disclosed.* See also par.0034 of Troy, ***individuals and/or businesses may register with the system****. To sign up,* ***the person enters general information 805, such as name and address. Then login information is entered 810, including an email address, password, and message board alias***].

Regarding Claim 10, Troy in view of Carter further teaches the system of claim 1, where the ID is an email address [*see FIG.4A, where Interface is disclosed*. See also par.0034 of Troy, *individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address. Then login information is entered 810,* ***including an email address****, password, and message board alias*].

Regarding Claim 11, Troy in view of Carter further teaches the system of claim 1, where the ID is a phone number [(par.0108 of Carter, *triggering an alert based upon a change in a client's geographic location or based upon an impermissible calling location or the rate of change in location, 500. The method includes first* ***determining a client's phone number at step 406 and comparing the phone number to the client's records at step 502***)]. The motivation to combine is the same as that of claim 2 above.

Regarding Claim 12, Troy in view of Carter further teaches the system of claim 1, where the ID is a name [(par.0034 of Troy, *to sign up, the person enters general information 805, such as* ***name and address****. Then login information is entered 810, including an email address, password, and message board alias*)].

Regarding Claim 13, Troy in view of Carter further teaches the system of claim 1, where the alert is an email [(par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred* ***communication channels 905, such as email,*** *fax, telephone, cell phone, wireless PDA, text message, Internet webpage, and mail.* ***This enables the system to send the person alerts in the form most convenient to the registrant***)].

Regarding Claim 14, Troy in view of Carter further teaches the system of claim 1, where the alert is a text message [(par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred* ***communication channels 905, such as*** *email, fax, telephone, cell phone, wireless PDA,* ***text message****, Internet webpage, and mail.* ***This enables the system to send the person alerts in the form most convenient to the registrant***)].

Regarding Claim 15, Troy in view of Carter further teaches the system of claim 1, where the alert is a device notification [(par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred* ***communication channels 905, such as*** *email, fax,* ***telephone, cell phone, wireless PDA, text message****, Internet webpage, and mail.* ***This enables the system to send the person alerts in the form most convenient to the registrant***)].

Regarding Claim 16, Troy in view of Carter further teaches the system of claim 1, where the alert is phone call [(par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred* ***communication channels 905, such as*** *email, fax,* ***telephone, cell phone****, wireless PDA, text message, Internet webpage, and mail.* ***This enables the system to send the person alerts in the form most convenient to the registrant***)].

Regarding Claim 17, Troy in view of Carter further teaches the system of claim 1, where the location information of the mobile device is determined by GPS [(par.0113 of Carter, *a call is received from the client.* ***When the call is received, the location of the client's phone is identified at step 726 using GPS and/or assisted GPS****. The client's voice is then verified by voice recognition at step 728. Voice recognition techniques disclosed earlier can be used to accomplish this*)]. The motivation to combine is the same as that of claim 2 above.

Regarding Claim 20, Troy in view of Carter further teaches the system of claim 1, where the first level administrative privileges are defined for a customer account [(par.0034 of Troy, *individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address.* ***Then login information is entered 810, including an email address, password, and message board alias****. If the person is affiliated with a law enforcement agency, he or she may enter a badge number 815. This will enable them to be reviewed and potentially granted rights such as being able to submit and* *distribute crime alerts. If the person represents a business, then he/she can request to receive business crime alerts 820. Otherwise, the person can request the types of alerts to receive 825*)].

Regarding Claim 21, Troy in view of Carter further teaches the system of claim 1, where the second level administrative privileges are defined for a customer account [(par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred* ***communication channels 905, such as*** *email, fax, telephone,* ***cell phone, wireless PDA, text message, Internet webpage, and mail. This enables the system to send the person alerts in the form most convenient to the registrant***)].

Regarding Claim 22, Troy in view of Carter further teaches the system of claim 1, where the first level administrative privileges are checked at a log-in [(par.0034 of Troy, *individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address.* ***Then login information is entered 810, including an email address, password, and message board alias****. If the person is affiliated with a law enforcement agency, he or she may enter a badge number 815. This will enable them to be reviewed and potentially granted rights such as being able to submit and distribute crime alerts. If the person represents a business, then he/she can request to receive business crime alerts 820. Otherwise, the person can request the types of alerts to receive 825*)].

Regarding Claim 23, Troy in view of Carter further teaches the system of claim 1, where the second level administrative privileges are checked at a log-in [(par.0035 of Troy, *the person can then personalize his/her registration to indicate one or more preferred* ***communication channels 905, such as*** *email, fax, telephone,* ***cell phone****,* ***wireless PDA****,* ***text message****,* ***Internet webpage, and mail. This enables the system to send the person alerts in the form most convenient to the registrant***)].

Regarding Claim 24 Troy in view of Carter further teaches the system of claim 1, where the first level administrative privileges are checked when a mobile device is added to the group [(par.0034 of Troy, ***individuals and/or businesses may register with the system. To sign up, the person enters general information 805, such as name and address****. Then login information is entered 810, including an email address, password, and message board alias. If the person is affiliated with a law enforcement agency, he or she may enter a badge number 815. This will enable them to be reviewed and potentially granted rights such as being able to submit and distribute crime alerts. If the person represents a business, then he/she can request to receive business crime alerts 820. Otherwise, the person can request the types of alerts to receive 825*)].

Regarding Claim 25, Troy in view of Carter further teaches the system of claim 1, where the second level privileges are checked when setting a zone, an event, or an alert for the group [(par.0035 of Troy, ***the person can then personalize his/her registration to indicate one or more preferred communication channels 905***, *such as email, fax, telephone, cell phone, wireless PDA, text message, Internet webpage, and mail. This enables the system to send the person alerts in the form most convenient to the registrant*)].

Regarding Claim 26, Troy in view of Carter further teaches the system of claim 1, where the one or more servers sends the alert [(par.0037 of Troy, ***the alerts and other notification messages are stored on a database 1215 and are accessible by the server 1220. One skilled in the art will recognize that any number of off-the-shelf hardware and software components can be utilized to create such an architecture***. *The business logic can be programmed using C++, C#, Java, or other programming language. The database 1215 can be one provided by Oracle Corporation, for example and accessed via standard SQL statements*)].

Regarding Claim 27, Troy in view of Carter further teaches the system of claim 1 1, where the one or more servers cause another server to send the alert [(par.0037 of Troy, ***the alerts and other notification messages are stored on a database 1215 and are accessible by the server 1220. One skilled in the art will recognize that any number of off-the-shelf hardware and software components can be utilized to create such an architecture***. *The business logic can be programmed using C++, C#, Java, or other programming language. The database 1215 can be one provided by Oracle Corporation, for example and accessed via standard SQL statements*)].

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Troy (US 2003/0142797) in view of Carter (US 2006/0020459) and further in view of Rappaport et al. (US 2004/0236547 A1).

Regarding Claim 9, Troy in view of Carter further teaches the system of claim 1, the system of identifying user using a phone number but fails to disclose the system of having a serial number as an ID. However, Rappaport, analogues art, teaches this limitation as, (paragraph 171 of Rappaport, *the computerized model of the network topology is being generated, the designer can identify a communication path between the graphical icon representing each network device within the computerized site-specific model and the actual physical network device. This identified communication path may take the form of an IP address, media access control (MAC) address,* ***network serial number****, phone number, bar code, user name, RF identifier (ID)) tag, or some other identifier that both uniquely defines the network device but also describes or implies a specific means of establishing a communication link with the device. For example, an IP address uniquely describes a network device that may be accessed using an IP protocol via the Internet*).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention was made, to modify the teaching of Troy and Carter by incorporating the teaching of Rappaport for the benefit of substituting one method for the other (phone number/serial number) to get the same end result of identifying user using device information.

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Troy et al. (US 2003/0142797 A1) in view of Carter et al. (US 2006/0020459 A1) and further in view of Phillips et al. (US 2006/0270421 A1).

Regarding Claim 18, Troy in view of Carter further teaches the system of claim 1, the system of locating a mobile device using GPS but fails to disclose the system of determining the location information of the mobile device using RFID. However, Phillips, analogues art, teaches this limitation as, (paragraph 98 of Phillips, ***the location information*** *provided by the location services facility to the user may originate from the use of various methods incorporating data from a sensor facility such as, without limitation,* ***a global positioning system (GPS), a radio frequency identification (RFID)****, a plurality of cell phone towers (for example, for time and/or triangulation)*).

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the invention was made to modify the teaching of Troy and Carter by incorporating the teaching of Phillips for the benefit of substituting one method for the other (GPS/RFID) to get the same end result of device location.

9. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Troy et al. (US 2003/0142797 A1) in view of Carter et al. (US 2006/0020459 A1) and further in view of Humbel (US 2007/0197261 A1).

Regarding Claim 19, Troy in view of Carter further teaches the system of claim 1, the system of locating a mobile device using GPS but fails to disclose the system of determining the location information of the mobile device using NFC. However, Humbel, analogues art, teaches this limitation as, (Paragraph 36 of Humbel, *the AIORK invention is that with one single mobile phone the exclusive opening closing, locking identification* ***tracking etc. of RFID-tags over "Near Field Communication"*** *transceivers as well as over Bluetooth, W-LAN and GSM for all other new products as laptops, video-cameras and over all of radio (bicycle)-locks as well as for other vehicles or garages and doors can be managed*).

Therefore, it would have been obvious to one of ordinary skill in the art before the effective filing date of the invention was made to modify the teaching of Troy and Carter tby incorporating the teaching of Humbel for the benefit of substituting one method for the other (GPS/RFID) to get the same end result of device location.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. (See PTO-892).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMARE F. TABOR whose telephone number is (571)270-3155. The examiner can normally be reached on Mon-Fri 8:00a.m. to 5:00p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, KAMBIZ ZAND can be reached on (571) 272-3811. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AMARE F TABOR/
Primary Examiner, Art Unit 2434

Notice of References Cited	Application/Control No. 14/620,913	Applicant(s)/Patent Under Reexamination DIEM, DARRELL	
	Examiner AMARE F. TABOR	Art Unit 2434	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0142797	07-2003	Troy et al.	379/88.12
*	B	US-2006/0020459	01-2006	Carter et al.	704/246
*	C	US-6,975,873	12-2005	Banks et al.	455/456.5
*	D	US-2006/0003775	01-2006	Bull et al.	455/456.1
*	E	US-2004/0236547	11-2004	Rappaport et al.	703/002
*	F	US-2006/0270421	11-2006	Phillips et al.	455/457
*	G	US-2007/0197261	08-2007	Humbel, Roger Marcel	455/558
	H	US-			
	I	US-			
	J	US-			
	K	US-			
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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CONFIRMATION NO. 7589

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/620,913	02/12/2015 **RULE**	726	2434	GDAC-7

APPLICANTS
Geofence Data Access Controls LLC, Huntsville, AL, Assignee (with 37 CFR 1.172 Interest);

INVENTORS
Darrell Diem, Madison, AL;

** **CONTINUING DATA** *************************
This application is a CON of 14/270,890 05/06/2014
which is a CON of 13/948,785 07/23/2013 PAT 8717166
which is a CON of 13/550,788 07/17/2012 PAT 8493207
which is a CON of 13/437,725 04/02/2012 PAT 8223012
which is a CON of 12/428,008 04/22/2009 PAT 8149113
which is a CON of 11/335,699 01/20/2006 PAT 7525425
which claims benefit of 60/752,879 12/23/2005

** **FOREIGN APPLICATIONS** *************************

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02/24/2015

		STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /AMARE F TABOR/ Examiner's Signature	☐ Met after Allowance /aft/ Initials	AL	21	26	1

ADDRESS

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Washington, DC 20007
UNITED STATES

TITLE

Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges

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BIB (Rev. 05/07).

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2434
	Examiner Name	AMARE F TABOR
	Attorney Docket Number	GDAC-7

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Examiner Initial*	Cite No	Patent Number	Kind Code1	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7876239		2011-01-25	Scott A. Horstemeyer	
	2	7479899		2009-01-20	Scott A. Horstemeyer	

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Receipt date: 04/14/2015

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
Application Number	14620913	14620913 - GAU: 2434
Filing Date	2015-02-12	
First Named Inventor	Darrell Diem	
Art Unit	2434	
Examiner Name	AMARE F TABOR	
Attorney Docket Number	GDAC-7	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2139
	Examiner Name	unassigned
	Attorney Docket Number	GDAC-7

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6331825		2001-12-18	Ladner et al.	
	2	7783507		2010-08-24	Schick et al.	
	3	6639516		2003-10-28	Copley	
	4	7231218		2007-06-12	Diacakis et al.	
	5	6212392		2001-04-03	Fitch et al.	
	6	6321092		2001-11-20	Fitch et al.	
	7	6202023		2001-03-13	Hancock et al.	
	8	5839088		1998-11-17	Hancock et al.	

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Receipt date: 02/13/2015	Application Number	14620913	14620913 - GAU: 2434
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	First Named Inventor	Darrell Diem	
	Art Unit	2139	
	Examiner Name	unassigned	
	Attorney Docket Number	GDAC-7	

	9	8935220		2015-01-13	Hancock et al.	
	10	6356834		2002-03-12	Hancock et al.	
	11	8593276		2013-11-26	Doyle	
	12	7660658		2010-02-09	Sheynblat	
	13	8559937		2013-10-15	Ram et al.	
	14	7880609		2011-02-01	Viegers et al.	
	15	5223844		1993-06-29	Mandell et al.	
	16	5400246		1995-03-21	Wilson et al.	
	17	5499182		1996-03-12	Ousborne	
	18	5661492		1997-08-26	Shoap et al.	
	19	6064970		2000-05-16	McMillan et al.	

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	1	20010018628	A1	2001-08-30	Jenkins et al.	
	2	20020184178	A1	2002-12-05	Tasooji et al.	
	3	20030114967	A1	2003-06-19	Good	
	4	20040236596	A1	2004-11-25	Chowdhary et al.	
	5	20070214258	A1	2007-09-13	Karrapanan et al.	
	6	20030023377	A1	2003-01-30	Chen et al.	
	7	20020024443	A1	2002-02-28	Hawkins et al.	

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	Attorney Docket Number	GDAC-7

	1	1990013186	WO		1990-11-01	Geostar Corporation		☐
	2	1995005649	WO		1995-02-23	Vorad Safety Systems, Inc.		☐
	3	2004104968	WO		2004-12-02	Landsonar, Inc.		☐

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	1	CZARNECKA, MARZENA, The Long View of the Law, Calgary Company's High-Tech Device Helps Police and Clients "See" Stolen Vehicles and Equipment, Alberta Venture 82-86 (June 2005)	☐

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	Application Number	
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	Art Unit	
	Examiner Name	
	Attorney Docket Number	GDAC-7

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7317927		2008-01-08	Staton et al.	
	2	7598855		2009-10-06	Scalisi et al.	
	3	7269426		2007-09-11	Kokkonen et al.	
	4	8547222		2013-10-01	Aninye et al.	
	5	7672677		2010-03-02	Howard et al.	
	6	8504057		2013-08-06	Choi et al.	
	7	5757916		1998-05-26	MacDoran et al.	
	8	6553308		2003-04-22	Uhlmann et al.	

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	Art Unit	
	Examiner Name	
	Attorney Docket Number	GDAC-7

	9	6618593		2003-09-09	Drutman et al.	
	10	6687504		2004-02-03	Raith	
	11	6801850		2004-10-05	Wolfson	
	12	6806814		2004-10-19	Iverson et al.	
	13	6813501		2004-11-02	Kinnunen et al.	
	14	6847892		2005-01-25	Zhou et al.	
	15	6850252		2005-02-01	Hoffberg	
	16	6867733		2005-03-15	Sandhu et al.	
	17	6879835		2005-04-12	Greene et al.	
	18	6888936		2005-05-03	Groen et al.	
	19	6952181		2005-10-04	Karr et al.	

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	Art Unit		
	Examiner Name		
	Attorney Docket Number	GDAC-7	

	20	7000015		2006-02-14	Moore et al.	
	21	7116985		2006-10-03	Wilson et al.	
	22	7123926		2006-10-17	Himmelstein	
	23	7130611		2006-10-31	Kimura et al.	
	24	7181227		2007-02-20	Wilson et al.	
	25	7190960		2007-03-13	Wilson et al.	
	26	7203752		2007-04-10	Rice et al.	
	27	7236100		2007-06-26	Obradovich et al.	
	28	7259668		2007-08-21	Casey	
	29	7275102		2007-09-25	Yeager et al.	
	30	7295119		2007-11-13	Rappaport et al.	

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	Attorney Docket Number	GDAC-7

	31	7327258		2008-02-05	Fast et al.	
	32	7336964		2008-02-26	Casey	
	33	7359716		2008-04-15	Rowitch et al.	
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	35	7423535		2008-09-09	Chung et al.	
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	41	7522634		2009-04-21	Casey et al.	

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	Attorney Docket Number: GDAC-7

	42	8095115		2012-01-10	Van de Groenendaal	
	43	7525426		2009-04-28	Edelstein et al.	
	44	7525484		2009-04-28	Dupray et al.	
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	50	7366522		2008-04-29	Thomas	
	51	7801506		2010-09-21	Haave et al.	
	52	7382248		2008-06-03	Black et al.	

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	53	7102510		2006-09-05	Boling et al.	
	54	6838998		2005-01-04	Brown et al.	
	55	6243039		2001-06-05	Elliot	
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	61	5263158		1993-11-16	Frederick	
	62	7027808		2006-04-11	Wesby	
	63	7277018		2007-10-02	Reyes et al.	

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	64	7460020		2008-12-02	Reyes et al.	
	65	7469139		2008-12-23	Van de Groenendaal	
	66	6691032		2004-02-10	Irish et al.	
	67	7138913		2006-11-21	Mackenzie et al.	
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	69	5982281		1999-11-09	Hoyt	

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	1	20070060108	A1	2007-03-15	East et al.	
	2	20070087828	A1	2007-04-19	Robertson	
	3	20070149208	A1	2007-06-28	Syrbe et al.	

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	4	20080065320	A1	2008-03-13	Irish et al.	
	5	20070156664	A1	2007-07-05	Norton et al.	
	6	20050215243		2005-09-29	Black et al.	
	7	20050210104		2005-09-22	Torvinen, Marko	
	8	20090065578		2009-03-12	Peterson et al.	

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	1	2002017656	WO	A2	2002-02-28	Von Scheele et al.		☐

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	1	BARKHUUS et al., Location-Based Services for Mobile Telephony: a study of users' privacy concerns, Proceedings of Interact 2003, ACM Press, Pages 709-712, Zurich, Switzerland	☐

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	Attorney Docket Number	GDAC-7

	2	HEWLETT-PACKARD DEVELOPMENT COPANY, Location-based Services, Consumer research findings from HP and Openwave, March 2004, U.S.	☐
	3	MALY et al., A Privilege Management and Enforcement System for Distributed Resource Sharing, 1996.	☐

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14620913	DIEM, DARRELL
	Examiner	**Art Unit**
	AMARE F TABOR	2434

CPC- SEARCHED

Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED

Symbol	Date	Examiner
(H04W4/02 OR H04W4/008 OR H04W4/023 OR H04W4/025 OR G06Q30/0261)	4/16/2015	aft

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
726	4	4/16/2015	aft

SEARCH NOTES

Search Notes	Date	Examiner
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	1	7876239		2011-01-25	Scott A. Horstemeyer	
	2	7479899		2009-01-20	Scott A. Horstemeyer	
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	Art Unit		2434
	Examiner Name	AMARE F TABOR	
	Attorney Docket Number		GDAC-7

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Robert S. Babayi/	Date (YYYY-MM-DD)	2015-04-14
Name/Print	ROBERT S. BABAYI	Registration Number	33471

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EFS ID:	22055946
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	14-APR-2015
Filing Date:	12-FEB-2015
Time Stamp:	14:21:38
Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_Increment1.pdf	612177 d18650a8adf36a2947f1ec38309440ab307a19e4	no	4

Warnings:

Information:

Total Files Size (in bytes):	612177

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PETITION TO MAKE SPECIAL BASED ON AGE FOR ADVANCEMENT OF EXAMINATION UNDER 37 CFR 1.102(c)(1)

Application Information

Application Number	14620913	Confirmation Number	7589	Filing Date	2015-02-12
Attorney Docket Number (optional)	GDAC-7	Art Unit	2139	Examiner	
First Named Inventor	Darrell Diem				
Title of Invention	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges				

Attention: Office of Petitions
An application may be made special for advancement of examination upon filing of a petition showing that the applicant is 65 years of age, or more. No fee is required with such a petition. See 37 CFR 1.102(c)(1) and MPEP 708.02 (IV).

APPLICANT HEREBY PETITIONS TO MAKE SPECIAL FOR ADVANCEMENT OF EXAMINATION IN THIS APPLICATION UNDER 37 CFR 1.102(c)(1) and MPEP 708.02 (IV) ON THE BASIS OF THE APPLICANT'S AGE.

A grantable petition requires one of the following items:
(1) Statement by one named inventor in the application that he/she is 65 years of age, or more; or
(2) Certification by a registered attorney/agent having evidence such as a birth certificate, passport, driver's license, etc. showing one named inventor in the application is 65 years of age, or more.

Name of Inventor who is 65 years of age, or older

Given Name	Middle Name	Family Name	Suffix
Darrell		Diem	

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18.
Please see 37 CFR 1.4(d) for the format of the signature.

Select (1) or (2) :

○ (1) I am an inventor in this application and I am 65 years of age, or more.

● (2) I am an attorney or agent registered to practice before the Patent and Trademark Office, and I certify that I am in possession of evidence, and will retain such in the application file record, showing that the inventor listed above is 65 years of age, or more.

Signature	/Robert S. Babayi/	Date (YYYY-MM-DD)	2015-02-27
Name	Robert S. Babayi	Registration Number	33471

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Fr eedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about indivi duals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Application of :
Darrell Diem :

Application No. 14620913 :DECISION ON PETITION TO MAKE SPECIAL
Filed: February 12,2015 :UNDER 37 CFR 1.102(c)(1)
:

Attorney Docket No. GDAC-7

This is a decision on the electronic petition under 37 CFR 1.102 (c)(1), filed 27-FEB-2015 to make the above-identified application special based on applicant's age as set forth in MPEP § 708.02, Section IV.

The petition is **GRANTED**.

A grantable petition to make an application special under 37 CFR 1.102(c)(1), MPEP § 708.02, Section IV: Applicant's Age must include a statement by applicant or a registered practitioner having evidence that applicant is at least 65 years of age. No fee is required.

Accordingly, the above-identified application has been accorded "special" status and will be taken up for action by the examiner upon the completion of all pre-examination processing.

Telephone inquiries concerning this electronic decision should be directed to the Electronic Business Center at 866-217-9197.

All other inquiries concerning either the examination or status of the application should be directed to the Technology Center.

Electronic Acknowledgement Receipt

EFS ID:	21618759
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	27-FEB-2015
Filing Date:	12-FEB-2015
Time Stamp:	11:21:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petitionagesb130.pdf	1468870 c0ec38fe6e53da36454cfd1e3e03ea16a60f45f4	no	2

Warnings:

Information:

Total Files Size (in bytes):	1468870

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/620,913	02/12/2015	2139	970	GDAC-7	26	1

CONFIRMATION NO. 7589

FILING RECEIPT

OC000000073595351

98699
Robert S. Babayi
3208 Q. Street, NW
Washington, DC 20007

Date Mailed: 02/26/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Darrell Diem, Madison, AL;

Applicant(s)

Geofence Data Access Controls LLC, Huntsville, AL

Assignment For Published Patent Application

Geofence Data Access Controls LLC, Huntsville, AL

Power of Attorney: The patent practitioners associated with Customer Number 98699

Domestic Priority data as claimed by applicant

This application is a CON of 14/270,890 05/06/2014
which is a CON of 13/948,785 07/23/2013 PAT 8717166
which is a CON of 13/550,788 07/17/2012 PAT 8493207
which is a CON of 13/437,725 04/02/2012 PAT 8223012
which is a CON of 12/428,008 04/22/2009 PAT 8149113
which is a CON of 11/335,699 01/20/2006 PAT 7525425
which claims benefit of 60/752,879 12/23/2005

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 02/24/2015
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/620,913**

Projected Publication Date: 06/04/2015

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges

Preliminary Class

711

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
14/620,913

APPLICATION AS FILED - PART I

FOR	NUMBER FILED (Column 1)		NUMBER EXTRA (Column 2)	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A		N/A	N/A	70		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A		N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A		N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	26	minus 20 =	* 6	x 40 =	240	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 =	*	x 210 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					0.00			
				TOTAL	970		TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED - PART II

AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Darrell Diem

Art Unit: 2139

Application No: 14/620,913

Examiner: unassigned

Confirmation No: 7589

Filed: **02-12-2015**

Atty. Docket No: GDAC-7

Customer No: 98699

For: System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

PATENT TRADEMARK OFFICE

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INTRODUCTORY COMMENTS

This is a preliminary amendment to the claims of application 14/620,913 filed on February 12, 2015.

Amendments to the Specification are reflected on page 2 of this paper

Amendments to the Claims are reflected in on page 3 of this paper.

Remarks begin on page 7 of this paper.

AMENDMENTS TO THE SPECIFICATION

In the Title of the Invention:

Please change the title to -- A Location Tracking System With Interfaces For Setting Group Zones, Events And Alerts Based On Multiple Levels Of Administrative Privileges--

PRELIMINARY AMENDMENTS TO THE CLAIMS

1. (Cancelled)

2. (New) A location tracking system comprising:

one or more servers capable of communicating with a plurality of mobile devices, each mobile device is associated with an identification (ID) and at least one location information source that provides location information for the mobile device;

the one or more servers configured to:

define first level administrative privileges to protect privacy of a group of multiple mobile devices;

define second level administrative privileges to control conveyance of information regarding the group;

check the first level administrative privileges before adding a mobile device to the group;

provide one or more interfaces for setting a zone, an event, and an alert for the group;

receive a request to set a zone for the group, the zone having a boundary that is independent of where the group's mobile devices are located;

receive a request to set an event for the group;

receive a request to set an alert for the group, the request identifying a recipient of the alert;

check the second level administrative privileges before setting a zone, an event, or an alert for the group;

store the group’s zone, event and alert in one or more databases;

receive IDs and location information for the multiple mobile devices in the group;

compare the IDs and location information with the group's zone and event to determine whether to send the group’s alert; and

cause the group’s alert to be sent.

3. (New) The system of claim 1, the one or more servers configured to:

receive a request to set a second zone for the group;

receive a request to set a second event for the group;

store the group’s second zone and second event in the database; and

compare the mobile device’s location information with the group’s second zone and second event to determine whether to send an alert.

4. (New) The system of claim 1, where the one or more interfaces are user interfaces.

5. (New) The system of claim 1, where the one or more interfaces comprise an interface for adding a mobile device to the group.

6. (New) The system of claim 3, where the one more user interfaces comprise a user interface for adding the mobile device to the group.

7. (New) The system of claim 4, where the one or more servers control access to the interface for adding a mobile device to the group.

8. (New) The system of claim 1, where the one or more servers control access to the interfaces.

9. (New) The system of claim 1, where the ID is a serial number.

10. (New) The system of claim 1, where the ID is an email address.

11. (New) The system of claim 1, where the ID is a phone number.

12. (New) The system of claim 1, where the ID is a name.

13. (New) The system of claim 1, where the alert is an email.

14. (New) The system of claim 1, where the alert is a text message.

15. (New) The system of claim 1, where the alert is a device notification.

16. (New) The system of claim 1, where the alert is phone call.

17. (New) The system of claim 1, where the location information of the mobile device is determined by GPS.

18. (New) The system of claim 1, where the location information of the mobile device is determined by RFID.

19. (New) The system of claim 1, where the location information of the mobile device is determined by NFC.

20. (New) The system of claim 1, where the first level administrative privileges are defined for a customer account.

21. (New) The system of claim 1, where the second level administrative privileges are defined for a customer account.

22. (New) The system of claim 1, where the first level administrative privileges are checked at a log-in.

23. (New) The system of claim 1, where the second level administrative privileges are checked at a log-in.

24. (New) The system of claim 1, where the first level administrative privileges are checked when a mobile device is added to the group.

25. (New) The system of claim 1, where the second level privileges are checked when setting a zone, an event, or an alert for the group.

26. (New) The system of claim 1, where the one or more servers sends the alert.

27. (New) The system of claim 1, where the one or more servers cause another server to send the alert.

REMARKS

Before examination of the application please enter the above preliminary amendment into the application.

Dated: February 13, 2015

Respectfully submitted,

By: / Robert S. Babayi /
Robert S. Babayi
Registration No.: 33,471

(703) 587-3803 (Mobile)
Attorney/Agent For Applicant

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2139
	Examiner Name	unassigned
	Attorney Docket Number	GDAC-7

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6331825		2001-12-18	Ladner et al.	
	2	7783507		2010-08-24	Schick et al.	
	3	6639516		2003-10-28	Copley	
	4	7231218		2007-06-12	Diacakis et al.	
	5	6212392		2001-04-03	Fitch et al.	
	6	6321092		2001-11-20	Fitch et al.	
	7	6202023		2001-03-13	Hancock et al.	
	8	5839088		1998-11-17	Hancock et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14620913
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	2139
	Examiner Name	unassigned
	Attorney Docket Number	GDAC-7

	9	8935220		2015-01-13	Hancock et al.	
	10	6356834		2002-03-12	Hancock et al.	
	11	8593276		2013-11-26	Doyle	
	12	7660658		2010-02-09	Sheynblat	
	13	8559937		2013-10-15	Ram et al.	
	14	7880609		2011-02-01	Viegers et al.	
	15	5223844		1993-06-29	Mandell et al.	
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	Application Number	14620913
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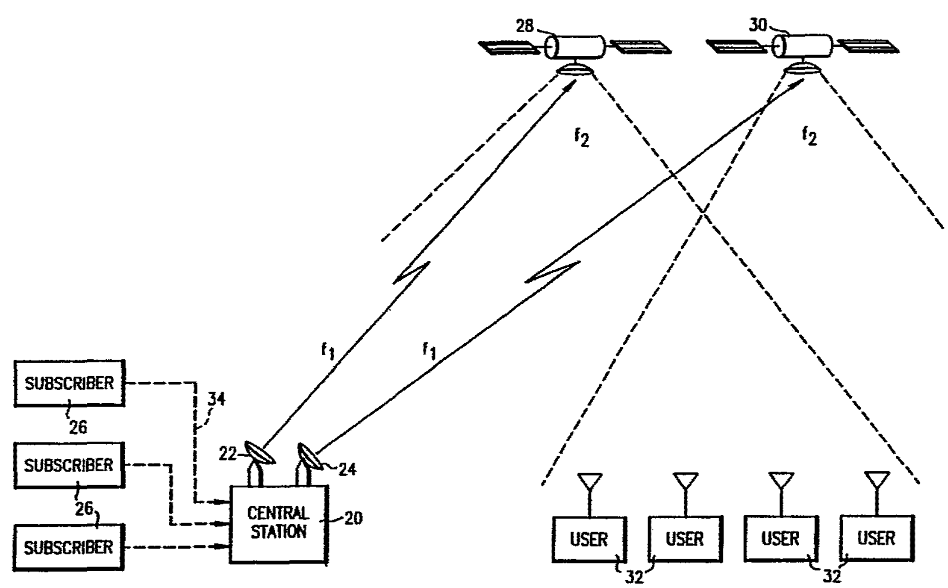

(57) Abstract

A mobile satellite communication system utilizes spread spectrum techniques to allow messages to be transmitted from a ground-based cenral station (20) to a number of essentially identical receiver terminals (32) through two or more relay satellites (28, 30) operating on the same downlink carrier frequency (f2) and covering the same geographic area. This arrangement allows the capacity of the system to be increased without the use of additional radio frequency spectrum on the downlink, and without reliance on directional tracking antennas at the receiving terminals. The system can also determine the positions of the receiver terminal (32) for navigational and tracking purposes.

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TITLE OF THE INVENTION:

COMMUNICATION SYSTEM EMPLOYING MULTIPLE RELAY SATELLITES OPERATING ON COMMON DOWNLINK FREQUENCY

BACKGROUND OF THE INVENTION:

The invention described and claimed herein relates generally to the field of communications, and is particularly concerned with a radio communication system in which signals are exchanged between ground-based transmitters and receivers through one or more relay satellites.

Many radio communication systems utilize satellites, particularly geostationary satellites, as signal relays. In fixed satellite communication systems, earth stations at fixed geographic locations transmit radio signals to a satellite which receives, amplifies, and rebroadcasts the transmissions at a shifted frequency to other earth stations at fixed locations. In this manner, point-to-point communication links can be established. Mobile satellite communication systems operate in much the same manner, although in this case the signals are relayed between mobile terminals which are carried by automobiles, trucks, airplanes, ships, or other movable platforms.

Both fixed and mobile satellite communications share certain limitations. A principal limitation, apart from the considerable cost involved in placing a satellite into orbit, relates to the maximum power available to operate the satellite. The amount of information which can be transmitted in a given bandwidth depends, in part, on the power available for transmission. The amplifiers on board the satellite are limited in their power output, and the electrical generating capacity of the satellite batteries and solar panels is also limited. Satellite power is thus a limited resource, and this will impose a limit on the total amount of information that can be processed by the communication system as a whole.

Another limitation arises from the fact that governmental regulations and international agreements designate limited frequency bands for use in satellite communication systems. Therefore, efficient use must be made of these frequency bands and communication techniques which are wasteful of radio spectrum must be avoided.

A further limitation results from the desirability of utilizing satellites in geostationary orbit as signal relays. Geostationary orbit is an equatorial orbit having a period of one day. To an observer on earth, a satellite in such an orbit appears to remain stationary at a fixed point in the sky, and can therefore serve as a fixed communication relay. Governmental regulations require a minimum spacing between satellites in order to avoid intersatellite interference. This, in turn, sets a limit on the total number of geostationary satellites which can be placed in orbit. Different satellites provide coverage of different portions of the earth, and demand is highest for satellites covering desirable markets. The signal handling capacity of these satellites must therefore be used in the most efficient manner possible.

These limitations have led to certain practices which have become common in the satellite communications industry. The high cost and limited number of satellites, for example, has led to the use of methods for allowing multiple earth stations to utilize the same satellite. One method is called frequency division multiple access (FDMA). In this technique, the allotted frequency spectrum is divided into a number of distinct bands. Different stations transmit in different frequency bands, and filters at the receiving stations block transmissions in all but the desired band.

Another method is called time division multiple access (TDMA). In this method, many different stations transmit in bursts using the same frequency band, but they are synchronized with one another so that the transmissions do not overlap in time.

In both FDMA and TDMA systems, satellite transponder power can limit the total amount of information that can be relayed. If a communication system has utilized all of the available transponder power, additional information can only be sent by utilizing another transponder on board the satellite. However, an increase in capacity using multiple transponder channels requires use of additional bandwidth, because each transponder on a given satellite operates in a different frequency band. Additional bandwidth may not always be available, especially for satellites placed in highly desirable locations. Moreover, the use of additional frequency channels requires the terrestrial transmitting and receiving stations to operate on multiple frequencies, which increases the cost and complexity of the communication system.

As an alternative, the capacity of a system can be increased by utilizing a transponder on a second satellite. If the second transponder operates at a frequency different from that of the first, spectrum usage is the same as in the situation where both transponders are carried by the same satellite. On the other hand, if the transponders on the two satellites operate in the same frequency band, interference may occur.

Fixed satellite communication systems which utilize two or more transponders operating at the same frequency on different satellites can avoid interference by using highly directional antennas. Such antennas may utilize large reflectors, phased antenna arrays, or other techniques to achieve the necessary degree of directionality. In mobile communication systems, however, directional antennas are undesirable because of their size, weight and complexity. Further, directional antennas must be aimed, and must track the satellite as the platform moves and changes direction. Even if tracking is possible, the cost of the necessary tracking equipment may become prohibitive when it is necessary to equip large numbers of mobile terminals at a low unit cost.

Small antennas, while more practical for mobile terminals, have a lower gain than large antennas. All else being equal, a system having a smaller receiving antenna will have a lower capacity than a system having a large antenna. Small antennas are generally less directional than large antennas, meaning that their gain is less dependent on orientation. Such small antennas cannot separate the transmissions of one satellite from those of another solely on the basis of the satellite positions.

To summarize, a conventional bandwidth-limited, mobile communication system which has reached the power limit of its satellite transponders cannot increase capacity by using additional transponders on the same satellite, since that would require additional bandwidth and complex user equipment, or by using a transponder on a second satellite operating at the same frequency, which would require multiple directional tracking antennas. A need exists, therefore, for a method by which the capacity of a satellite communication system can be increased without incurring any of these disadvantages.

SUMMARY OF THE INVENTION:

In accordance with the present invention, spread spectrum techniques are utilized to allow signals to be transmitted from a ground-based transmitting station to a plurality of receiver terminals through two or more relay satellites operating on the same downlink carrier frequency and covering the same geographic area. In this way, the capacity of the system can be increased without the use of additional radio bandwidth, and without reliance on directional tracking antennas at the receiver terminals. The use of a common downlink frequency also has the advantage of allowing all of the receiver terminals to be of essentially identical construction, which reduces the cost and complexity of the communication system.

In one aspect, the present invention relates to a radio communication system comprising means for generating messages to be transmitted; means for assigning said messages to first and second message groups; means for encoding said first and second message groups with mutually distinguishable codes; means for transmitting said first and second message groups; first and second elevated relay stations for receiving said first and second message groups, respectively, and for retransmitting said message groups at a common downlink carrier frequency, said relay stations having transmitting antennas which provide overlapping coverage of a common geographic area; and a plurality of receiver terminals located in said common geographic area for receiving said first and second message groups at said common downlink frequency, each of said receiver terminals including decoding means for decoding at least one of said first and second codes in order to allow messages to be received from at least one of said relay stations without interference from the other relay station.

Additional aspects of the invention relate to a method for transmitting messages from a central station to a plurality of receiver terminals using first and second relay stations operating at the same downlink frequency, and a method for expanding the capacity of a satellite communication system by employing additional relay satellites operating at the same downlink frequency. The invention has particular utility in satellite-based position determination and message transfer systems, but is also useful in other applications.

BRIEF DESCRIPTION OF THE DRAWINGS:

The various objects, advantages, and novel features of the present invention will be more readily apprehended from the following detailed description when read in conjunction with the appended drawings, in which:

Fig. 1 is a schematic illustration of a mobile satellite communication system incorporating the features of the present invention;

Fig. 2 is a schematic block diagram of the ground-based central station used in the communication system of Fig. 1;

Fig. 3 is a schematic diagram illustrating the general organization of software in the central station computer;

Fig. 4 is a flow chart which describes the operation of the message routing software used in the central station computer;

Fig. 5 is a block diagram of a modulator which forms a part of the transmitting equipment used at the central station;

Fig. 6 is a schematic diagram illustrating the format of the modulator output signals in Fig. 5;

Fig. 7 is a schematic diagram illustrating the principal transponder components used in the satellites of Fig. 1;

Fig. 8 is a schematic diagram illustrating the principal receiver components used in the receiver terminals of Fig. 1;

Fig. 9 is a schematic diagram of one of the decoder channels in Fig. 8; and

Fig. 10 is a schematic diagram of the message recovery circuit used in the receiver terminal of Fig. 8.

Throughout the drawings, like reference numerals will be understood to refer to like parts or components.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

Fig. 1 illustrates a satellite communication system operating in accordance with the principles of the present invention. The system comprises a fixed central station 20, a number of subscriber stations 26, two geostationary relay satellites 28 and 30 at spaced orbital positions, and number of mobile receivers 32 which are referred to as user terminals. The central station 20 operates two parabolic transmitting antennas 22 and 24. The system of Fig. 1 provides two types of communications, namely, message transmission (also referred to as paging) and radio position determination. For paging, the subscriber stations 26 generate text messages for specific ones of the user terminals 32. These messages are sent to the central station 20 over terrestrial communication links 34 which may, for example, comprise telephone lines, microwave links or optical fiber links. The central station 20 collects the messages and transmits them to the user terminals 32 by means of the two relay satellites 28 and 30. The user terminals 32 may, if desired, have the capability to reply to the central station 20 with their own text messages.

For position determination, the central station 20 transmits an interrogation signal (which may also carry message data) that is relayed to the user terminals 32 through one or both of the satellites 28, 30, and the user terminals 32 respond by transmitting reply signals back to the central station through both satellites. The central station 20 then performs time difference of arrival calculations to determine the positions of individual user terminals 32. The position data may then be made available to the subscribers 26 and, optionally, to the involved user terminals 32.

Further details of the message exchange and position determination functions may be found in U.S. Patent 4,359,733, issued to G.K. O'Neill on November 16, 1982; in U.S. Patent 4,744,083, issued to G.K. O'Neill and L.O. Snively on May 10, 1988; in copending U.S. patent application Serial No. 641,385, filed by G.K. O'Neill and L.O. Snively on August 16, 1984; and in copending U.S. patent application Serial No. 260,614, filed by M. Motamedi on October 21, 1988; all of said patents and applications being expressly incorporated herein by reference.

One application of a system of the type shown in Fig. 1 is to provide tracking and paging services for a number of vehicle fleets operated by different companies (the latter corresponding to the subscribers 26). Each subscriber 26 operates a number of vehicles (e.g., trucks, automobiles, ships, railroad cars, or the like) and each vehicle carries a mobile user terminal 32. The central station 20 determines the locations of each user terminal 32, and informs each subscriber 26 of the locations of its associated user terminals. In addition, the central station 20 accepts messages from each subscriber 26, sorts the messages, and transmits them to the appropriate user terminals 32. Message and position information for each subscriber 26 is confidential with respect to the other subscribers. In the description which follows, primary emphasis will be placed on the paging aspects of the system, although it should be understood that position determination and paging functions may be carried out simultaneously using the apparatus and methods disclosed in the patents and applications mentioned previously.

The partitioning of the outgoing message traffic between the two satellites 28, 30 of Fig. 1 allows the message handling capacity of the system to be increased beyond that which would be obtained in a single satellite system. As will be described, this result can be achieved without increasing the amount of radio spectrum utilized, by operating both satellites on the same uplink and downlink carrier frequencies and by taking steps to eliminate interference between the signals transmitted to and received from the two satellites. On the uplink side, interference is eliminated by utilizing highly directional transmitting antennas which are aligned toward the respective satellites. On the downlink side, interference is eliminated by encoding the message transmissions relayed through the two satellites using mutually distinguishable codes, and by providing the user terminals with equipment for decoding one or both codes.

Referring again to Fig. 1, the first directional antenna 22 at the central station 20 transmits messages to the first satellite 28 at an uplink frequency f_1. The second directional antenna 24 transmits messages to the second satellite 30 at the same uplink frequency f_1. Energy from the first transmitting antenna 22 is focused on the first satellite 28, but not on the second satellite 30. Conversely, energy from the second transmitting antenna 24 is focused on the second satellite 30, but not on the first satellite 28. The satellites 28, 30 shift the uplink transmissions to the same downlink frequency f_2, and both satellites 28, 30 provide coverage to the same geographic region which encompasses the user terminals 32. In practice, the satellites may use multiple antennas or overlapping spot beams to provide the desired geographic coverage.

The user terminals 32 can potentially receive transmissions from both satellites since the transmissions will have the same frequency and approximately the same power level. In order to avoid the interference which would otherwise result in this situation, the signal transmissions are encoded by the central station 20 and are decoded by the user terminals 32 using spread spectrum techniques, as will be discussed in more detail below. The use of spread spectrum transmissions allows the signal traffic to be divided between the two satellites 28, 30 without requiring an additional downlink frequency, and without resorting to the use of directional antennas at the user terminals.

Since radio spectrum allocations are somewhat easier to obtain for narrow beam transmissions than for broad beam transmissions, the use of a single uplink frequency f_1 is desirable but not essential. The objective of minimizing the spectrum requirement is substantially met by the use of a single downlink frequency f_2 for the transmissions taking place between the satellites 28, 30 and the user terminals 32, since these transmissions cover a much wider geographic area than the uplink transmissions.

Fig. 2 is a functional block diagram of the central station 20. The subscribers 26 (not shown) generate messages on input lines 36. These messages may, for example, consist of ASCII characters in the form of digital electronic signals. Along with the message data, the subscribers specify the destination of each message by identifying a specific user terminal 32. A communications interface 38 receives the subscriber information and routes it to a computer 40. The computer 40 receives the information, temporarily stores the messages, identifies their destinations, and routes each message to one of two equipment chains 42, 44.

The two equipment chains 42, 44 contain similar equipment. Referring first to the chain 42, a modulator 46 spreads the data stream onto a pseudo-noise (PN) code according to the direct sequence spread spectrum modulation technique. The modulator 46 also modulates the spread signal onto an intermediate frequency (IF) carrier using biphase shift keying. An up converter 48 shifts the frequency of the IF carrier to a microwave frequency f_1 on the order of several gigahertz. A high power amplifier 50 increases the power of the microwave signal for transmission. The directional transmitting antenna 22 focuses the radiated energy of the amplified signal from the first equipment chain 42 to the satellite 28 of Fig. 1. The second equipment chain 44 performs identical functions using a modulator 52, up converter 54 and high power amplifier 56, but this chain processes messages which are intended for transmission by the second directional antenna 24 to the second satellite 30 of Fig. 1.

The up converters 48, 54 of the two equipment chains 42, 44 shift their respective IF carriers to the same uplink frequency f_1. However, since each of the two parabolic transmitting antennas 22, 24 focuses its power on only one satellite, interference at the satellites does not occur even though a common uplink frequency is employed. At the user level, interference is avoided by virtue of the fact that the modulators 46, 52 of the two equipment chains 42, 44 utilize different PN codes, allowing the user terminals 32 to receive the signal from only one satellite without requiring a directional antenna.

The computer 40 performs message routing and message stream aggregation using known packet switching techniques. The computer hardware may, for example, consist of an HP 850 system manufactured by Hewlett Packard Corporation. The interface to the subscriber equipment will vary according to the specific requirements of each subscriber, but may include a modem or coder/decoder unit connected by telephone lines to similar equipment at the subscriber site.

Figure 3 illustrates the general organization of software in the computer 40. An operating system 58 provides the highest level of control of the computer and establishes the system environment for various application programs. An outbound message signal processing program 60 is one such application. Other application programs 62 (e.g., for billing and accounting functions) also exist and may be called to run on the same computer. Within the outbound message processing program 60, the software is divided into several functional modules. The outbound message processing control module 64 regulates the sequence in which other modules are called. A routing module 66 routes messages to one of the two equipment chains 42, 44 (Fig. 2). The remaining modules 68 control the formatting and sequencing of the messages, the generation of timing data for use in position calculations, and other functions. For the purposes of the present invention, only the routing module 66 is of importance and the other software modules need not be described further.

Fig. 4 is a flow chart which describes the operation of the routing module 66. The module begins at an entry point 70 when called from the outbound message processing control module 64 (Fig. 3). In block 72, the computer executes an input operation which reads an identification code for the message destination from the information received from the subscriber. The computer then performs a table look-up in block 74 to determine which PN code has been assigned to the user terminal that is to receive the message. The table 76 lists all user terminals according to identification code. For each identification code, the table 76 indicates whether the receiver is capable of decoding a first PN code, a second PN code, or both PN codes.

After executing the table look-up, the computer proceeds to a decision block 78. If the receiver is capable of decoding only the first PN code, the computer executes a first output operation in block 80 which passes the message to the first equipment chain 42 of Fig. 2. If the receiver is capable of decoding only the second PN code, the computer executes a second output operation in block 82 which passes the message to the second equipment chain 44 of Fig. 2. If the receiver is capable of decoding both PN codes, the computer executes a decision operation in block 84 which selects one of the two output operations 80, 82.

The select operation in block 84 may select an equipment chain in such a manner as to equalize signal traffic between the two satellites 28, 30 (Fig. 1), to shunt signal traffic away from a satellite which has reached its message handling capacity, or to avoid failed equipment in one of the equipment chains or in one of the satellites. In certain cases, the message may be passed to both equipment chains so that it will be transmitted to the intended user terminal 32 through both satellites simultaneously. This may be desirable as a means for insuring that certain critical messages reach the user, or as a means for carrying out position determination using techniques to be discussed shortly.

After executing the appropriate output operation in block 80 or 82, the computer reaches an exit point 86 and execution of the routing module terminates. The computer may then execute another functional module or re-enter the routing module, as directed by the outbound message processing control module 64 of Fig. 3.

Fig. 5 is a block diagram of the modulator 46 in the first equipment chain 42 of Fig. 2. The modulator 52 in the second equipment chain 44 is essentially identical except for the particular PN code employed, and the description which follows applies to both.

The modulator 46 performs two functions, namely, spreading the output data stream from the computer 40 onto a pseudo-noise (PN) code, and modulating the spread data stream onto an intermediate frequency (IF) carrier. A clock 88 generates a periodic signal and a first divider chain 90 generates a 1200 Hz signal from the clock signal. A mixer 92 shifts the input data signal on line 94 to 1200 Hz. A second divider chain 96 generates a 1.112 MHz signal from the clock signal which drives a pseudo-noise (PN) generator 98 at a 1.112 megachip per second (Mcps) chip rate. The PN generator 98, in turn, generates a 1.112 Mcps pseudo-noise code which consists of a Gold code having a length of $(2^{17}-1)$ chips. A second mixer 100 spreads the 1200 Hz data signal over the 1.112 Mcps PN code. A biphase shift keyed (BPSK) modulator 102 modulates a 70 MHz carrier with the spread data. A bandpass filter 104 eliminates spurious signals outside a pass band centered at 70 MHz, and produces an output signal on line 106 which is applied as an input to the up converter 48 of Fig. 2.

Fig. 6 is a schematic diagram illustrating the time domain organization of the modulator output signal in Fig. 5. The output signal 108 is divided into successive frames 110, each frame comprising one repetition of the $(2^{17}-1)$ chip PN sequence. Each frame 110 is further subdivided into a number of parts. An initial sequence (L1) denotes the beginning of the frame and may be an all-ones portion of the PN sequence. A succession of messages 112 addressed to individual user terminals follows the L1 sequence. A parity check (PC) follows the last message, and an ending sequence (L2) marks the end of the frame. Each message 112 contains two portions, the first portion 114 comprising an identification code which designates the intended user terminal. This is the same information that is used in the look-up table 76 of the routing module 66 to select an equipment chain 42, 44 for the message. The remaining portion 116 of the message consists of the ASCII text or other data that is being sent by the subscriber to the user terminal.

Fig. 7 is a schematic diagram illustrating the principal transponder components of the first satellite 28 in Fig. 1, it being understood that the second satellite 30 is substantially identical. The satellite includes an antenna 118 which collects energy from the uplink signals at frequency f_1 and also focuses the downlink transmissions at frequency f_2. The uplink signals pass through a diplexer 120 to a bandpass filter 122 which only passes signals in a narrow frequency band that includes the uplink frequency f_1. A frequency converter 124 shifts the frequency f_1 of the uplink signal to the downlink frequency f_2. A transmitter 126 increases the total power of the downlink signal, which then passes through the diplexer 120 to the antenna 118 and propagates back to earth.

The user terminals 32 (Fig. 1) receive the message signals after they are retransmitted by the relay satellites 28, 30. The retransmitted signals are sequences of individual messages intended for specific ones of the user terminals 32. The receiver portion of each user terminal 32 includes message processing means to identify and display those messages from the received signal that are specifically directed to that particular user terminal. Optionally, the user terminals 32 may also transmit reply signals to the central station 20 via the satellites 28, 30 in order to send return messages to the subscriber stations 26 or to allow the user positions to be calculated by the central station 20, as described in the patents and copending patent applications cited above. Alternatively, user terminals which are equipped to decode both of the PN codes associated with the respective satellites 28, 30 can calculate their own positions based on the relative arrival times of the signals received from the two satellites, assuming that the satellite positions are known and the signals are encoded with their transmission times. The calculated position data can be returned to the central station 20 using only one of the two satellites 28, 30, and the data may then be sent to the relevant subscriber stations 26. As a further alternative, the user terminals can themselves measure the arrival times of the signals received from the two satellites, and the arrival time data can be returned to the central station through one of the satellites. The user positions can then be calculated at the central station and made available to the subscriber stations 26 (and, optionally, to the user terminals 32 as part of the next paging cycle).

Figure 8 shows the general organization of subsystems in the receiver portion of a user terminal 32. The user terminal 32 utilizes a small, fixed omnidirectional antenna 128 to receive transmissions from the satellites 28 and 30 of Fig. 1. A low noise amplifier 130 increases the power of the received signal. A down converter 132 referenced to a local oscillator 134 converts the received signal from a microwave frequency on the order of several gigahertz to a lower frequency of about 70 MHz suitable for intermediate frequency processing. A bandpass filter 136 blocks all energy in the received signal except frequencies centered around 70 MHz. A biphase shift keyed (BPSK) demodulator 138 removes the 70 MHz biphase modulated carrier of the received IF signal to yield a 1.112 Mcps spread signal. The BPSK demodulator 138 also produces a signal for controlling the frequency of the local oscillator 134.

In the embodiment shown, the user terminal 123 includes separate decoding channels 140 and 142 for removing first and second PN codes, respectively, from the spread signals. A divider 144 splits each spread signal into two identical signals, and directs the signals to the decoding channels 140, 142. The outputs of the decoding channels 140, 142 are applied as inputs to a message recovery circuit 146, which in turn drives a display 148 or produces a command signal. In instances where it is desired to confine a particular user terminal to a single PN code, only one decoding channel is used and the divider 144 is omitted.

Fig. 9 shows the decoding channel 140 in detail, the other decoding channel 142 being substantially identical. A mixer 150 combines the data stream from the divider 144 with a locally generated PN code produced by a code generator 151 in order to despread the received signal. The mixer output is applied as an input to a demodulator 152 which recovers the data when the PN generator 151 is operating in synchronism with the incoming signal. The frequency of the PN generator

151 is adjusted by a voltage controlled oscillator 153, which is in turn controlled by a feedback signal from the demodulator 152. Various methods for acquisition and synchronization of PN-coded signals, such as serial searching and delay locked loops, are known in the field of spread spectrum communications. Any of these techniques may be used in the practice of the present invention.

The output of the decoding channels 140, 142 of Fig. 8 are despread baseband signals comprising a plurality of messages. The message recovery circuit 146 isolates those messages which are directed to the specific user terminal 32 of interest. This circuit, shown in more detail in Fig. 10, includes a buffer 154 for storing the outputs of the decoding channels 140, 142. Despread signals stored in the buffer 154 are serially read into a correlator 156. The correlator 156 comprises registers having sufficient size to store the destination and message information for a single message 112 (Fig. 6). Another set of registers in the correlator stores the identification code assigned to the user terminal. The received identification information is continuously compared with the stored identification code for the user terminal, and when correlation is achieved, the associated message data is transferred to one of two different outputs depending on the type of data being sent. If the data comprises a message that is intended for a human operator, it is transferred to a display memory 158. The display memory 158 directs the message data to the display unit 148 of Fig. 8 so that the message can be read by the user. The display unit 148 may comprise a visual display such as a light emitting diode (LED) array, liquid crystal display (LCD) or cathode ray tube (CRT), an audible readout such as a voice synthesizer, or a hard copy output device such as a printer. On the other hand, if the data comprises control data that is intended to control a physical device connected to the user terminal, a command signal is produced and is applied as input to the controlled device. As an example, a command signal of this type may be used to control the refrigeration unit in a truck or railroad car that is equipped with a user terminal 32.

If a reply capability is desired, the user terminal may be provided with an input device such as a keyboard or voice digitizer, together with suitable transmitting circuitry for transmitting reply signals to the central station 20 through one or both of the satellites 28, 30. The transmitting circuitry may be enabled by reply trigger outputs from the decoding channels 140, 142 of Fig. 8. These outputs occur whenever the initial bits of an incoming signal having the appropriate PN code are detected, regardless of whether the associated message data is intend for that particular user terminal. This allows a given user terminal to send data (or a position request) to the central station 20 once during each paging cycle, even if no message data is being sent to the user terminal.

It should be emphasized that the use of a common carrier frequency for the downlink signals, in addition to reducing radio spectrum usage, has the advantage of allowing all of the user terminals 32 to be of substantially identical construction since only one set of oscillators, filters and other frequency-selective components is required. This allows substantial savings in cost, size and weight to be realized, and also allows commonality of spare parts, maintenance and test equipment, and so on. Although two PN decoders are required in the user terminals in order to allow message transmissions to be received from both satellites, these decoders can be implemented in digital circuitry of relatively small size and low cost. In situations where different PN codes are assigned to different groups of user terminals, the necessary PN decoders may be provided as replaceable plug-in components so that the user terminals can be manufactured as identical units. In any case, the resulting system is considerably less complex than, for example, one in which different groups of user terminals are required to operate on different frequencies or a given user terminal is required to receive signals on more than one frequency. Fault tolerance is also increased since the failure of the downlink frequency channel on one satellite will not disable the entire system.

Although the present invention has been described with reference to a preferred embodiment, the invention is not limited to the details thereof. For example, the communication system may be expanded to include additional satellite relays and PN codes, and the spread spectrum modulation signal may be carried out aboard the satellites rather than at the central station. Further, it should be noted that various types of signal relays other than satellites may be employed in the practice of the invention. Other substitutions and modifications will occur to those of ordinary skill in the art, and all such substitutions and modifications are intended to fall within the scope of the invention as defined in the appended claims.

WHAT IS CLAIMED IS:

1. A radio communication system comprising:

means for generating messages to be transmitted;

means for assigning said messages to first and second message groups;

means for encoding said first and second message groups with mutually distinguishable codes;

means for transmitting said first and second message groups;

first and second elevated relay stations for receiving said first and second message groups, respectively, and for retransmitting said message groups at a common downlink carrier frequency, said relay stations having transmitting antennas which provide overlapping coverage of a common geographic area; and

a plurality of receiver terminals located in said common geographic area for receiving said first and second message groups at said common downlink carrier frequency, each of said receiver terminals including decoding means for decoding at least one of said first and second codes in order to allow messages to be received from at least one of said relay stations without interference from the other relay station.

2. A radio communication system as claimed in claim 1, wherein said encoding means comprises means for spread spectrum modulating said first and second message groups using different pseudo-noise codes.

3. A radio communication system as claimed in claim 1, wherein the decoding means of at least one of said receiver terminals is effective to decode both of

said first and second message groups in order to allow messages to be received from both of said relay stations.

4. The radio communication system as claimed in claim 1, wherein the messages in said first and second message groups each contain an identification portion designating one of said receiver terminals and an information portion containing message data intended for said designated receiver terminal, and wherein each of said receiver terminals comprises means for comparing the identification portions of received messages with a stored identification code and for recovering the message data from messages having identification portions matching said stored identification code.

5. A radio communication system as claimed in claim 4, wherein each of said receiver terminals further comprises means for displaying said recovered message data.

6. A radio communication system as claimed in claim 1, wherein said assigning means comprises a stored look-up table indicating whether the decoding means of a given receiver terminal is capable of decoding said first code or said second code.

7. A radio communication system as claimed in claim 1, wherein said transmitting means includes first and second directional transmitting antennas aligned in the direction of said first and second elevated relay stations, respectively, for transmitting said first and second message groups to said relay stations at a common uplink carrier frequency.

8. A radio communication system as claimed in claim 1, wherein said assigning means, said encoding means and said transmitting means are located at a transmitting station having a fixed location.

9. A radio communication system as claimed in claim 8, wherein said means for generating messages comprises a plurality of subscriber stations connected to said transmitting station.

10. A radio communication system as claimed in claim 1, wherein said first and second elevated relay stations comprise geostationary satellites.

11. A radio communication system as claimed in claim 1, wherein at least one of said receiver terminals comprises a mobile terminal.

12. A radio communication system as claimed in claim 1, wherein each of said receiver terminals includes a nondirectional receiving antenna.

13. A method for transmitting messages from a central station to a plurality of receiver terminals using first and second elevated relay stations operating at the same downlink carrier frequency, comprising the steps of:

assigning said messages to first and second message groups;

encoding said first and second message groups with mutually distinguishable codes;

transmitting said first and second message groups from said central station to said first and second elevated relay stations, respectively;

retransmitting said first and second message groups at a common downlink carrier frequency from said respective first and second elevated relay stations to a common geographic area containing said receiver stations;

decoding at least one of said first and second codes at each of said receiver terminals in order to allow messages to be received by said receiver terminal from at least one of said relay stations without interference from the other relay station.

14. A method as claimed in claim 13, wherein said encoding step comprises spread spectrum modulating said first and second message groups using different pseudo-noise codes.

15. A method as claimed in claim 13, wherein the messages in said message groups each contain an identification portion designating one of said receiver terminals and an information portion containing message data intended for said designated receiver terminal, and further comprising the steps of:

comparing the identification portions of received messages with an identification code stored in the receiver terminal;

recovering the message data from messages having identification portions matching said stored identification code.

16. A method as claimed in claim 15, further comprising the step of displaying said message data at the receiver terminal.

17. A method as claimed in claim 13, further comprising the steps of:

generating messages intended for specific ones of said receiver terminals at a plurality of subscriber terminals;

transmitting said messages from the subscriber stations to the central station.

18. A method as claimed in claim 13, wherein the step of assigning said messages to first and second message groups comprises carrying out a look-up operation to determine from stored data whether the decoding means of a given receiver terminal is capable of decoding said first code or said second code.

19. A method as claimed in claim 13, wherein the step of transmitting said first and second message groups to said first and second elevated relay stations is carried out at a common uplink carrier frequency using directional transmitting antennas.

20. A method for expanding the capacity of a radio communication system in which messages are transmitted from a central station to a plurality of receiver terminals by means of a relay satellite, comprising the steps of partitioning the messages into at least two message groups, encoding said message groups with mutually distinguishable codes, transmitting one message group to said receiver terminals through the first relay satellite, transmitting the other message group to the same receiver terminals in the same geographic area using an additional relay satellite operating at the same downlink carrier frequency, and decoding at least one of the codes at each receiver terminal in order to allow messages to be received at said terminal from at least one relay satellite

without interference from the other relay satellite.

AMENDED CLAIMS

[received by the International Bureau on 7 September 1990 (07.09.90); original claims 13 and 15 amended; other claims unchanged (1 page)]

said respective first and second elevated relay stations to a common geographic area containing said receiver terminals; and

decoding at least one of said first and second codes at each of said receiver terminals in order to allow messages to be received by said receiver terminal from at least one of said relay stations without interference from the other relay station.

14. A method as claimed in claim 13, wherein said encoding step comprises spread spectrum modulating said first and second message groups using different pseudo-noise codes.

15. A method as claimed in claim 13, wherein the messages in said message groups each contain an identification portion designating one of said receiver terminals and an information portion containing message data intended for said designated receiver terminal, and further comprising the steps of:

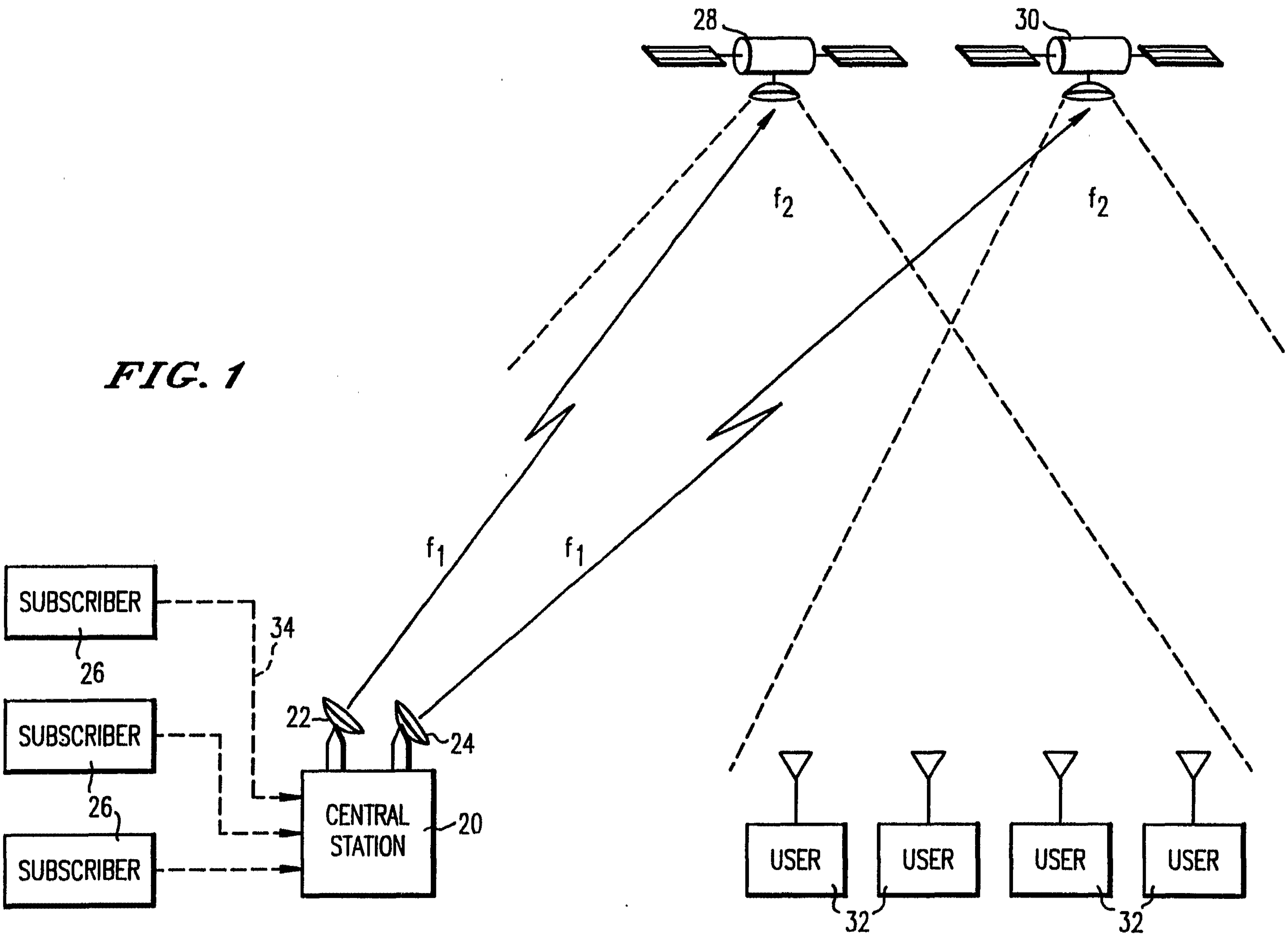
comparing the identification portions of received messages with an identification code stored in the receiver terminal; and

recovering the message data from messages having identification portions matching said stored identification code.

16. A method as claimed in claim 15, further comprising the step of displaying said message data at the receiver terminal.

17. A method as claimed in claim 13, further comprising the steps of:

FIG. 1


28
30
f_2
f_2
f_1
f_1
SUBSCRIBER
26
SUBSCRIBER
26
SUBSCRIBER
34
22
24
CENTRAL STATION
20
USER
USER
USER
USER
32
32

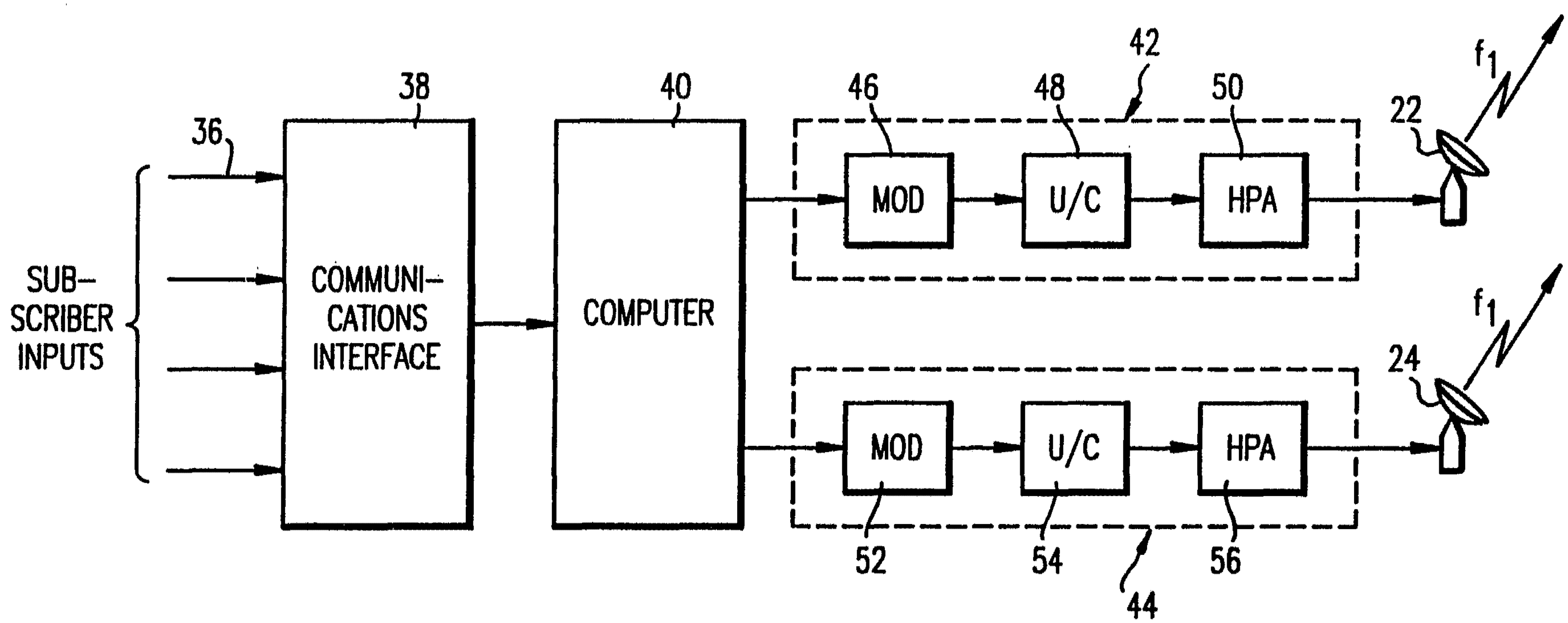

36
38
40
42
46
48
50
22
f_1
SUB-
SCRIBER
INPUTS
COMMUNI-
CATIONS
INTERFACE
COMPUTER
MOD
U/C
HPA
24
f_1
MOD
U/C
HPA
52
54
56
44

FIG. 2

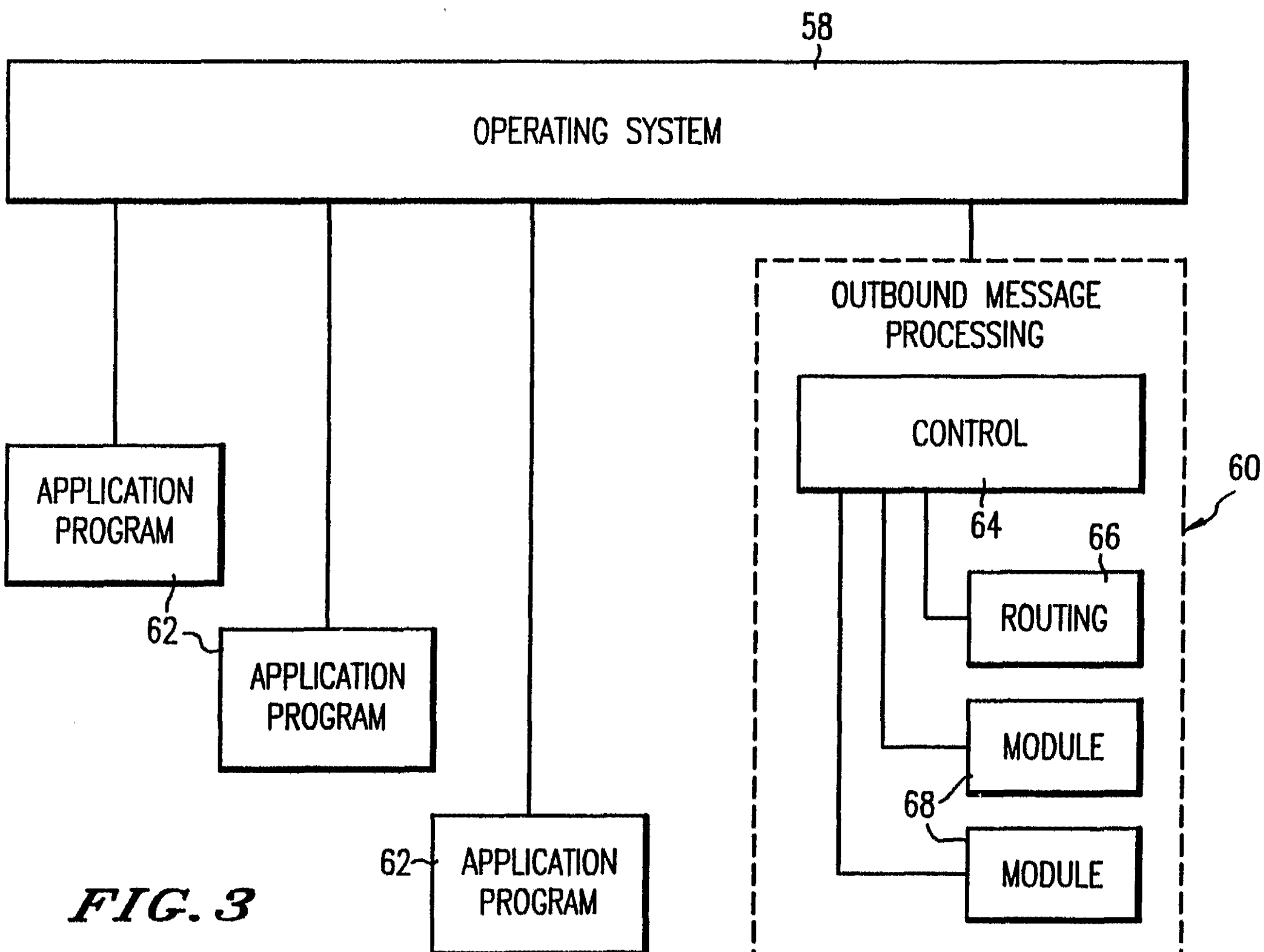

58
OPERATING SYSTEM
OUTBOUND MESSAGE PROCESSING
CONTROL
60
64
66
ROUTING
MODULE
68
MODULE
APPLICATION PROGRAM
62
APPLICATION PROGRAM
62
APPLICATION PROGRAM

FIG. 3

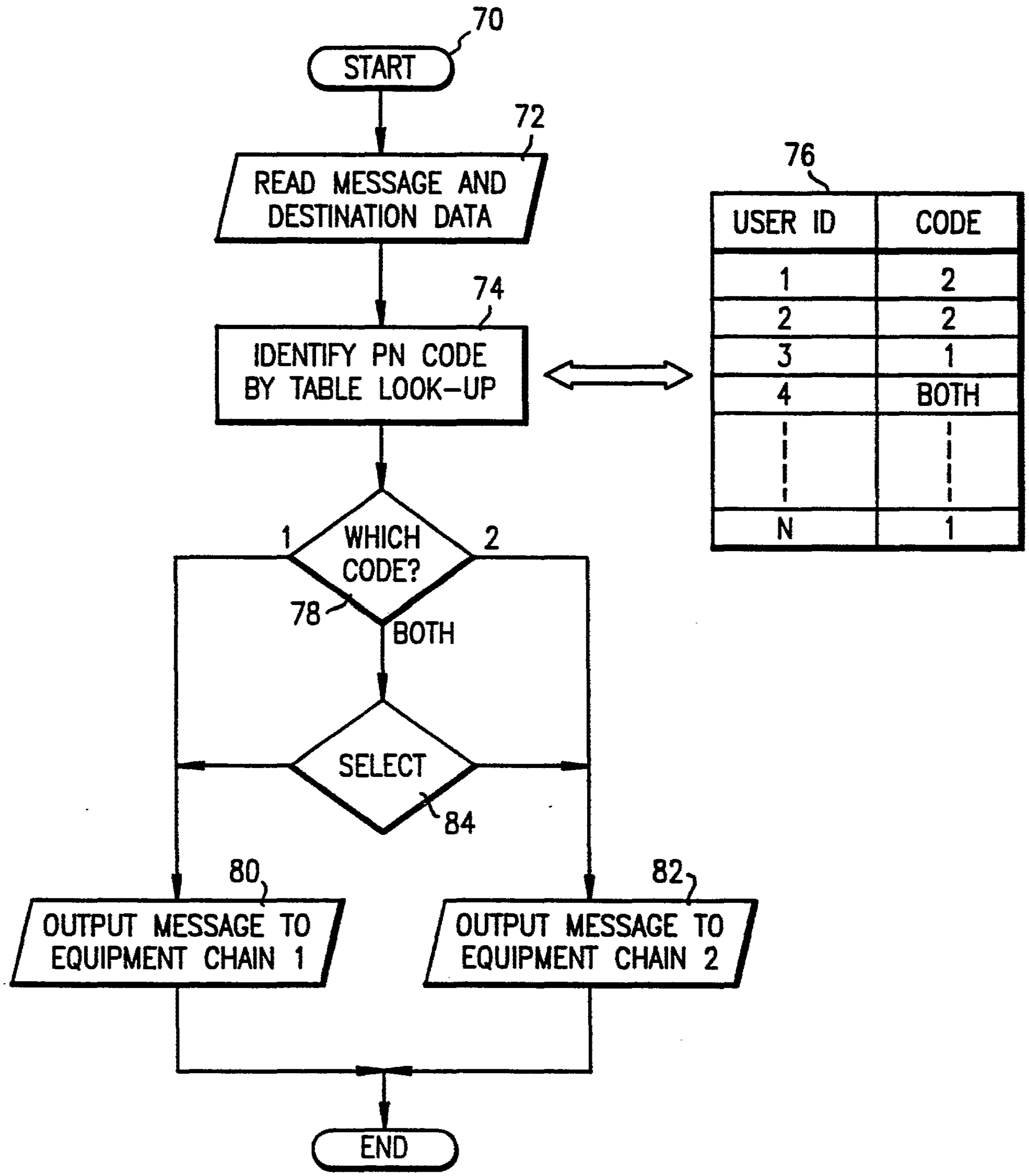

70
START
72
READ MESSAGE AND DESTINATION DATA
74
IDENTIFY PN CODE BY TABLE LOOK-UP
76
USER ID
CODE
1
2
2
2
3
1
4
BOTH
N
1
1
WHICH CODE?
2
78
BOTH
SELECT
84
80
OUTPUT MESSAGE TO EQUIPMENT CHAIN 1
82
OUTPUT MESSAGE TO EQUIPMENT CHAIN 2
END

FIG. 4

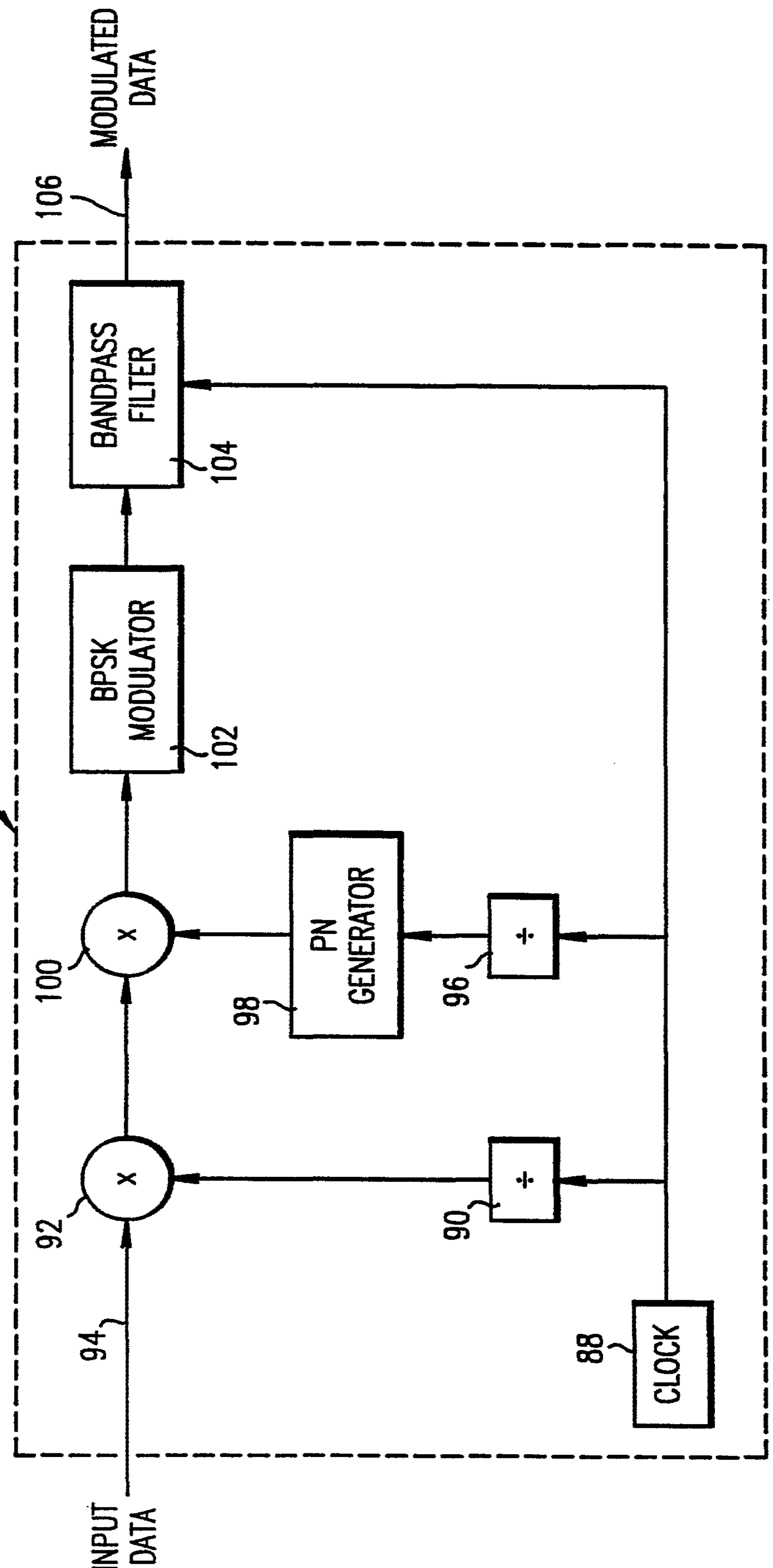

MODULATED DATA
106
BANDPASS FILTER
104
BPSK MODULATOR
102
46
100
x
PN GENERATOR
98
÷
96
92
x
÷
90
94
88
CLOCK
INPUT DATA

FIG. 5

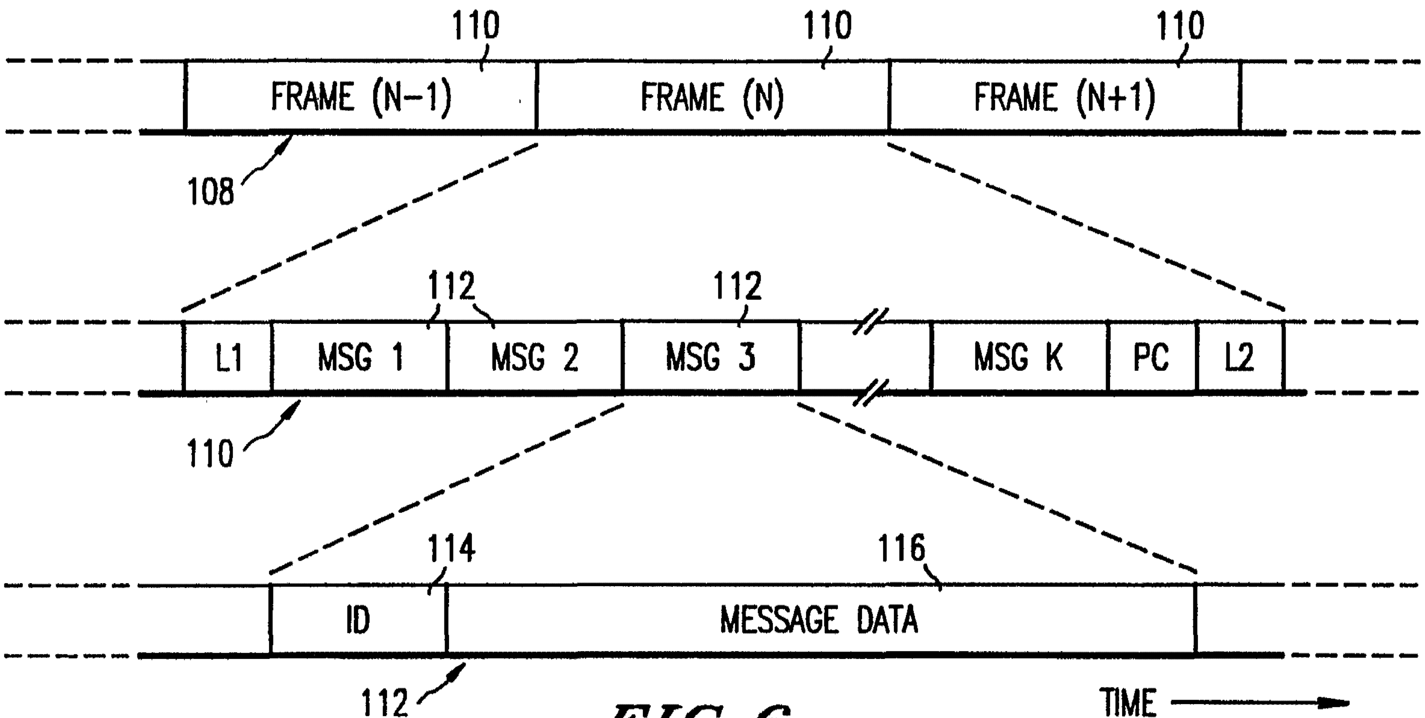

110
110
110
FRAME (N-1)
FRAME (N)
FRAME (N+1)
108
112
112
112
L1
MSG 1
MSG 2
MSG 3
MSG K
PC
L2
110
114
116
ID
MESSAGE DATA
112
TIME

FIG. 6

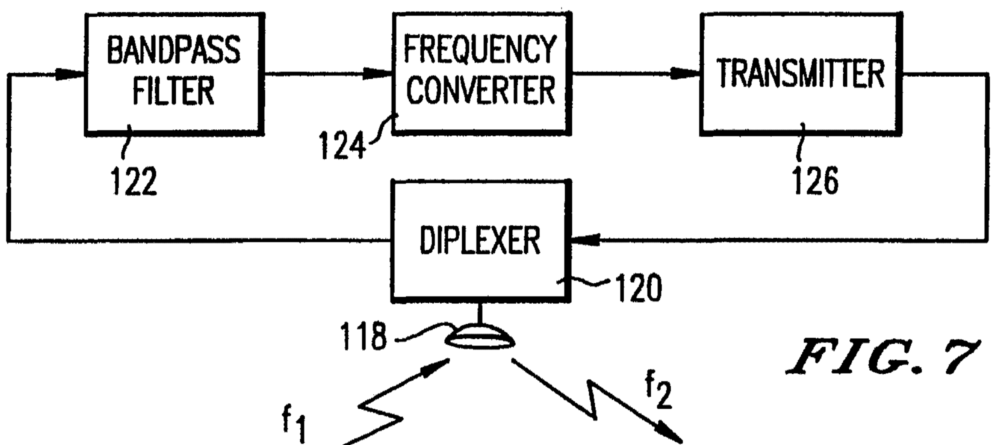

BANDPASS FILTER
FREQUENCY CONVERTER
TRANSMITTER
122
124
126
DIPLEXER
120
118
f_1
f_2

FIG. 7

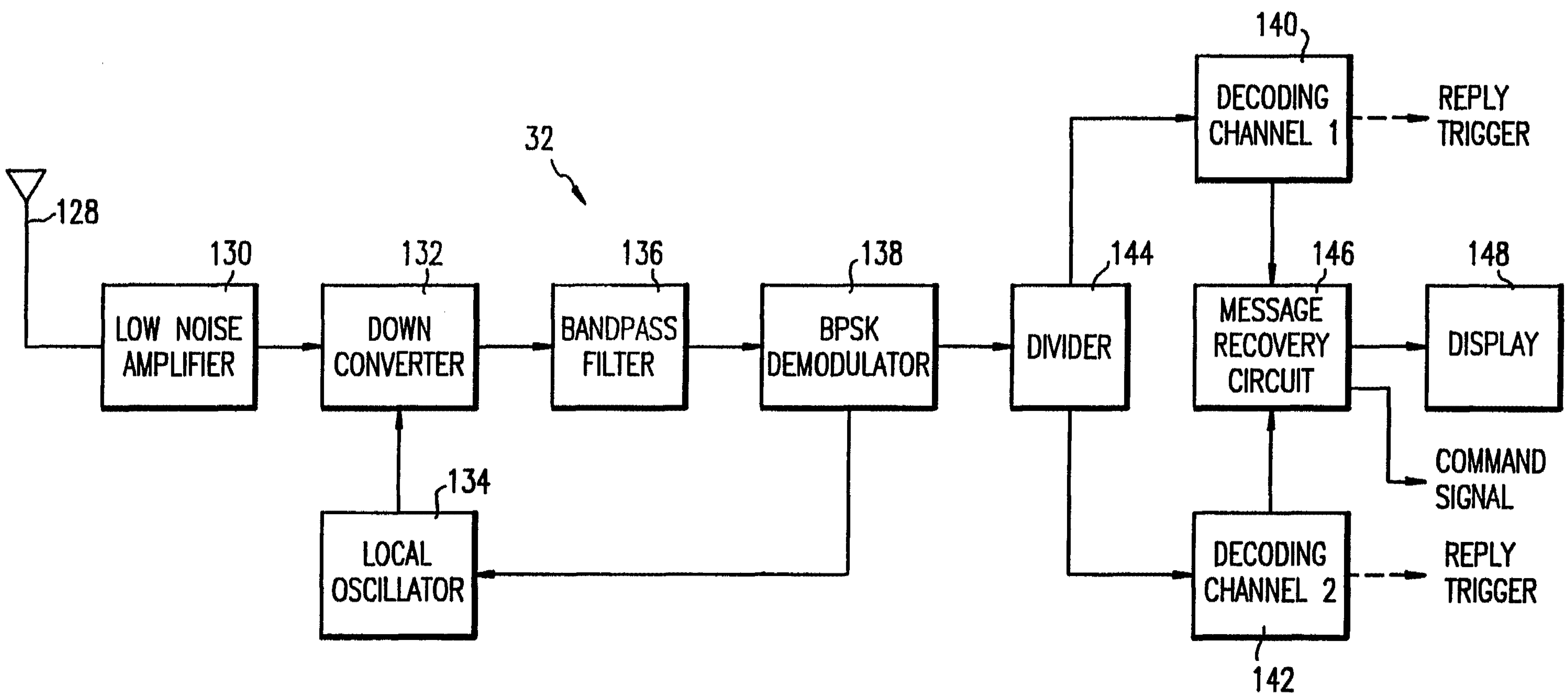

32
128
130
LOW NOISE AMPLIFIER
132
DOWN CONVERTER
136
BANDPASS FILTER
138
BPSK DEMODULATOR
134
LOCAL OSCILLATOR
144
DIVIDER
140
DECODING CHANNEL 1
REPLY TRIGGER
146
MESSAGE RECOVERY CIRCUIT
148
DISPLAY
COMMAND SIGNAL
DECODING CHANNEL 2
142
REPLY TRIGGER

FIG. 8

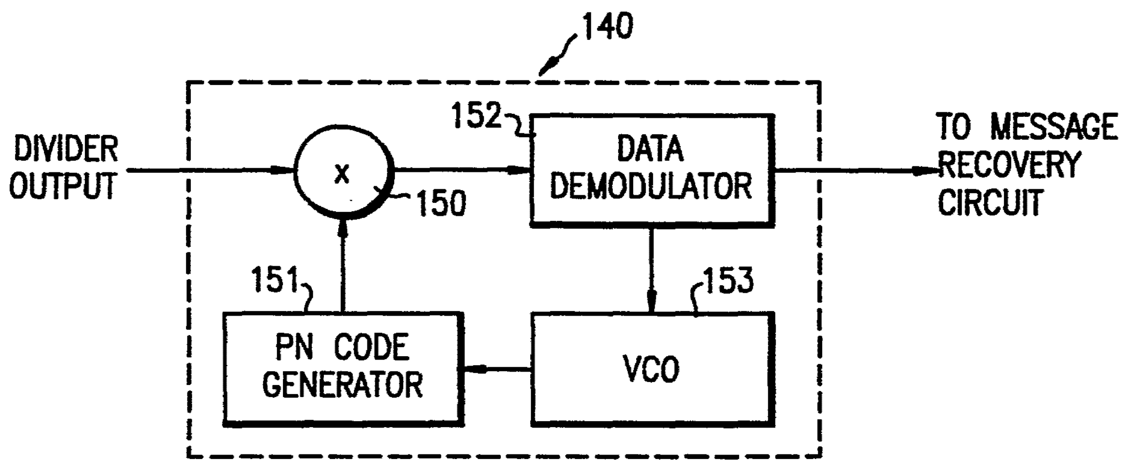

140
DIVIDER OUTPUT
X
150
152
DATA DEMODULATOR
TO MESSAGE RECOVERY CIRCUIT
151
PN CODE GENERATOR
153
VCO

FIG. 9

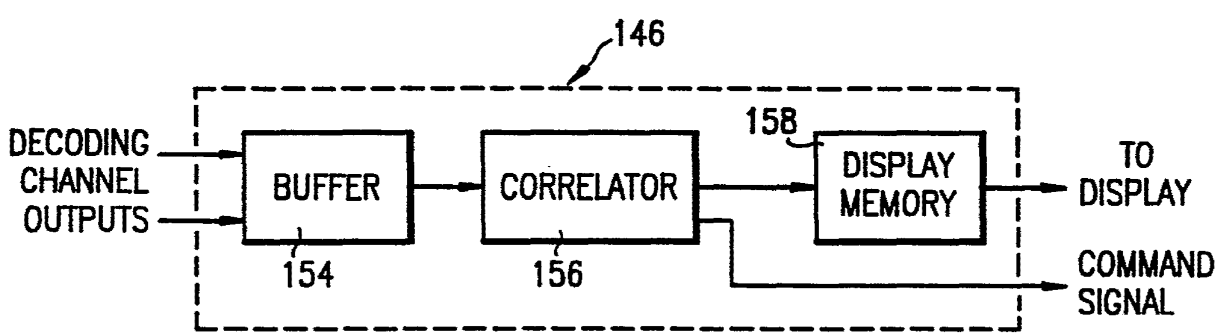

146
DECODING CHANNEL OUTPUTS
BUFFER
154
CORRELATOR
156
158
DISPLAY MEMORY
TO DISPLAY
COMMAND SIGNAL

FIG. 10

INTERNATIONAL SEARCH REPORT

International Application No PCT/US90/02077

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5): H04B 7/00

U.S.Cl.: 455/12, 13, 7; 375/1, 3; 370/104.1; 340/425

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	455/12, 13, 7, 9, 17, 23, 53, 54 375/1, 106, 3; 370/104.1; 340/425

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
X	US, A, 4,744,083 (O'Neill et al) 10 May 1988 See entire document	1-3, 7-14, 17, 19, 20
A	US, A, 4,004,098 (Shimasaki) 18 January 1977 See entire document	1-20
A	US, A, 3,879,580 (Schlosser et al) 22 April 1975 See entire document	1-20

* Special categories of cited documents: [15]

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
11 July 1990	16 AUG 1990
International Searching Authority [1]	**Signature of Authorized Officer**
ISA/US	NGUYEN NGOC-HO INTERNATIONAL DIVISION for Donnie L. Crosland Nguyen Nguyen

Form PCT/ISA/210 (second sheet) (May 1986)

PCT

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With amended claims.

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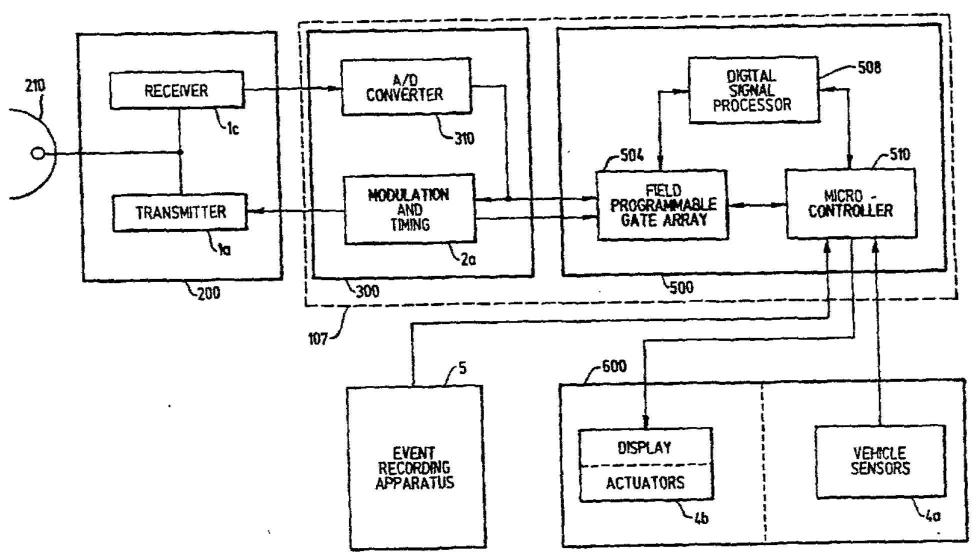
(74) Agents: GREENHAUS, Bruce, W. et al.; Spensley Horn Jubas & Lubitz, 5th floor, 1880 Century Park East, Los Angeles, CA 90067 (US).

(54) Title: METHOD AND APPARATUS FOR DETERMINING DRIVER FITNESS IN REAL TIME



(57) Abstract

A method and apparatus for evaluating a driver's performance under actual real-time conditions to determine the driver's ability to safely operate a vehicle, utilizes the information that is gathered by a radar system (200, 210) and other sensors (4a), together with information previously stored in an event recording device (5). Conditions monitored are used to make a determination as to whether the driver is performing in conformity with normal driving standards and the driver's own past performance. The driver's performance is constantly monitored and compared to that driver's past performance to determine whether the driver's present performance is impaired, and if so, whether the impairment is detrimental to the driver's ability to safely operate the vehicle.

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GB	United Kingdom
GE	Georgia
GN	Guinea
GR	Greece
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NL	Netherlands
NO	Norway
NZ	New Zealand
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SN	Senegal
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UZ	Uzbekistan
VN	Viet Nam

METHOD AND APPARATUS FOR DETERMINING DRIVER FITNESS IN REAL TIME

RELATED APPLICATION

This application is a continuation-in-part of (1) application Serial No. 07/930,066 of Jimmie R. Asbury, Bryan D. Woll, and Van R. Malan, which application was filed August 14, 1992 and is entitled MULTI-FREQUENCY, MULTI-TARGET VEHICULAR RADAR SYSTEM USING DIGITAL SIGNAL PROCESSING, and (2) application Serial No. 07/930,158 of Jerry D. Woll, Bryan D. Woll and Van R. Malan, which was filed on August 14, 1992 and is entitled RECORDING OF OPERATIONAL EVENTS IN AN AUTOMOTIVE VEHICLE.

BACKGROUND OF THE INVENTION

1. *Field of the Invention*

This invention relates to a method and apparatus for determining whether a person is capable of performing specific tasks, and more particularly, whether a person is fit to operate a motor vehicle.

2. *Description of Related Art*

There is a continuing need to increase the density of vehicles traveling the world's roadways, and simultaneously to improve the safety of highway vehicle operations by preventing highway vehicles from colliding with stationary and moving objects (such as roadside obstacles and other vehicles). One means for accomplishing these seemingly contradictory goals is to monitor the relative speed, direction of travel, and distance between vehicles sharing the roadway, and to use such information to provide direct indications to the vehicle's operator of potential danger. It is becoming increasingly more common for automotive engineers to consider the use of microwave radar systems as a means to monitor and warn drivers of such environmental conditions. Another means for accomplishing these diverse goals is to ensure that the driver of each vehicle is fit to operate the vehicle for which the driver is responsible.

Whenever a person is responsible for operating a motor vehicle, it is critical that the person be capable of demonstrating basic cognitive and motor skills at a level that will assure the safe operation of the vehicle. A number of conditions can impair a person's ability to perform the basic cognitive and motor skills that are necessary for the safe operation of a motor vehicle. For example, consumption of alcohol or narcotic drugs, or lack of sleep can make it impossible for a person to react appropriately to a potentially hazardous situation with sufficient speed to avoid danger to the operator, the vehicle, and other people and property which might be in the potential zone of danger. Therefore, it is very important to continuously evaluate a driver's ability to identify an appropriate action and react under the conditions encountered while operating a motor vehicle. Such conditions can cause a driver to experience extreme boredom and fatigue. For example, a truck driver carrying a load of merchandise cross-country is likely to experience boredom and fatigue under the conditions of such a long and monotonous interstate highway trip.

A number of pre-trip tests have been developed which allow a driver's fitness to operate a motor vehicle to be evaluated before the driver enters the vehicle. In one such test, a potential driver is requested to stand or sit before a panel that simulates the dashboard of a vehicle which the potential driver is to operate. A screen, such as a cathode ray tube (CRT) screen, simulates the view the driver would have when looking out the windshield of the vehicle. A mock steering wheel, brake pedal, and accelerator pedal are monitored to detect the reactions of the potential driver to events displayed on the screen. The potential driver's reactions are evaluated to determine whether the potential driver is performing adequately to safely operate a vehicle. The problem with such a pre-trip test is that the driver is only tested at the outset of his shift and it is quite possible for his fitness to deteriorate dramatically in the hours following his pre-trip test.

In a variation of the pre-trip test described above, a potential driver enters a specially-equipped vehicle and pulls down a screen located in the sun visor. Images are displayed on the screen and the driver must react to the images using the actual vehicle controls, such as the brake pedal, the accelerator pedal, and the steering wheel. As is the case in the previously described test, the driver's performance is evaluated by comparing the drivers remeasured reactions to a predetermined standard to determine whether the driver is fit to safely operate the vehicle. Only if the potential driver performs adequately will the engine of the vehicle operate. While this test more closely approximates the conditions encountered by the driver on the road, it nonetheless is not performed under actual conditions or in real-time. Furthermore, the condition of the driver may change during the course of the trip. For example, the driver may consume alcohol or a narcotic drug, or may become sleepy after operating the vehicle for a period of time. Thus, a need exists for dynamic, continuous, real-time testing of a driver's ability to safely operate a vehicle.

Turning the reader's attention now to vehicle borne radar systems as another means for enhancing the safe operation of vehicles, a number of vehicle borne radar systems which monitor the relationship of the vehicle to other vehicles and to obstacles are known. For example, systems are known that transmit and receive at three different frequencies on a time division basis, with two of the frequencies being used to determine range, and the third being combined with one of the first two to determine closing speed and likelihood of collision, are presently known. One such system is disclosed in U.S. Patent No. 3,952,303 to Watanabe et al., which teaches an analog radar signal processing front end.

However, analog systems such as the one disclosed in Watanabe are sensitive to temperature changes, difficult to calibrate, limited in resolution and reliability, and are require complex processing. Furthermore, such systems are dedicated to particular tasks, such as determining the range and relative rate of motion of other objects, and therefore are difficult to upgrade and customize to meet varying requirements. Still further, the transmit and receive frames in such three frequency systems can be wasteful, in that only small portions thereof are needed to determine the range and relative rate of motion of a target, with the remaining portions of the frame being unused.

Another recent example of an automotive radar system that uses analog signal processing techniques to analyze reflected radar signals is described in U.S. Patent Application, Ser. No. 08/020,600, entitled "Multi-Frequency Automotive Radar System", and assigned to the assignee of the present invention. In that system, a transmit signal and the reflected received signal are coupled to an RF mixer. The relevant output from the RF mixer is a signal that has a frequency equal to the difference between the transmit and receive frequencies. The frequency of the reflected received signal may be shifted from the frequency of the transmit signal upon its return due to the "Doppler" effect. The Doppler effect occurs whenever a transmitted signal reflects off a target that has a motion relative to a transceiver. The resulting frequency shift is referred to as a "Doppler shift".

The transmit signal changes at regular intervals between three frequencies spaced 250 kHz apart. Two of the frequencies are used to generate range information as described therein, while a third frequency is used to determine Doppler closing rate and target selection. After substantial analog waveform detection, amplification, shaping, and gating, the information regarding range, closing rate, and target selection of a single target can be input to a microcontroller for digital processing.

The use of analog processing techniques is fast and allows real time processing. However, the cost of analog circuitry is typically much greater than the cost of digital circuitry. In addition, digital circuitry is more reliable and capable of higher precision and more complex processing than analog circuitry. Thus, the sooner the analog signal can be converted to a digital signal and handled by digital circuitry, the lower the cost, the greater the performance, and the higher the reliability of the system. Additionally, digital signal processing circuits are much less sensitive to temperature and manufacturing variations and interference from noise than are analog signal processing circuits. Furthermore, the use of analog signal processing techniques limits the number of features that can be added to a system since each new feature typically requires all new processing hardware. In contrast, many additional features can be added to a system in which digital signal processing is used to determine range and relative motion simply by adding or modifying software. Still further, in analog systems the level of sophistication that can be achieved is limited by the available hardware and the cost of such hardware.

Furthermore, in vehicular radar systems, only a small part of the reflected signal is returned to the antenna. Thus, target detection runs from very good to non-existent, even when a strongly reflecting target is present. Improving the ability to detect targets requires sophisticated signal processing and tracking algorithms. Under many circumstances, such sophisticated signal processing is the only means by which meaningful information can be attained. Without sophisticated information processing, it may be difficult to identify and interpret the reflected signal. This requirement for sophisticated processing makes digital signal manipulation especially advantageous.

Another means by which roadways are being made more safe is by recording operational information regarding drivers and vehicles during vehicle operation. A number of electronic devices exist that record data on various aspects of vehicle performance and/or environment information. Such devices have used magnetic tape and paper strips to record such information. These devices primarily function as trip recorders, storing information such as trip distance, trip time, miles per gallon consumed, and average speed.

A drawback of such devices is that magnetic tapes and paper strips are susceptible to the detrimental effects of heat and vibration commonly found in a vehicular environment. A further drawback is that prior art vehicular recording devices have not been used in conjunction with an automotive radar system to record such information as the closing rate (CR) between the recording vehicle and other vehicles located by the vehicle's radar system, the distance (D) between the recording vehicle and other vehicles, vehicle speed (VS), and such vehicle performance and environment information as braking pressure, vehicle acceleration or deceleration in one or more dimensions, rate of turning of the vehicle, steering angle, hazard levels determined from a radar system processor, detected vehicle direction, and cruise control status, to name a few.

Further, it is believed that such automotive recording devices have not been used to record information to be used for accident reconstruction. Most commercial aircraft and some private aircraft are equipped with an event recording device commonly called a "black box". This device records pertinent data from the aircraft's major subsystems as the aircraft is operating. If an accident occurs, the "black box" generally can be retrieved from the aircraft and the recorded information extracted to determine the status of subsystems of the aircraft just before the accident. Such information is then used to reconstruct the events leading up to the accident, and can help determine the cause of the accident. Black box recording devices have proven invaluable in aircraft accident reconstruction. However, this type of technology is quite expensive, and its use has been limited to more expensive vehicles such as aircraft. In addition, it is believed that all such devices operate using a cumbersome magnetic tape to record data. These devices also tend to be larger, heavier, consume more power, and cost more than would be acceptable for automotive use.

In the area of automobile accident reconstruction, an accident analyst determines how an accident most probably occurred by measuring, among other things, the length of skid marks, the extent of vehicle and nearby property damage, and the condition of the road at the time of the accident. This method of reconstructing accidents has been shown to be expensive and inaccurate at times. Accordingly, it would be desirable for automotive vehicles to have a system that would function as an event recording "black box". Such a system should record information relating to the vehicle and the environment around the vehicle prior to an accident. Such data should be readable after an accident for use in reconstructing the events leading up to the accident. An accident could then be reconstructed using real historical data, as opposed to post-accident estimated data.

In addition to recording data useful for accident reconstruction, it would also be desirable for such a device to record more standard vehicle performance, operational status, and/or environment data. In addition, it would be desirable that such a device be configurable for a driver's particular preferences, or to provide an authorization function that prohibits unauthorized personnel from driving the vehicle, and/or to provide a convenient means for upgrading system-wide software for an automotive electronic control system or an automotive radar system.

Accordingly, there is a need for an automotive event recording system. In addition, there is a need for an automotive radar system that converts signals received into digital form before processing of those signals. Furthermore, there is a need for a simplified system in which only two frequencies are broadcast and in which a larger portion of the transmit signal is useful. The present invention provides a system which accomplishes these desired objectives.

Still further, it would be desirable to have a method and apparatus which utilizes the information that is gathered by a radar system and other sensors, and the information that has been recorded during past trips and a present trip, to evaluate a driver's performance in real-time and under actual conditions. It would also be desirable for such a system to predict when a driver is near the point of being unfit to safely operate a vehicle and determine when the driver is actually unfit to safely operate a vehicle.

The present invention meets these needs.

SUMMARY OF THE INVENTION

The present invention provides a method and apparatus which functions as an event recording device that can personalize a vehicle to the driver associated with that event recording device. Further, the present invention provides a method and apparatus that converts automotive radar signals into digital signals before processing those signals, and both displays the results and stores the results of the digital processor in the event recording device. Still further, the present invention provides a method and apparatus for evaluating a driver's performance under actual real-time conditions to determine the driver's ability to safely operate a vehicle, utilizing the information that is gathered by the radar system and other sensors, together with information that was previously stored in the event recording device.

The present invention operates by monitoring conditions external to a driver of a motor vehicle. Each of the conditions monitored are used to make a determination as to whether the driver is performing in conformity with normal driving standards and the driver's past performance. The driver's performance is constantly monitored and compared to that driver's past performance to determine whether the driver's present performance is impaired, and if so, whether the impairment is detrimental to the driver's ability to safely operate the vehicle. Some of the conditions are monitored by sensors which provide independent outputs. Additionally, some of the conditions are determined by a vehicular radar system.

In the preferred embodiment of the present invention, the radar system operates as a part of three distinct systems: (1) a collision warning system, (2) an operational event recording system, and (3) a driver fitness evaluation system. The three functions are distinct, but share a single radar system that provides information to all three systems, and thereby allows a substantial cost benefit to be realized when the three systems are used together. In an alternative embodiment, each system may operate completely independent of each other system.

The radar system of the preferred embodiment of the present invention includes an antenna/microwave transceiver section, a front-end electronics section, a digital electronics section, and a display and sensor section. In the preferred embodiment of the present invention, information regarding each target is output by a microcontroller that includes an audio warning unit, a control display unit, a plurality of sensors, and a digital interface to allow communications with outside devices.

The preferred embodiment of the present invention also provides a removable, externally readable, non-volatile solid-state memory event recording apparatus (ERA) that records selectable vehicle performance, operational status, and/or environment information. The ERA preferably records information useful for accident analysis and driver fitness evaluation. In the preferred embodiment of the present invention, the information that is recorded is also used to determine a baseline performance standard based on the driver's past performance against which a driver's present performance can be measured. In addition, the ERA of the preferred embodiment of the present invention can be used to store updated software for use by a system processor capable of reading data from the ERA. The ERA system is configured to store a wide variety of vehicle information gathered by sensors dispersed throughout a vehicle. The ERA can also be configured to function as a common trip recorder.

In the preferred embodiment of the present invention, each driver maintains a removable ERA that is personalized to that particular driver. Each ERA has information that identifies the driver, and a record of that driver's driving history and performance. The driver must insert the ERA before the driver may start the engine of a vehicle equipped with a system in accordance with the preferred embodiment of the present invention. A system processing unit, which in the preferred embodiment of the present invention is shared by the radar system, the ERA, and the driver fitness evaluating system, generates a profile of the driver based upon the information that is stored in the ERA.

The system processor monitors each of the external conditions and activities that are relevant to determining the fitness of the driver to operate the vehicle. In the preferred embodiment of the present invention, if driving performance is found to be below the individual standard calculated for that particular driver at any time during a trip, the driver is alerted to the fact that driving performance is not up to the calculated individual minimum standard. If the driver's performance continues to degrade (or, in an alternative embodiment, does not improve), an indication of the driver's performance is communicated to a remote site to alert a dispatcher or controller. If the driver's performance degrades still further, the vehicle ceases operating after a sufficient warning is provided to the driver that such action is imminent. Each step of the process, along with the data that is collected at each step of the process, is recorded in the ERA.

The details of the preferred embodiment of the present invention are set forth in the accompanying drawings and the description below. Once the details of the invention are known, numerous additional enhancements and changes will become obvious to one skilled in the art.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an perspective view of a vehicle in which the inventive system is installed.

FIGURE 2 is a simplified block diagram of the vehicular radar system of the present invention.

FIGURE 3 is an overall block diagram showing the inventive event recording apparatus being used in conjunction with an automotive radar system using digital signal processing.

FIGURE 4 is a block diagram of the antenna/microwave transceiver section of the vehicular radar system of the present invention.

FIGURE 5 is a block diagram of the front end electronics section of the vehicular radar system of the present invention.

FIGURE 6 is a timing diagram of the frequency control voltage signal referenced to the channel 1 and channel 2 select signals.

FIGURE 7 is an illustration of the envelope of the output of one channel of the signal switch of the vehicular radar system of the present invention.

FIGURE 8 is a block diagram of the digital electronic section of the vehicular radar system of the preferred embodiment of the present invention.

FIGURE 9 is a block diagram of the field programmable array of the vehicular radar system of the preferred embodiment of the present invention.

FIGURE 10 is a graph of the results of a FFT operation as performed by the DSP of the preferred embodiment of the present invention.

FIGURE 11 is a high level flow chart of the method by which the DSP of the preferred embodiment determines the number of samples upon which to perform an FFT calculation.

FIGURE 12 is a block diagram of the display and sensor section of the vehicular radar system of the present invention.

FIGURE 13 is a block diagram of a RAM card in accordance with the present invention, shown connected to the radar system microcontroller and a non-volatile memory device.

FIGURE 14 is a timing diagram of a Write cycle to a RAM card in accordance with the present invention.

FIGURE 15 is a timing diagram of a Read cycle from a RAM card in accordance with the present invention.

FIGURE 16 is a detailed block diagram of a RAM card in accordance with the present invention.

FIGURE 17 is a block diagram of an interface between a RAM card in accordance with the present invention and a personal computer.

FIGURE 18 is a flowchart of the fitness algorithm used to determine the fitness of a motor vehicle driver in accordance with the preferred embodiment of the present invention.

Like reference numbers and designations in the various drawings refer to like elements.

DETAILED DESCRIPTION OF THE INVENTION

Throughout this description, the preferred embodiment and examples shown should be considered as exemplars, rather than as limitations on the present invention.

Overview

The present invention is a system for determining whether a driver is fit to operate a motor vehicle. The preferred embodiment of the invention operates in cooperation with an obstacle detection and collision avoidance system, and an operational event recording system. However, the inventive system may operate as a stand alone system in which information is dynamically gathered by sensors which are dedicated to the purpose of determining a driver's fitness to operate a vehicle.

FIGURE 1 is a perspective view of a vehicle 100 in which the preferred embodiment of the present invention is installed. A plurality of sensors 4a and receiver/transmitter modules (such as the antenna/microwave transceiver 200 illustrated in FIGURE 2) are strategically located within the vehicle 100. As depicted in FIGURE 1, one antenna/microwave transceiver 200 is located in the front of the vehicle 100 and one antenna/microwave transceiver 200 is located in the rear of the vehicle 100. Each of the sensors 4a and antenna/microwave transceivers 200 are electrically coupled to a system processor 107, as represented by connecting broken lines. In the preferred embodiment of the present invention, the system processor 107 includes a front end electronics section 300 and a digital electronics section 500 (refer to FIGURE 2). In an alternative embodiment of the present invention, each antenna/microwave transceiver 200 is associated with a front end electronics section 300 which is placed in close proximity to the associated antenna/microwave transceiver 200.

In another alternative embodiment, transceivers 200 may also be installed on the sides of the vehicle to detect obstacles in the vehicle's "blind spot". Such a system is disclosed in U.S. Patent Application Ser. No. 07/930,079 assigned to the assignee of the present invention.

In the preferred embodiment of the present invention, each of the sensors 4a independently collect information about the environment in which the vehicle is operating, or the condition or operation of the vehicle.

FIGURE 2 is a high level block diagram of the radar system of the preferred embodiment of the invention. The system 1000 detects objects (targets) in the environment surrounding the system 1000, determines the range and relative motion of each target with respect to the system 1000, and alerts the automotive operator of potential hazards that could result from the presence or motion of such targets.

The antenna/microwave transceiver section 200 of the system 1000 transmits and receives Radio Frequency (RF) signals. The received signals are compared to the transmitted signals. A difference signal is generated having a frequency equal to the difference between the frequency of the transmit and the receive signal. The difference signal is coupled to the front end electronics section 300. The front end electronics section 300 digitizes the difference signal. The digitized difference signal is coupled to the digital electronics section 500 which determines the range and relative motion of each target. The digital electronics section 500 is coupled to an input/output module, such as a display and sensor section 600. The display and sensor section 600 has a plurality of sensors that indicate to the system the status of various vehicle controls. The display and sensor section 600 also produces audio and visual indications for presentation to the automotive operator. In the present invention the radar system is capable of determining the rate at which a target is approaching or retreating, and distance to a plurality of different targets. In an alternative embodiment of the present invention, the radar system may be capable of determining the spacial relationship of the vehicle to the roadway (i.e., whether the vehicle is centered within an appropriate travel lane and whether the roadway is straight or curved and the radius of curvature).

A removable, externally readable, non-volatile solid-state memory event recording apparatus (ERA) 5 is coupled to the system processor 107. The ERA records the output of each of the sensors and information about targets detected by the radar system.

FIGURE 3 is an overall block diagram showing the inventive ERA 5 being used in conjunction with an automotive radar system using digital signal processing. Such a system is described in greater detail in co-pending U.S. Patent Application Serial No. 07/930,066, entitled MULTI-FREQUENCY, MULTI-TARGET AUTOMOTIVE RADAR SYSTEM USING DIGITAL SIGNAL PROCESSING, of which this application is a continuation-in-part, and which is assigned to the assignee of the present invention. This radar system is referenced by way of example. However, the invention could be readily adapted to be used in conjunction with other automotive radar systems known in the art, such as the systems described in U.S. Patent No. 4,673,937, entitled AUTOMOTIVE COLLISION AVOIDANCE AND/OR AIR BAG DEPLOYMENT RADAR, and U.S. Patent No. 4,916,450, entitled RADAR SYSTEM FOR HEADWAY CONTROL OF A VEHICLE, both of which are assigned to the assignee of the present invention.

Using the present ERA invention in conjunction with such a radar system allows recording of important data relating to obstacles in the path of the vehicle that were detected by the radar system. This type of information is particularly useful in accident reconstruction and in determining a driver's ability to safely operate a vehicle.

Referring to FIGURE 3, a antenna/microwave transceiver 200 transmits a radar signal from a radar transmitter 1a via a radar antenna 210, and receives reflected Doppler shifted radar echoes in a receiver 1c through the antenna 210. A control module (such as the front end electronics section 300 of FIGURE 2) coupled to the antenna/microwave transceiver 200 contains a modulation and timing circuit 2a that controls the transmission of the radar signal, and an A/D converter 310 for converting the received echo signal into a digital data stream. A signal processing module (such as the digital electronics section 500 of FIGURE 2) includes a digital signal processor (DSP) 508, a microcontroller 510, and a field programmable gate array 504, configured to control the flow of digital radar data to the DSP 508 under the control of the microcontroller 510. The digital electronics section 500 is also coupled to the display and sensor section 600.

The display and sensor section 600 which provides information from a variety of vehicle sensors 4a to the microcontroller 510 for use in calculating the hazard level presented by targets indicated from the received radar signal and/or to indicate the operational status and environment of the vehicle. Commonly known sensors may be used, for example, to measure distance travelled, vehicle speed (momentary and average), fuel consumption, fuel remaining, direction of travel, engine temperature, oil pressure, engine RPM, oil temperature, transmission fluid temperature, coolant temperature, engine timing and other values relating to the environment or performance of the vehicle. The digital electronics section 500 itself generates information from the transmitted and received radar signal, such as the closing rate (CR) of a target with respect to the vehicle, the distance (D) of various targets, and the direction of movement (towards or away from) of the targets with respect to the vehicle. Additional information can be obtained by providing other sensors, such as a brake pedal pressure sensor, brake hydraulic line pressure sensor, tire pressure, accelerometer sensors (for example, fore and aft acceleration/deceleration, and/or left and right (yaw) acceleration of the vehicle), turning rate, turn angle, and/or impact sensors (such as the type used to trigger vehicle air bags), windshield wiper status (to determine if it is raining), fog light status, outside temperature, defroster status, and geographic positioning information. Recording some or all of this data or similar relevant data would make accident reconstruction more reliable and less expensive.

The display and sensor section 600 also has a display and/or actuators 4b, for displaying indications to a user and/or controlling various aspects of vehicle operation (for example, flashing a dashboard warning light to a user if a vehicle is approaching too rapidly, and/or, in extreme conditions, automatically activating the vehicle brakes and/or air bag or disabling a vehicle from unauthorized or unfit drivers).

By selecting appropriate outputs from the sensors and radar system which have been recorded in the ERA, (which may include the outputs recorded during past and present trips) a profile of the driver is formed. The driver's performance over a recent period of time is compared to a standard derived from the personal profile calculated using the driver's past performance. The results of the comparison are used to determine the driver's current fitness to operate a vehicle. In the preferred embodiment of the present invention, if the driver's performance at any time during a trip is found to be below the personal standard calculated for that driver, the driver is alerted that driving performance is not up to the driver's personal standard. In the preferred embodiment of the invention, if the driver's performance continues to degrade (or, in an alternative embodiment, does not improve), an indication of the driver's performance is communicated to a remote site to alert a dispatcher or controller. In the preferred embodiment of the invention, if the driver's performance degrades still further, the vehicle ceases operating after a sufficient warning is provided to the driver that such action is imminent. Each step of the process, along with the data that is collected at each step of the process, is recorded in the ERA.

Sensors

The present invention includes a plurality of sensors for sensing a wide range of operational conditions and environmental conditions. Commonly known sensors may be used, for example, the preferred embodiment of the present invention has a mechanical speedometer coupled to the drive train of the vehicle in known fashion. A steering wheel position sensor using a dual Hall-effect device senses the location of a magnetic located on the steering wheel shaft. (Further details regarding the means for determining the position and motion of the steering wheel are disclosed below). A tachometer coupled to the engine in known fashion senses the number of revolutions per minute of the engine. A pressure gauge senses the engine oil pressure. A thermometer senses the temperature of the engine oil and/or engine block. A thermometer senses the temperature of the transmission fluid (if the vehicle uses any such fluid). A thermometer senses the temperature of the engine coolant. Accelerometers sense the rate of lateral acceleration in the direction of forward motion and at right angles to the direction of forward motion. Inclinometers sense the attitude of the vehicle with respect to the gravitational field of the earth. An anti-lock braking system, as is known, is provided and a sensor detects activation of this system. Pressure sensors are placed on the accelerator and brake pedals to sense the amount of pressure being applied to each pedal. A vehicle turn signal sensor senses which, of either of the right or left vehicle turn signals, is active. An external thermometer senses the temperature outside the vehicle. A sensor is also provided which senses when the windshield wipers are active. This list of sensors is not intended to be exhaustive, nor are these particular sensors important in every instance. It should therefore be understood that the number and type of sensors provided in the present invention is not of particular importance. The important aspect of the present invention is the ability to determine the operational conditions under which the driver and vehicle are operating.

The digital electronics section 500 generates information from the transmitted and received radar signal, such as the closing rate (CR) of a target with respect to the vehicle, the distance (D) of various targets, and the direction of movement (towards or away from) of the targets with respect to the vehicle. Additional information can be obtained by providing other sensors, such as a brake pedal pressure sensor, brake hydraulic line pressure sensor, tire pressure, accelerometer sensors (for example, fore and aft acceleration/deceleration, and/or left and right (yaw) acceleration of the vehicle), turning rate, turn angle, and/or impact sensors (such as the type used to trigger vehicle air bags), windshield wiper status (to determine if it is raining), fog light status, defroster status, turn signal status, anti-skid brake system (ABS) status and performance, and geographic positioning information.

Referring to FIGURE 3, the display and sensor section 600 provides information from the vehicle sensors 4a to the microcontroller 510 for use in calculating the hazard level presented by targets indicated from the received radar signal. In the preferred embodiment of the present invention, each of the sensors are coupled to the system processor 107 which controls both the obstacle detection and collision avoidance system, and the operational event recording system. In the preferred embodiment of the present invention, the sensors are sampled or "polled" in known fashion. However, any means for reading the sensors is within the scope of the present invention. For example, the sensors may cause an interrupt to the microcontroller 510 within the digital electronics section 500 of the system processor 107 at intervals. When the microcontroller 510 recognizes the interrupt, the microcontroller 510 reads the output of the sensor 4a that is responsible for generating the interrupt. Furthermore, it is within the scope of the present invention to include a discrete processor that is dedicated to monitoring each of the sensors and storing the output of each in the ERA. Recording some or all of the data collected from each of the sensors would make accident reconstruction more reliable and less expensive.

Radar System

In addition to the information that is gathered by the sensors 4a, information is also gathered by the radar system of the preferred embodiment of the present invention.

1. Antenna/microwave transceiver section

FIGURE 4 shows the antenna/microwave transceiver 200 in greater detail. The transceiver 200 is relatively conventional, and includes an oscillator 202, such as a Gunn diode used in the preferred embodiment of the present invention, a directional coupler 204, a receive directional coupler 206, a Schottky diode mixer 208, an antenna 210, and an RF load 212. The Gunn diode 202 produces a transmit signal. The frequency of the transmit signal varies as a function of a frequency control voltage signal 406 coupled to the Gunn diode 202 from the front end electronics section 300 on a frequency control voltage signal line 214 (see the timing diagram of FIGURE 6). The voltage level that is presented to the Gunn diode 202 on the frequency control voltage signal line 214 alternates between two voltage levels, thereby causing the transmit frequency to alternate between two frequencies. In the preferred embodiment of the present invention, these two frequencies are approximately 24.125 GHz and 24.125250 GHz. The lower of these frequencies is hereafter referred to as the channel 1 frequency, and the higher frequency as the channel 2 frequency. The channel 1 and channel 2 frequencies are spaced approximately 250 kHz apart in the illustrated embodiment.

The transmit signal is coupled through the transmit directional coupler 204 to the antenna 210 via the receive directional coupler 206. The directional coupler 204 reduces the power of the transmit signal and isolates the Gunn diode 202 from received signals. The output power may be reduced to comply with current Federal Communication Commission regulations. An RF load 212 may be used to absorb excess power that is coupled away from the antenna 210. The receive directional coupler 206 couples signals received by the antenna 210 to the mixer 208 and further isolates the Gunn diode 202 from the received signals. In addition, the receive coupler 206 couples a portion of the transmit signal to the mixer 208. The mixer 208 produces an output that has frequencies equal to the difference between the frequency of the transmit signal and the frequencies of the received signals, i.e., the RF mixer 208 "down converts" the received signals. (It should be understood that the receive signal may at times have a lower frequency than the transmit signal. Throughout this document the phrase "down convert the received signals" is applied to this case as well as to the case in which the received signals have a greater frequency than the transmit signal). Other frequencies are also produced by the mixer 208. However, these other frequencies are not of interest and are filtered out at various points within the system, as discussed below.

When a target is present, the target reflects some of the transmitted signal back into the transceiver antenna 210. Targets that move at different speeds generate different reflected frequencies. For example, the frequency of an RF signal increases when reflected off an approaching target, and decreases when reflected off a retreating target. The frequency change is due to the well-known Doppler shift phenomenon. Therefore, the output of the mixer 208 is, in many cases, the difference between the frequencies of the transmitted signal, and a summation of reflections of the transmitted signal, each Doppler shifted by a different amount and a variety of other signals received signals generated by sources other than the present invention and having various frequencies.

2. Front end electronics section

The output of the mixer 208 is coupled to the front end electronics section 300. The front end electronics section 300 is shown in greater detail in FIGURE 5. The front end electronics section 300 includes a preamplifier (preamp) 302, a channel 1 signal switch 304a, a channel 2 signal switch 304b, a channel 1 low pass filter 306, a channel 1 audio amplifier 307, a channel 2 low pass filter 308, a channel 2 audio amplifier 309, an analog to digital converter (A/D) 310, a BIT (Built-In-Test) signal generator 311, timing generator circuit 312, a clock circuit 314, a frequency control voltage generator 316, and various line drivers and receivers 320, 322, 324.

The output of the mixer 208 is coupled to the input of the preamp 302 within the front end electronics section 300. The preamp 302 amplifies the signal coupled from the mixer 208. The signal that is presented to the preamp 302 is a composite of the various signals that are received and mixed with the transmit frequency. Typically, when the transmit frequency is transmitted, a plurality of targets reflect some of the signal back to the antenna 210. Some of those targets may be stationary with respect to the antenna 210, while others may have a relative motion with respect to the antenna 210. By virtue of the Doppler shift that occurs when a radio wave is reflected off a target in motion relative to the transmitter or receiver, the frequency difference between the transmit frequency and the receive frequency can be used to determine the relative speed of the target and to distinguish one target from another, assuming there is a difference in the relative speed of the targets.

A target with a relative speed of 100 miles per hour with respect to the transmitter causes the frequency of the receive signal with respect to the transmit signal to shift by approximately 7.2 kHz. The frequencies that are of interest in the preferred embodiment of the present invention are those frequencies that are within the frequency range of about 0 to 7.2 kHz. Since the received signal is a composite of a signals reflected off a number of targets, the receive signal typically will not be a single sinusoid. Of course, higher frequencies could be used.

The strength of the transmitted signal is such that most targets of interest are detected at ranges up to about 1600 feet. The speed at which radio frequency waves propagate through free space is approximately 1 ft/ns. Therefore, at a distance of 1600 feet, there is a round-trip signal delay of about 3.2 μS. Hence, when a received signal is reflected off a target at a distance, the output of the mixer 208 has a frequency of 250 kHz, plus or minus the Doppler frequency, for the amount of time that it takes the transmit signal to reach the target and reflect back to the transceiver (i.e., 3.2 μS for a range of 1600 feet) immediately after the transmit frequency changes from the channel 1 frequency to the channel 2 frequency, and *vice versa*.

The output of the preamp 302 is coupled to both the signal switches 304a, 304b. The signal switches 304a and 304b time demultiplex the signal from the preamp 302 by coupling the preamp 302 to either the channel 1 audio amplifier 307 and low pass filter 306, or the channel 2 audio amplifier 309 and low pass filter 308, alternatively. Additionally, each signal switch couples the input of the associated filter 306, 308 to a circuit 305a, 305b having an output impedance equal to the output impedance of the preamp 302 (and the input impedance of each filter 306, 308). Thus, a constant source impedance is seen by the filters 306, 308. By ensuring that the source impedance to each filter remains constant, the filters remain linear and so the power of the intermodulation products of the Doppler frequencies of multiple targets created by the nonlinearity of the filters are held to a minimum (and ideally, eliminated). Such intermodulation products, when created, appear as "phantom" targets.

Paired switch timing control signals 402, 404, coupled to respective paired signal switches 304a, 304b from timing generator circuit 312 on switch timing control lines 318, determine to which filter 306, 308 the preamp 302 output is to be coupled, and the timing of such coupling. FIGURE 6 is a timing diagram showing the timing of the switch timing control signals 402, 404 with respect to the frequency control voltage signal 406 coupled to the Gunn diode 202 on the frequency control voltage signal line 214. In the preferred embodiment of the present invention, the frequency control voltage signal 406 alternates between a relatively high voltage and a relatively low voltage at intervals of 7.8 μS. One period of the frequency control voltage signal 406 is equal to 15.6 μS. Therefore, the output frequency of the Gunn diode 202 alternates between a relatively low frequency (the channel 1 frequency) and a relatively high frequency (the channel 2 frequency) at intervals of 7.8 μS as a function of the frequency control voltage.

The switch timing control signal on switch timing control line 318 includes a channel 1 select signal 402 and a channel 2 select signal 404. The channel 1 select signal 402 in the high state causes the preamp 302 output to be coupled to the channel 1 low pass filter 306 through the signal switch 304. The channel 2 select signal 404 in the high state causes the preamp 302 output to be coupled to the channel 2 low pass filter 308 through the signal switch 304. The signal switch 304 is synchronized to the frequency control voltage signal 406 by the timing generator circuit 312. Therefore, in the preferred embodiment of the present invention, the signal switch 304 connects the preamp 302 to the channel 1 low pass filter 306 for approximately one-fifth of a period (3.12 μS), synchronized to the time when the transmit signal is at the channel 1 frequency. The signal switch 304 also connects the preamp 302 to the channel 2 low pass filter 308 for approximately one-fifth of a period (3.12 μS), synchronized to the time when the transmit signal is at the channel 2 frequency. Hence, the signal switch 304 time demultiplexes the down converted channel 1 and channel 2 signals. Alternative embodiments, in which the length of the channel 1 and channel 2 select signal 402, 404 pulses are longer or shorter, are within the scope of the present invention.

The timing diagram of FIGURE 6 shows the channel 1 select signal 402 pulses and the channel 2 select signal 404 pulses offset from the respective edges of the frequency control signal 406 to allow the transmit signal time to stabilize and/or to ensure that the receive and the transmit signal are at the same carrier frequency (i.e., both the receive and transmit signals are at either the channel 1 or channel 2 frequency) at the time the channel 1 and channel 2 select signals 402, 404 are active. However, it should be understood that in alternative embodiments of the present invention, these signals 402, 404 may occur anywhere at or between the rising edge and the falling edge of the frequency control voltage signal 406.

In the preferred embodiment of the present invention, each filter 306, 308 has a 3 dB cutoff frequency of 24 kHz. The filters 306, 308 reconstruct the output of the signal switch 304 by acting as an envelope detector. The channel 1 low pass filter 306 reconstructs (or "smooths") the time demultiplexed down converted channel 1 signal and the channel 2 low pass filter 308 reconstructs the time demultiplexed down converted channel 2 signal, as shown for one channel in FIGURE 7. The composite of the samples 702 taken by the signal switch 304 under the control of the channel 1 select signal 402 and the channel 2 select signal 404 creates an envelope 704 for each channel that is essentially below the 3 dB cutoff frequency of the low pass filters 306, 308. Therefore, the output of each filter is a smooth signal with frequency components equal to the difference between the frequency of the transmit signal corresponding to the channel associated with the filter and the frequency of each signal received during the time that channel is transmitted. For example, the channel 1 low pass filter 306 outputs a smooth signal with a frequency equal to the difference between the channel 1 transmit frequency and the channel 1 receive frequencies reflected from a multitude of targets as if the channel 1 transmit frequency were transmitted in a continuous wave fashion.

The outputs of each filter 306, 308 are coupled to the A/D converter 310. The A/D converter 310 includes two discrete channels corresponding to front-end signal channels 1 and 2. Each channel of the A/D converter 310 converts the analog inputs from the corresponding down-converted frequency channel into a stream of digital data words. A digital low pass filter 328 within the A/D converter 310 filters each channel, and a multiplexer 330 within the A/D converter 310 time multiplexes the digital data words from each of the A/D converter channels (i.e., channel 1 and channel 2 digital data words are interleaved). The low pass filters 328 within the A/D converter 310 have a 3 dB cutoff frequency of approximately 7.5 kHz. These filters 328, in conjunction with low pass filters 306, 308, ensure that the Nyquist criteria is satisfied with respect to the sample frequency, thereby preventing aliasing when the FFT operation is performed (i.e., the effective sampling frequency from the A/D converter 310 should exceed twice the frequency of the doppler frequency of interest).

The A/D converter 310 of the preferred embodiment of the present invention is an oversampling analog to digital converter. The output from the A/D converter 310 is a series of 32 bits data words. The first 16 bits represent the amplitude of the analog signal sampled at a particular time (i.e., 16 bit resolution). Bits 17 through 19 indicate whether the A/D converter 310 is near saturation. Bits 20 through the 31 indicate whether the word is associated with channel 1 or channel 2. Knowledge of the proximity of the A/D converter 310 to saturation aids in compensating for any signal distortion that might occur as the A/D converter 310 approaches saturation. Such compensation may be performed in a number of ways that are well known in the art of digital signal processing, such as using automatic gain control corresponding to each value represented by the last three bits of the A/D converter 310 output. In alternative embodiments of the present invention, the output of the A/D converter 310 is merely the digital representation of the input plus one bit that represents the channel of the A/D converter 310. The A/D converter 310 output in such alternative embodiments may have fewer or more than 16 bits of resolution.

The Timing generator circuit 312 determines the sample rate of the A/D converter 310. In the preferred embodiment of the present invention, the A/D converter 310 has a sample frequency of about 1 MHz, as determined by a timing clock signal coupled from the timing generator circuit 312 to the A/D converter 310 on a timing clock line 326. The A/D converter 310 of the preferred embodiment of the present invention oversamples by 64x, and thus has an equivalent sample rate equal to (1/64) MHz = 16 kHz. In an alternative embodiment of the present invention, the sample rate can be changed dynamically.

The preferred embodiment of the present invention has a real-time Built-In-Test (BIT) capability which verifies the proper operation of the system. The BIT signal generator circuit 311 creates a BIT signal upon receiving a command from the timing generator circuit 312. The BIT signal is coupled to the preamp 302 and simulates a signal from the mixer 208. When the BIT signal is injected into the preamp 302, it is summed with the output of the mixer 208. Therefore, the ongoing operations need not be interrupted. In the preferred embodiment of the present invention, the microcontroller 510 (shown in FIGURE 8) determines which frequency is to be injected into the preamp 302. The determination is made based upon the absence of other targets. Therefore, normal operation of the system is not impeded by the BIT function. The BIT signal injected into the preamp 302 propagates through the system along with the output of the mixer 208. The microcontroller compares the range and relative motion expected by the microcontroller 510 for the BIT signal with the values of range and relative motion that actually result after the BIT signal propagates through the front-end electronics. Thus, a high degree of certainty that each component in the front end electronics section 300 and the digital electronics section 500 are operating properly can be had.

The timing generator circuit 312 of the preferred embodiment of the present invention also generates a calibrate signal which is coupled to the A/D converter 310. The calibrate signal initiates a calibrate function within the A/D converter 310 which calibrates the A/D converter 310 for selected offsets. Offset calibration of the A/D converter 310 is performed periodically to ensure the accuracy of the conversion. Calibration functions, such as the calibration function of the preferred embodiment of the present invention, are standard features of many A/D converters, such as the CS5336 A/D converter manufactured by *Crystal Semiconductor* and used in the preferred embodiment of the present invention.

3. Digital electronics section

The digital output of the A/D converter 310 is coupled to a signal line driver/receiver 320. The line driver/receiver 320 couples the digital signal to the digital electronics section 500. The digital electronics section 500 is shown in greater detail in FIGURE 8. A signal line driver/receiver 502 receives the digital output of the A/D converter 310. The signal line driver/receiver 502 is coupled to a field programmable gate array (FPGA) 504, such as a 3042PC84-70 FPGA manufactured by *Xilinx*. The FPGA 504 accepts the digital data sent from the A/D converter 310 and stores the data in a high-speed random-access-memory 506 (RAM).

The digital data sent from the A/D converter 310 is sent as a synchronous serial data stream to the FPGA 504. A frame synchronization (frame sync) signal and a serial clock (bit sync) signal are generated by the timing generator circuit 312 and transmitted to the FPGA 504 from the front end electronics section 300. The frame sync and serial clock signals are coupled from the timing generator circuit 312 to line drivers 322, 324. The line drivers 322, 324 of the front end section 300 are coupled to line receivers 516, 518, respectively, in the digital electronics section 500. From the line receivers 516, 518, the frame sync and serial clock signals are coupled to the FPGA 504. The frame sync signal identifies the beginning of each digital data word transmitted from the A/D converter 310 to the FPGA 504, and the serial clock signal synchronizes each bit of each digital data word from the A/D converter 310 to the input circuit of the FPGA 504. The generation and use of frame synchronization and serial clock signals to communicate synchronous digital data is well known in the art.

FIGURE 9 is a detailed block diagram of the FPGA 504. In the preferred embodiment of the present invention, a direct memory access controller 555 (DMAC), a counter and synchronizer 558, a serial link synchronizer 562, a front end electronics interface 560, a microcontroller interface 566, an up/down counter 564, a serial to parallel conversion buffer 556, an analog-to-digital data-scaling monitor 554, a blind spot sensor interface, and an FFT overflow monitor 557 are implemented in the FPGA 504. The serial to parallel conversion buffer 556 receives the stream of serial data words from the A/D converter 310 along with the frame synchronization and serial clock signals. The counter and synchronizer circuit 558 counts the number of bits being received by the parallel to serial conversion buffer 556 and couples the serial clock signal to the serial to parallel conversion buffer 556. The serial to parallel conversion buffer 556 converts the serial stream to a parallel format. Each data word sent from the A/D converter 310 includes 32 bits, 16 of which represent the amplitude of the samples taken during a particular sample period. The 16 amplitude bits, together with 8 bits set to a known value, such as zero in the preferred embodiment of the present invention, form a 24 bit parallel word.

The FPGA 504 is coupled to a Digital Signal Processor 508 (DSP), such as model *DSP56001* manufactured by *Motorola Incorporated*. The DSP 508 is coupled to a clock 514 that determines the speed at which the DSP 508 operates. The DSP 508 of the preferred embodiment of the present invention operates at approximately 26 MHz. When a complete 32 bit word has been received from the A/D converter 310, the DMAC 555 initiates a DMA (direct memory access) cycle by asserting a bus-request signal to the DSP 508. When this signal is asserted, the DSP 508 releases a bus 509 shared by the FPGA 504, DSP 508, and the RAM 506. When the DSP 508 is off the bus 509, the DSP 508 asserts a bus-grant signal to the DMAC 555, indicating that the DMAC 555 is granted the use of the bus 509. The DMAC 555 directly writes the 16 bit digitized sample as a 24 bit word to the RAM 506. The lower 8 bits are zero filled. When the DMAC 555 is finished with the write to the RAM 506 the DMAC 555 de-asserts the bus-request signal, thereby allowing the DSP 508 to regain control of the bus 509.

The RAM 506 locations in which the data is written by the DMAC 55 are divided into blocks. Each block of data has two memory areas, each of which are capable of storing 512 words. Each of the memory areas within each block of memory is associated with one of the front-end signal channels. Initially, the DMAC 555 is disabled until the DSP 508 initializes the DMAC 555 by writing the block address of the block of memory in the RAM 506 to which the words are to be stored.

The DMAC 555 reads a channel bit from each serial word and writes the word to the memory area associated with the channel designated by that channel bit. The channel bit alternates with each word read by the DMAC 555, and thus the memory area to which the word is written alternates causing the memory areas associated with each channel to fill concurrently. The DMAC 555 has an internal counter with a maximum count of 511. Each time a word from channel 2 is written to memory, the counter is incremented. To ensure that the counter is synchronized to the write operation, the first increment only occurs after both memory areas have been written to at least once (i.e., if channel 2 is written to before channel 1, the counter does not increment until the second time data is written to channel 2). This causes the first word that was written to channel 2 to be overwritten, however, the benefit of ensuring that each word is current is greater than the benefit of ensuring that no data is dropped.

When the counter reaches a terminal count of 511 (i.e., each of the memory areas are full) the counter returns to zero and the DMAC 555 interrupts the DSP 508. The DSP 508 updates the DMAC 555 with the block address of the next block of memory to which the next series of words is to be written. Thus, the DSP 508 determines the number of samples that have been acquired. The DSP 508 determines the number of samples to be used in an FFT to be performed by the DSP 508 based upon the number of samples acquired.

Each time the FPGA 504 asserts the bus-request signal, the A/D converter data scaling monitor 554 monitors the word to be written to the RAM 506. The A/D converter data scaling monitor 554 determines the greatest absolute magnitude for all of the words in the block. Each word is in two's complement format, and so the most significant bit determines whether the value is positive or negative (i.e., is the "sign" bit). The word that has the greatest absolute magnitude also has the least number of "guard" bits. Guard bits are those consecutive bits which are adjacent to, and have the same logic level as, the sign bit. These consecutive bits are referred to as guard bits because they guard the data from overflowing registers within the DSP 508 as digital processing functions, such as FFT operations, are performed. The number of guard bits contained in the word having the fewest guard bits is recorded as a scaling indicator associated with the each memory area of each block to be written. The scaling indicator is stored along with each block of data in the RAM 506.

For example, assume that one memory area of length 5 contained the following words: 00001010; 11110101; 00101011; 00011101; 00010101. The word "00101011" has only two guard bits, whereas each of the other words have at least 3 guard bits. Therefore, the scaling indicator for this memory area would indicate a value of 2 guard bits. Thus, indicating to the DSP 508 how to scale the data to guaranty that no registers overflow in the FFT operation.

All communications between the microcontroller 510 and the timing generator circuit 312 are routed through the microcontroller interface 566, the serial link synchronizer 562, and the front end electronics interface 560, within the FPGA 504. The front end electronics interface 560 and the microcontroller interface 566 are standard interface circuits, such as are well known in the art. The serial link synchronizer 562 serves as a buffer between the microcontroller 510 and the front end electronics section 300. The serial link synchronizer 562 receives each instruction in serial form from the micro-controller 510, and synchronizes the instruction for transmission to the timing generator circuit 312 via the line driver/receiver 502 and the line driver/receiver 320, in known fashion. Such communications include instructions to the timing generator circuit 312 to initiate an A/D converter calibration procedure, instruction to the timing generator circuit 312 to initiate a BIT, instruction to change carrier frequency if interference is detected, etc. Such instructions are transmitted from the microcontroller 510 to the FPGA 504.

In the preferred embodiment of the present invention, the FPGA 504 also determines a variety of vehicle conditions, such as the position of the vehicle steering wheel. The FPGA 504 receives data from a dual Hall-effect sensor 552 which sense the location of a magnet on the steering wheel shaft. In the preferred embodiment of the present invention, an up/down counter 564 implemented in the FPGA 504 counts the revolutions (or partial revolutions, for finer position determination) of the steering wheel to determine the position of the steering wheel. That is, each time the steering wheel is turned one full rotation the counter is incremented. As the steering wheel is returned to a position that would direct the vehicle in a straight line, each full rotation causes the counter to decrement back toward zero. Information regarding the position of the steering wheel is communicated directly to the microcontroller 510 from the FPGA 504. The FPGA also has a blind spot sensor interface 567 that digitally conditions those signals, then communicates directly to the microcontroller 510.

4. <u>FFT Computation</u>

When sufficient data is present in the RAM 506, the DSP 508 performs an FFT operation that maps the digital representation of the time-demultiplexed receive signal from the time domain into the frequency domain (i.e., performs a spectral analysis of the signal and determines the frequencies and phase that are present and the relative power at each frequency). Performing FFT operations using digital signal processors, such as the DSP56001 used in the preferred embodiment of the present invention, is well known in the art as is demonstrated in *Implementation of Fast Fourier Transforms on Motorola's DSP56000/DPS56001 and DSP96002 Digital Signal Processors, Guy R. L. Sohie* (published by Motorola Inc., 1991).

Before performing the FFT, the DSP 508 determines the scaling factor to be used (i.e., the number of bits left or right to shift the data) by reading each of the scaling indicators associated with each memory area within each block of data transmitted from the FPGA 504 to the RAM 506. The DSP 508 shifts all the data in each block either to the right or to the left an equal amount, such that the word having the least number of guard bits has exactly two high order guard bits after the shift (scaling) is complete.

For example, if an FFT is to be calculated using 1024 points (i.e., two blocks of data from the RAM 506 including 1024 samples from channel 1 and 1024 samples from channel 2), two scaling indicators are read. Each scaling indicator is associated with two blocks of 512 words, one block associated with each channel. If the scaling factors associated with each memory area of each block indicate values of 1 and 3 respectively, then each word of each block is shifted to the right one bit. This ensures that the word with the least number of guard bits has exactly two guard bits before the FFT calculation is started. Thus, overflow errors are eliminated. In contrast, if the values of the scaling indicators associated with the blocks were 3 and 5 respectively, each word of each of the two blocks is shifted to the left one bit to ensure that each word that had three guard bits in the blocks with a scaling factors of 3 now has exactly two guard bits. Thus, truncation errors are minimized.

This process of scaling the values of each block of words is called a "block floating point operation". The purpose of the block floating point operation is to provide the greatest accuracy in the calculation of the FFT, while ensuring that the results of the calculations do not overflow the registers in which they are stored. Because the DSP of the preferred embodiment of the present invention is not a floating point processor, such block floating point operations are necessary. However, block floating point operations are not necessary in processors which perform true floating point calculations. A digital signal processor which has true floating point capabilities could be used in an alternative embodiment of the present invention.

The FFT overflow monitor 557 performs block floating point scaling monitor operations on data that results from intermediate calculations performed by the DSP 508 during the process of calculating the FFT. These block floating point scaling monitor operations ensure that the intermediate products from the FFT operation do not overflow those registers within the DSP 508 which hold them.

Since the DSP 508 is capable of performing an FFT operation on complex numbers, the FFT operation is linear, and the operation is being performed on data having only real values, both channels of data from the A/D converter 310 are transformed in a single operation. Thus, both channels can be transformed in nearly the same amount of time required to transform only one channel. This procedure in particular, as well as FFT operations in general, are explained in greater detail in *Introduction to Digital Signal Processing*, John G. Proakis and Dimitris G. Manolakij, at pg. 720 et al., which is hereby incorporated by reference.

The DSP 508 circuit used in the preferred embodiment has one register set ("real register set") that is intended to accommodate the real portion of each sample, and a second register set ("imaginary register set") that is intended to accommodate the imaginary portion of each sample. Because the samples from each channel are real, the imaginary portion is zero. Therefore, normally when performing an FFT operation on such real data, the imaginary registers initially would be set to zero. However, instead of loading the samples from channel 1 into the real register and setting the imaginary registers to zero, the real samples from channel 2 are loaded into the imaginary registers. When the FFT is completed, the results can be separated to produce the transform of each of the two sequences by applying the formula: $X_1(k) = [1/2] [X(k) + X^*(N - k)]$, and $X_2(k) = [1/2j] [X(k) - X^*(N - k)]$; where $X(k)$ is the FFT of $x(n)$, $X_1(k)$ is the FFT of the sequence of samples from channel 1, $X_2(k)$ is the FFT of the sequence of samples from channel 2, $X^*(k)$ is the complex conjugate of $X(k)$, and N is the number of samples in each sequence.

Performing the FFT transforms the channel 1 and channel 2 digital data from the time domain to the frequency domain. Therefore, the result of the FFT operation is a list of frequencies and the power associated with each such frequency. The result of the FFT is periodic, having a period that is equal to the sampling frequency. In the preferred embodiment of the present invention, the sampling frequency is 15 kHz. Therefore, the range of frequencies into which the time domain signal is mapped is equal to the sample frequency. When the power at a particular frequency is greater than a selected threshold amount, the DSP 508 determines that a target is present.

By counting the number of frequency peaks at which power is detected to be over the threshold, the DSP 508 determines how many targets are present (i.e., how many targets are moving at different speeds). Targets that are moving at the same speed reflect signals that have the same frequency. Such targets are not distinguishable one from another. In the illustrated embodiment, targets must differ in speed by at least 1/4 MPH (a Doppler shift of 18 Hz at a carrier frequency of 24,125 GHz) to be individually identified. This limitation is fixed by the resolution with which the DSP 508 can discriminate between frequencies. In an alternative embodiment in which the DSP 508 has greater resolution, the ability to distinguish targets is greater.

The DSP 508 also determines the phase relationship of the channel 1 signal to the channel 2 signal. This can be easily determined by applying the formula, *ARCTAN* $[\{(B \times C) - (A \times D)\} / \{(A \times C) + (B \times D)\}] = \phi$(difference in phase), where A = the value of the real portion of the transformed channel 1 signal, B = the value of the imaginary portion of the transformed channel 1 signal, C = the real portion of the transformed channel 2 signal, and D = the value of the imaginary portion of the transformed channel 2 signal. Separate registers within the DSP 508 contain the real and imaginary values for the transformed channel 1 and channel 2 signals, making it a simple matter to implement the above formula to determine the phase relationship between the channel 1 and channel 2 signals at each frequency. Using a greater number of samples provides greater accuracy in determining the phase relationship. Using 4096 samples yields phase information with sufficient resolution to determine the range with an resolution of 0.25 ft.

FIGURE 10 is a graphic representation of the result of a typical FFT operation, wherein the receive signal was reflected off two targets, one of which is moving at a relative speed of 26 MPH with respect to the vehicle on which the system was mounted, the other moving at a relative speed of 52 MPH with respect to the vehicle on which the system was mounted. The hash marks along the X-axis are spaced in increments of (0.1 x f_s) Hertz, where f_s is the sample frequency (in the preferred embodiment of the present invention, f_s = 16 kHz). Power at each frequency is plotted on the Y-axis in decibels. No particular values are attached to each hash mark along the Y-axis, since the power is plotted as a relative value.

A spike 700 along the X-axis represents the target moving at a relative speed of approximately 26 MPH. The relative speed is calculated by: $V = (f_d \times C) / (2 \times f_{rf})$, where V is the relative speed (velocity) of the transmitter with respect to the target, f_d is the Doppler shift frequency, f_{rf} is the carrier frequency, and C is the speed of light (6.696×10^8 MPH). Applying this at a carrier frequency of 24.125 GHz, and f_d = (0.125 x f_s), as determined from the graph of the spike 700, yields a speed of V = 26 MPH. Another smaller spike 702 represents the target moving at a relative speed of 52 MPH computed in the same manner. A broken line 704 is shown at 7.5 kHz. Because the results of the FFT operation are periodic, the results to the left of the broken line 704 are mirrored on the right side of the broken line 704. (The period of the FFT is equal to f_s, however, because the signals are real, the power spectrum is symmetric about $f_s/2$, for $0 < n < f_s$).

FIGURE 11 is a high level flow chart of the method by which the number of digital data words to be included in an FFT calculation is determined in the preferred embodiment of the present invention. Initially, the RAM 506 has no data stored and the FPGA 504 must be initialized by the DSP 508 with the location in the RAM 506 at which to begin to store the digital data sent from the A/D converter 310 to the FPGA 504 (STEP 900). Once the FPGA 504 has been initialized, the DSP 508 counts the number of interrupts that occur to determine how many samples have been stored in the RAM 506 by the FPGA 504. Each interrupt indicates that 512 samples have been stored. Immediately after the FPGA 504 has been initialized it begins collecting data from the A/D converter 310. When the FPGA 504 has stored 512 samples from each channel in the RAM 506, the FPGA 504 generates an interrupt. The DSP 508 keeps an internal counter in a register, and increments the count each time an interrupt is generated by the FPGA 504.

If there have not been at least 8 interrupts (STEP 901), the DSP 508 checks whether there have been at least 4 interrupts (STEP 902). If there have not been at least 4 interrupts, the DSP 508 checks whether there have been at least 2 interrupts (STEP 903). If there have not been at least 2 interrupts, the DSP 508 waits for the next interrupt (STEP 904). When the next interrupt occurs (i.e., 512 samples of each channel have been stored in the RAM 506), the DSP 508 checks once again whether at least 2 interrupts have occurred (i.e., whether at least 1024 samples of each channel have been stored in the RAM 506) (STEP 903). Steps 903 and 904 are repeated until the FPGA 504 has generated at least 2 interrupts.

When the second interrupt is generated, the response to the inquiry of STEP 903 is "yes", and the DSP 508 calculates an initial FFT using the last 1024 samples of each channel stored in the RAM 506 (STEP 909). When the initial FFT is complete, the DSP 508 checks whether at least 4 interrupts have been generated by the FPGA 504 (STEP 902). If less than 4 interrupts have been generated, STEPS 903 and 909 are repeated. When the response to the inquiry at STEP 902 is "yes", the DSP 508 calculates a next FFT using the last 2048 samples of each channel stored in the RAM 506 (STEP 907). Upon completion of the 2048 sample FFT of STEP 907, the DSP 508 checks whether the FPGA 504 has generated at least 8 interrupts

(STEP 901). STEPS 901, 902 and 907 are repeated until at least 8 interrupts have been generated by the FPGA 504.

Once 8 or more interrupts have been generated by the FPGA 504, the DSP 508 calculates each succeeding FFT using the last 4096 samples of each channel stored in the RAM 506 (STEP 905). STEPS 901 and 905 are repeated until either the system is removed from service, or interference is encountered. If interference is encountered, the microcontroller 510 instructs the DSP 508 to change the carrier frequency, flush the samples thus far collected, and begin the process of FIGURE 11 from the start, resetting the counter that counts the number of interrupts generated. Use of the samples previously collected would distort the result due to their contamination by the interference. Thus, this method of calculating the FFT provides the most accurate information regarding the nature of the targets present in the least amount of time possible, since it would require a substantially longer period of time to collect 4096 new samples from each channel.

The DSP 508 is coupled to the microcontroller 510. The microcontroller 510 is coupled to the clock 514, which determines the operational speed of the microcontroller 510. In the preferred embodiment of the present invention, the microcontroller 510 operates at approximately 16 MHz. The microcontroller 510 is also coupled to a local random access memory (RAM) 512, a battery backed RAM/Real-time clock 25, and a Flash Programmable Read Only Memory (PROM) 520. The Flash PROM 520 stores the instructions which the microcontroller 510 executes. The microcontroller 510 uses the local RAM 512 as a utility memory space in which the microcontroller 510 stores previously detected target information and a record of events.

The DSP 508 transmits to the microcontroller 510 four coded 24-bit words associated with each FFT operation. The first word indicates the number of targets present, the second word indicates the number of scaling bits, the third word indicates the magnitude of the low frequency noise floor, and the fourth word indicates the magnitude of the high frequency noise floor. The high and low frequency noise floors are determined by calculating the average of the power levels of each frequency above and below, respectively, a predetermined frequency. Following these four digital data words are sets of additional digital data words associated with each identified target. Each set consists of four digital data words associated with one target. These four words indicate the Doppler frequency of the target, the magnitude of the signal reflected from the target at the channel 1 frequency, the magnitude of the signal reflected from the target at the channel 2 frequency, and the difference between the phase of the channel 1 and channel 2 signals.

In the preferred embodiment of the present invention, the magnitude of the channel 1 and channel 2 reflected signals are transmitted from the DSP 508 to the microcontroller 510 only to aid in determining when the system has failed to properly identify a target. For example, under normal conditions, the magnitude of the channel 1 frequency should be approximately equal to the magnitude of the channel 2 frequency. If the two magnitudes are not approximately equal, it is likely that the target in question was erroneously detected and the data is disregarded.

Likewise, the magnitude of the low frequency noise floor and the magnitude of the high frequency noise floor are used to check the validity of the FFT operation, the presence of RF interference, and the functionality of the microwave portion of the antenna/microwave section 200. Since it is a characteristic of the noise floor spectrum output by an FFT that the low frequency noise floor has a higher apparent power level then the high frequency noise floor, the microcontroller 510 checks to ensure that such is the case. If the low frequency noise floor is not greater than the high frequency noise floor, then an error/interference condition is assumed.

If the microcontroller 510 determines that the noise floor is above a selected threshold value, an assumption is made that there is RF interference with the transmit signal at one or both of the transmit frequencies. In such a case, the microcontroller 510 sends a command to the DSP 508 to flush the data that has thus far been stored and restart the sequence described in the flow chart shown in FIGURE 11, with the exception that the FPGA 504 need not be initialized with the first address in the RAM 506 (STEP 900). In addition, the microcontroller 510 commands the frequency voltage generator 316 to change the level of the voltages applied to the Gunn diode 202, thereby changing the transmit frequency. Further details of this interference detection feature are provided in copending U.S. Patent Application, Serial No. 07/930,760, entitled Interference Avoidance System for Automotive Radar System.

5. Range and Relative Speed

From the information transmitted to the microcontroller 510 from the DSP 508, the microcontroller 510 calculates the range and relative speed of each target. The determination of the relative speed and distance is directly calculated by multiplying the frequency and phase difference by fixed factors, since the phase is linearly proportional to distance to (or range of) the target according to the formula, $R = C (\theta_1 - \theta_2) / (4\pi (f_1 - f_2))$, and frequency is linearly proportional to the relative speed of the target according to the formula, $f_d = 72$ (Hz·hours/mile) x V (miles/hour). In the range formula, R is the range in feet, C is the speed of light in feet/second, f_1 is the frequency of the channel 1 signal, and f_2 is the frequency of the channel 2 signal. In the relative speed formula, f_d is the frequency shift due to the Doppler phenomenon, and V is the relative velocity of the target with respect to the transceiver. However, in alternative embodiments, other means to map the frequency to a relative speed and the phase relationship to range may be used. For example, a table may be used to cross-reference frequency and phase to relative speed and distance, respectively.

If the data is not within selected preset limits it is deemed to be invalid and is disregarded. If the data is within the preset limits, the microcontroller 510 compares the new target range and relative speed with ranges and relative speeds previously recorded. If the range and relative speed of a target is consistent with the range and relative speed of a previously recorded target (i.e., if the difference between the range and speed of a new target and the range and speed of a previously recorded target is within a predetermined amount), the microcontroller 510 updates the range and relative speed previously recorded with the newly received range and relative speed. If the new target does not correspond to an existing target, the range and relative speed are stored and a new target is thus defined. When the microcontroller 510 fails to receive data that closely matches a previously recorded target, the previously recorded target is assumed to have left the environment and the range and relative speed are dropped from the record. Thus, the system identifies and tracks a multiplicity of targets concurrently.

The microcontroller 510 employs a target priority system to determine which one of the multiplicity of targets presents the greatest hazard, assigns a hazard priority, and alerts the driver with the appropriate level of urgency. The system continues to track and reevaluate the hazard priority assigned to each target. If the range and relative speed of an older target fails to be similar to the range and relative speed of newer targets, the system discontinues tracking the old target while continuing to track each of the remaining targets.

A hazard algorithm may be used which is as simple as alerting the vehicle operator that a target is present within a range of 500 ft., as in the illustrated embodiment of present invention. More sophisticated algorithms such as the algorithm taught in U.S. Patent No. 4,916,450 entitled Radar System for Headway Control of a Vehicle, which is hereby incorporated by reference are used in alternative embodiments of the present invention.

6. Hazard Indicators and Displays

In the context of the obstacle detection and collision avoidance system, the digital electronics system 500 is coupled to a display and sensor section 600. The display and sensor section 600 has a display, indicators and/or actuators 4b, for displaying indications to a user and/or controlling various aspects of vehicle operation (for example, flashing a dashboard warning light to a user if a vehicle is approaching too rapidly, and/or, in extreme conditions, automatically activating the vehicle brakes and/or air bag).

The display and sensor section 600 of FIGURE 2 is shown in more detail in FIGURE 12. The display and sensor section 600 includes a monitoring section 601, a warning section 603, and a sensor section 605.

The sensor section 605 includes a multiplicity of sensors, such as a vehicle steering sensor 608, a brake sensor 610, a power monitor sensor 612, a windshield wiper sensor 614, and a speed coil sensor 616 a turn signal sensor 617, and/or a blind spot detector 618. The microcontroller 510 is coupled to each sensor 608, 610, 612, 614, 616, 617, and 618. The sensors provide information which is used to determine whether there is a danger present or to alter the factors used to compute a hazard level. For example, if the microcontroller 510 detects that the windshield wipers of the vehicle have been turned on, thus indicating a rain condition, the preferred following distance from targets may be lengthened to account for longer stopping distances on a wet road.

Additionally, the power output by the transmitter may be increased to compensate for the attenuation caused by rain or snow conditions.

If a danger is present, the microcontroller 510 activates an appropriate visual and/or audio warning. The level of the danger is preferably determined based upon brake lag, brake rate, vehicle speed, closing rate, target distance, and the reaction time of the operator. In the preferred embodiment, an average reaction time is used. However, the microcontroller 510 could request the operator to perform various exercises to establish the particular reaction time of the operator at the time that a trip begins. Alternatively, the vehicle operator's reaction to events that occur throughout a trip may be used to determine the reaction time of the operator.

The warning section 603 includes a control display unit 604, blind spot display unit, and an audio warning unit 606. The control display unit 604 includes warning lights that are illuminated when a danger is present. In the preferred embodiment of the present invention, the color of the lights change from green to yellow to red, respectively, as the level of the danger increases. The audio warning unit 606 includes a sound generator that emits an audible beep or warble if the hazard level exceeds a threshold level.

In the preferred embodiment, the microcontroller 510 monitors a volume potentiometer (not shown) and an advanced warning potentiometer (not shown) within the control display unit 604. The volume potentiometer and the advanced warning potentiometer are controlled directly by the vehicle operator. It should be understood that a wide variety of methods for warning the vehicle operator of danger fall within the scope of the present invention, such as inducing vibration in the steering wheel, pedals or other vehicle controls, such that the vibration increases as the level of the warning increases, and/or activating an audible tone that increases in pitch or volume as the level of the warning increases.

The monitoring section 601 preferably includes an EIA RS-232 port connector 602. The RS-232 port connector 602 provides a port from which target information can be communicated to external devices, and from which diagnostics can be performed on the system. The micro-controller 510 is coupled to RS-232 port connector 602, thereby providing information and system access to external devices coupled to the port connector 602.

Event Recorder Apparatus

FIGURE 13 shows a more detailed block diagram of the ERA of the preferred embodiment of the present invention, showing a RAM card 20 coupled through an interface receptacle 21 to a microcontroller 22 (which may be the microcontroller 510 shown in FIGURES 3 and 8, but can be an independent microcontroller coupled to the microcontroller 510). In the preferred embodiment, the microcontroller 22 includes a real-time clock. The microcontroller 22 is also coupled to a non-volatile memory device 23. "Non-volatile" means that the data stored in the memory device 23 will be retained even if power is interrupted to the device. In the preferred embodiment, the memory device 23 is a "flash" programmable memory device available from a number of suppliers and a battery backed RAM/Real-time clock 25. Such devices are electrically alterable, but retain their data even after power is removed from the device. Alternatively, the memory device 23 may comprise, for example, dynamic RAM with a battery backup and refresh circuitry, static RAM with a battery backup, electrically alterable read-only memory, or other solid-state, non-volatile memory technologies known in the art.

The microcontroller 22 and non-volatile memory device 23 are coupled in known fashion by Address and Data buses, and read/write control lines FLASHCSB, RD, WR, as shown, such that the microcontroller 22 can read data from, and write data to, the non-volatile memory device 23. The memory device 23 is preferably used to store programs to be executed by the microcontroller 22 for control of all, or various aspects, of the components shown in FIGURE 3.

In the preferred embodiment, the interface between the RAM card receptacle 21 and the microcontroller 22 is kept as simple as possible. Preferably, a standard 3-wire (not including power and ground) serial interface bus is used, which has a clock line CLK for the data transfer clock, a DQ line bidirectional data line, and an $\overline{\mathrm{RST}}$ line to enable/disable the RAM card 20. The 3-wire bus is coupled to the microcontroller 22 as shown.

An advantage of the simple 3-wire serial interface bus preferred for use with the present invention is that it is well known, simple to implement, and requires a minimum amount of interface connection between the RAM card 20 and the microcontroller 22. However, other interfaces could be used, such as the more complete RS232 serial interface standard. As another alternative, the RAM card receptacle 21 could be an adapter compatible with the Personal Computer Memory Card International Association (PCMCIA) interface. As yet another alternative, a fiber optic connection could be used, which would give the system greater immunity from electromagnetic interference.

The RAM card 20 comprises one or more non-volatile memory devices and appropriate control and interface circuitry. The RAM card 20 may comprise, for example, dynamic RAM with a battery backup and refresh circuitry, static RAM with a battery backup, flash memory devices, electrically alterable read-only memory, or other solid-state, non-volatile memory technologies known in the art. The data storage capacity of the RAM card 20 is a matter of design choice and available integrated circuit chip capacity and size. In the illustrated embodiment, the capacity of the RAM card 20 is at least 32 kBytes.

The RAM card 20 may be custom designed, or may be a commercial product. In the preferred embodiment of the present invention, the RAM card 20 comprises a model DS6417 "CyberCard" from Dallas Semiconductor, Inc.

In the preferred embodiment, the microcontroller 22 begins a data transfer to the RAM card 20 by sending a 56-bit protocol word to the RAM card 20. Referring to FIGURES 14 and 15, all data transfers to and from the RAM card 20 are initiated by setting the $\overline{RST}$ input to a logical "1". Each data transfer is terminated by resetting the $\overline{RST}$ signal to a logical "0". In the preferred embodiment, the protocol word includes a command byte, 2 bytes for the starting address where data storage or retrieval will begin, and a cyclic redundancy check (CRC) byte or word that ensures all bits have been transmitted correctly.

After the desired operation (e.g., Read or Write) is specified by the 56-protocol word, a first byte is read from or written to the designated address a bit at a time. The address is then automatically incremented to the next location, and a next byte is read or written. As desired, the microcontroller 22 can write any data from the non-volatile memory device 23 to the RAM card 20, or vice versa.

Referring to FIGURE 14, for a Write cycle to the RAM card 20, the data input bits and the command word bits on the DQ line must be valid during the rising edge of the clock signal CLK. Referring to FIGURE 15, for a Read cycle from the RAM card 20, data bits read out of the RAM card 20 must be valid during the falling edge of the clock signal CLK. When data transfers are terminated by the reset of the $\overline{RST}$ signal, the transition of the $\overline{RST}$ signal from a logical "1" to a logical "0" must occur during a logical "1" state of the clock signal CLK. This simple protocol ensures a generally error-free transfer of data to and from the RAM card 20.

FIGURE 16 is a more detailed block diagram of the RAM card 20 in accordance with the present invention. A serial port buffer 51 serves as the electrical interface to the preferred 3-wire serial bus shown in FIGURE 13. The serial port buffer 51 is coupled to a serial-to-parallel byte-wide converter 52, which converts serial data to and from byte-wide parallel data. The converter 52 responds to the clock signal CLK and $\overline{\text{RST}}$ input to accept data from or transmit data to the data line DQ. The converter 52 also controls a non-volatile memory 54 through the use of a data/control buffer 53, as provided by the manufacturer.

In the illustrated embodiment, the memory 54 is a static RAM with sustaining power supplied by a battery 55, permitting the RAM card 20 to be removed from the RAM card receptacle 21. The battery backup also protects against data loss if the power from the RAM card receptacle 21 is interrupted due to system failure or an accident.

If fixed-size data blocks are used, data stored in the memory 54 is delimited by an implicit block size. If variable-size data blocks are used, the data preferably contain internal record and field length counts and/or unique delimiters, so that the blocks can be read back in a meaningful manner. Such variable-size record structures are well-known in the art. However, for simplicity of implementation, the preferred embodiment of the invention uses fixed-size data blocks.

In operation, a RAM card 20 would be inserted into the RAM card receptacle 21. In the preferred embodiment, selected data would be gathered from the vehicle sensors 4a and/or the digital electronics section 500 by the microcontroller 22, typically after the vehicle is started. The data is stored into the RAM card 20 by the microcontroller 22 at periodic intervals, which may be determined by time and/or by distance traveled. The microcontroller 22 may also do some computation on the data, such as determining a miles-per-gallon value or average speed, to derive processed data for storage in the RAM card 20.

In general, data blocks would be stored in the RAM card 20 beginning at the first location in the memory 54. The address is incremented to point to successive storage locations for storing subsequent data blocks.

Different modes of operation can be used. In a first mode, selected data is stored approximately every 0.5 seconds, until the memory 54 on the RAM card 20 is full (which, in the illustrated embodiment, takes about 15 minutes). Thereafter, the address sent to the RAM card 20 by the microcontroller 22 is reset to the first address used, causing the oldest data in the memory 54 to be overwritten with new data (i.e., the memory 54 is operated as a circular queue). This provides a "moving window" of the last 15 minutes of operation (or longer, if longer intervals or a larger capacity memory 54 are used). Recording can be stopped when external power to the RAM card 20 is turned off (for example, when the vehicle is turned off voluntarily or because of an accident), or when the vehicle is not moving. If desired, a delayed turn-off time can be used to continue recording for some period of time after external power is removed, to record, for example, such things as the engine coolant temperature as a measure of residual heat in the engine.

In a second mode of operation, the memory 54 is divided, in a static or dynamic fashion, into multiple logical "pages" for storing independent sets of data. A "current" page may be used to record a moving window of, for example, selected data from the last 5 or 10 minutes of operation, as described above for the first mode of operation. One or more additional pages can be used to record, for example, selected data (which need not be the same items of data stored in the current page) for fixed or variable time periods for later analysis. Such data may include, for example, information related to vehicle maintenance. In such a case, when a page fills up, writing stops, in order to preserve an archival record of the selected data. A page would be "reset" after a readout of the data or upon execution of a specific command, permitting new data to be written to the page.

In one variation of the second mode of operation, a first page may be used to record a moving window of selected data. If an accident occurs, the first page of data is "frozen", and a next page is used for subsequent recording. An accident condition may be detected automatically, or indicated by activation of a manual switch. In this manner, data can be captured for later analysis of the accident.

In another variation of the second mode of operation, recording to a page other than the current page may be triggered by an unusual event, such as a vehicle operational or performance value exceeding a preset threshold value, or an accident. For instance, it may be desirable to record drive train sensor values only if one or more values, such as engine temperature, exceed a threshold value. As another example, such recording may be triggered by an unusual condition that may indicate an accident, such as a sudden acceleration or deceleration, sudden application of the brakes, activation of an air bag, etc. Recording can also be triggered manually. Recording such information on a separate page in memory, and only upon being triggered by a particular event, permits capturing data for later analysis of vehicle and/or driver performance.

In a third mode of operation, the recording rate may be increased upon the occurrence of an unusual condition, such as a sudden acceleration or deceleration, sudden application of the brakes, activation of an air bag, etc., in order to store more data values surrounding the event, for later analysis.

One skilled in the art would recognize that variations and combinations of these modes of operation could be implemented with the present invention as a matter of design choice.

The selected data may be any of the values mentioned above, or similar values. Further, not all of the values selected need be recorded at the same rate. For example, information that can change rapidly, such as the status of the brake system, vehicle speed, turning conditions, and other information useful for accident reconstruction purposes, may be recorded very frequently (e.g., every 0.2 seconds). Information that changes more slowly, or is less pertinent to accident reconstruction, such as engine temperature, coolant temperature, etc., may be recorded less frequently (e.g., every 5 seconds, or every mile).

In accordance with one means to read out the data collected in the RAM card 20, the RAM card 20 is removed from the interface receptacle on the automotive system and inserted in a similar interface coupled to a personal computer. The data can then be displayed on the computer or stored on a different memory device, such as a floppy disk or a hard drive in the computer.

FIGURE 17 is a block diagram of an interface between the RAM card 20 and a personal computer (PC) 60. An interface receptacle 21, identical to the interface receptacle 21 in the vehicle system, is coupled to a bi-directional connector 61 that is connected to a parallel port of the PC 60. The signal lines between the PC 60 and the RAM card 20 are preferably the standard 3-wire serial bus described above. The bidirectional connector 61 may also provide a parallel interface signal pass-through so that a standard parallel interface device, such as a printer (not shown), may still be coupled to the PC 60 through the parallel port. Such pass-through type connectors are well-known in the art.

When a RAM card 20 is removed from a vehicle system, the card is inserted into the interface receptacle 21 for data retrieval by the PC 60. Data is then read out of the RAM card 20 under control of the microcomputer of the PC, using the same process described above with respect to the microcontroller 22. That is, data is transmitted serially through the bidirectional connector 61, through the parallel port and to the microcontroller. The microcontroller converts the serial data to parallel form under software control, in known fashion.

Once data has been retrieved from the RAM card 20, it can be displayed on the PC in a variety of ways, such as in various tabular forms, depending on whether the information represents accident reconstruction information, trip monitoring information, maintenance information, or other information. The manner of presentation of the data is a matter of design choice.

Since the RAM card 20 is removable and relatively inexpensive, each driver of a particular vehicle, such as a fleet car or bus, could be given a personalized RAM card 20. Thus, the ERA invention can be used to monitor the performance of particular drivers, including characteristics such as average driving speed, braking and acceleration habits, typical "headway" distance (i.e., the distance from the vehicle immediately in front in the same lane, as determined by the radar system), etc.

As another aspect of the invention, the ERA can be used to provide an authorization function that prohibits unauthorized personnel from driving a vehicle. Since each driver can be given a personalized RAM card 20, each RAM card 20 can be "keyed" with an electronic "signature" to work only with a particular vehicle. Anyone without a RAM card 20 "keyed" to a vehicle could not drive the vehicle. The "keying" signature may be as simple or as sophisticated as desired, and may be, for instance, a numeric code stored in the first address of the memory 54 of the RAM card 20. A matching code would be stored in the non-volatile memory device 23. The microcontroller 22 would read the pre-stored code in the RAM card 20 and compare the code with the corresponding code read from the non-volatile memory device 23. If no match occurred, the vehicle would not be enabled to operate. In addition, each RAM card 20 may have an "expiration" date coded therein, such that the vehicle would not be enabled to operate if the card had expired.

As still another aspect of the invention, the ERA can be used to load upgraded or updated computer programs (software) into the vehicle system. In this mode of operation, new software is loaded into a RAM card 20 through, for example, a PC 60, before insertion of the RAM card 20 into a vehicle system. The microcontroller 22 in the vehicle system reads the new program data out of the RAM card 20, converts it from serial to parallel form, and stores it in the non-volatile memory device 23 coupled to the microcontroller 22. The uploaded software may be for an automotive electronic control system or an automotive radar system, or both. This feature circumvents the time consuming and cumbersome task of removing the control system from the vehicle to load a software upgrade.

This aspect of the invention can also be used to "customize" or "personalize" the operational characteristics of a vehicle to a driver's preferences. For example, each driver of a fleet vehicle or bus can use the RAM card 20 to upload into the vehicle the driver's preferences relating to desired headway distance, warning thresholds, or any other parameter that can be set through a vehicle's electronic control system.

Further, as automotive technology progresses, the subsystems in a vehicle likely will communicate via a vehicle-wide system serial data bus. The ERA is able to accommodate this technological advance since the invention can be coupled to a serial system bus without major modification. This would allow the invention to record information from other subsystems on the serial bus for accident reconstruction, trip monitoring, or other tasks. The microcontroller 22 would be coupled to the system serial bus, and could either monitor activity on the bus and store relevant information it encounters, or take an active role on the bus by requesting relevant information from other subsystems and then storing such information.

As yet another aspect of the invention, a second ERA 5 could be mounted in a vehicle. A first ERA 5 system can be used to record information pertinent to the vehicle regardless of the identity of the driver (e.g., vehicle maintenance information), while a second ERA 5 system can be used to record information pertinent to each driver on the driver's personal RAM card 20. If desired, the first ERA 5 system may be non-removable, in which case the RAM card 20 and interface receptacle 21 can be replaced with a non-volatile RAM circuit directly coupled to the microcontroller 22.

Thus, the present invention records data until an event, such as an accident, stops the recording. In the preferred embodiment, the RAM card 20 can then be removed and the events leading up to the event read back using a standard personal computer with a matching interface. The invention is thus extremely useful for accident reconstruction as well as more standard vehicle performance, operational status, and/or environment data. In addition, the invention is configurable for a driver's particular preferences, and optionally provides an authorization function that prohibits unauthorized personnel from driving a vehicle, and provides a convenient means for upgrading system-wide software for an automotive electronic control system or an automotive radar system. The RAM card 20 also uses rugged and durable technology that is suitable for integration into an automotive system.

7. <u>Driver Fitness Determination</u>

In the preferred embodiment of the present invention, the information recorded in the ERA is accessed by the microcontroller 510 and applied to a fitness algorithm which (1) generates a personalized performance standard for a driver associated with the ERA, and (2) compares the driver's performance over a recent and relatively short period of time to the personalized performance standard.

A flow chart of the fitness algorithm is shown in FIGURE 18.

In accordance with the preferred embodiment of the present invention, the driving environment is classified by determining whether the vehicle is (1) stopped, (2) in an urban environment, (3) in a suburban environment, or (4) on an open highway (STEP 1801). In the present example, environment classification is determined using speed. Thus, if the speed is 0 mph, then the vehicle is determined to be stopped. An urban environment is determined if the speed is within the range of 0-35 mph. A suburban environment is determined if the vehicle speed is in the range of 35-45 mph. Finally, a highway environment is determined if the speed exceeds 45 mph.

In addition to classifying the environment, certain time factors are classified (STEP 1802). The time factors include time of day (morning nadir, afternoon nadir, or other), trip length, and duty day as determined by length. The fitness algorithm classifies time factors, inasmuch as accidents are more likely to occur during the early morning, pre-dawn hours, and during the mid-afternoon hours. In particular, when the end of a long trip or a long duty period occurs in conjunction with such time periods, the risk of an accident rises.

Certain profiles are then generated (STEP 1803). These profiles include characterizations of the history of the throttle, speed, headway (closure, distance, and phase as determined by margin), steering, headlights, windshield wipers, and/or turn signal use. The throttle profile is determined in accordance with mean value and variability thereof, as is the speed profile. The headway profile includes: (1) the rate at which the vehicle approaches obstacles, including other vehicles (i.e., closure); (2) the vehicle speed; (3) how smoothly the vehicle accelerates, decelerates, and closes on obstacles (i.e., jerk); (4) the distance between the vehicle equipped with the present invention and other vehicles, determined in terms of mean value and variability; (5) "phase margin" (i.e., a measure of the vehicle operator's reserve capacity to respond safely to particular conditions that might arise); and (6) headlights and windshield wipers are monitored since they are indications of poor visibility and road conditions. The steering profile is generated by monitoring the median frequency shifts, in other words, the variations in lane position. The frequency and amplitude of steering changes, correlated to the vehicle speed, provide a simplistic means for determining lane position. Lane position is an important profile in determining driver fitness. The steering profile is generated by monitoring median frequency shifts. Other more sophisticated methods are used in alternative embodiments of the present invention. For example, the relative position and motion of other vehicles detected by the radar system may be used. The turn signal profile is generated by monitoring turn signal use.

The various profiles set forth in the STEP 1803 are used in conjunction with the various driving environments of the STEP 1801, as shown in the table of FIGURE 19. Thus, preferably, when a vehicle equipped with the present invention is stopped, the present invention assesses the throttle position, the number of times the driver blinks his eyes, and duration of each such blink. In one embodiment of the present invention, the turn signals and the secondary tasks are not included in the assessment when the vehicle is not moving. However, in an alternative embodiment of the present invention the turn signals are included when the vehicle is stopped. The speed, rate of closure, distance, phase margin and steering are not applicable when the vehicle is stopped. At the other extreme, when the vehicle is determined to be in a highway environment, all of the profiles listed in the table of FIGURE 19 are applicable and are utilized. The urban and suburban environments utilize selected ones of the profiles to the exclusion of others, as shown in the table.

If the vehicle is determined to be in a highway environment, secondary task performance is assessed (STEP 1804). Lapses in response, such as a substantial increases in reaction time, are considered by the present invention to indicate drowsiness on the part of the driver.

In accordance with the preferred embodiment of the present invention, the eye blink duration of the vehicle driver is assessed (STEP 1805). This is accomplished by covert digitized video scanning for eye blinks longer than 200 msec. in duration. This assessment is used in all of the driving environments. Long duration eye blinks are interpreted as indicating a state of drowsiness on the part of the driver.

The results of the steps 1803, 1804 and 1805 are compared to a recent history for the driver using statistical criteria (STEP 1806). For example, in one embodiment of the present invention, a performance distribution curve is generated which indicates the level of a driver's performance at any one time with relation to his performance at each other time recorded. The driver's recent driving history is used to generate short term profiles and to evaluate current secondary task performance. Driver patterns that show a driver's recent performance to be at the less desirable ends of that particular driver's performance distribution curve indicate a need for caution.

In STEP 1807, the recent history of the driver is updated. This updating is accomplished using new data derived from the earlier steps of FIGURE 18.

One or more of the possible consequences of the data evaluation, particularly in the comparison of step 1806, are then selected (STEP 1808). In the step 1806, as previously noted, the data from the steps 1803, 1804, and 1805 is compared to the recent driver history using statistical criteria. The possible consequences, as determined in the step 1808, include alerting the driver, a dispatcher, shutting down or limiting the operation of the vehicle, and event recording. Upon determining that the driver is operating below the personalized standard associated with that driver, the microcontroller of the illustrated embodiment of the present invention indicates that determination to the driver. Having been alerted to the fact that the driver's performance is below the calculated standard, the driver has a predetermined amount of time to raise the level of performance to the level of the calculated standard. In the illustrated embodiment of the present invention, if the driver is not performing at the required level at the end of the predetermined period, the microcontroller broadcasts a message to a dispatcher or controller at a remote site who is responsible for ensuring the safety of the driver and vehicle. If the driver's performance does not improve a required amount within a predetermined amount of time after the message is broadcast, a warning is presented to the driver indicating that a shut-down of the vehicle is imminent after a predetermined time. In one embodiment of the present invention, the amount of time until the shut-down will occur is displayed to the driver. Additionally, both strong visual and audio warnings are given to the driver to ensure that the driver is aware of the impending shut-down. The shut-down can be implemented as a gradually increasing inability to maintain speed, thus allowing the driver to find a safe location to park the vehicle. In one embodiment of the present invention, a remote shut-down disable is provided which permits the dispatcher, or controller, responsible for the safety of the driver and vehicle to override the shut-down for limited periods to afford the driver additional time to find an appropriate place to park the vehicle. Each action taken in accordance with the fitness algorithm is recorded on the ERA 5, along with the continuing stream of information from the sensors 4a and the radar system.

As another example, in order to enforce mandatory rest stops, a RAM card 20 and microcontroller 22 combination could be programmed to disable the vehicle for a fixed period of time after a stop, or until an authorization code was provided by a dispatcher (such a code could be provided to the microcontroller 22 by means of a 10-key keypad, for example).

Although the preferred embodiment of the invention is illustrated as being used in conjunction with an automotive radar system, it should be understood that the invention can be used in conjunction with any microcontroller-based or microcomputer-based automotive electronic system that gathers data about various vehicle performance and environment factors and can control the loading of such information into a memory device.

A number of embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. For example, the number of sensors that are used to collect information regarding the vehicle, driver, and environmental conditions may be far less than those that have been cited herein. Also, the invention is not limited to only those sensors that have been listed herein. Furthermore, the number and type of responses to a driver's failure to meet the personal standard established for that driver are not limited to those cited herein. Nor are the particular responses cited herein required as a part of the present invention. Therefore, a system in which the ERA merely recorded the fact that the driver's performance was below the standard set for that driver would be within the scope of the present invention. Furthermore, the standard may be determined by a method other than the method recited herein. For example, a system in which a standard that applies equally to all drivers would be within the scope of the present invention. Still further, any method for recording the events and conditions could be used in the present invention. Thus, the ERA described herein is provided as an example and need not be present in the form described. Also, no radar system is required in the present invention, but is disclosed as an example of a means for collecting information regarding the environment in which the vehicle and driver are operating. Accordingly, it is to be understood that the invention is not to be limited by the specific illustrated embodiment, but only by the scope of the appended claims.

CLAIMS

1. A system for evaluating fitness of a vehicle driver to operate a vehicle, including:
   (a) a collision warning apparatus for determining the operational state of the vehicle and the driver;
   (b) an operational event recorder apparatus for recording the operational state of the vehicle and the driver;
   (c) a driver fitness evaluation apparatus for providing a real-time evaluation of the driver's fitness to operate the vehicle.
2. The system of claim 1, wherein the operational state of the vehicle is determined by monitoring:
   (a) speed;
   (b) headlights;
   (c) windshield wipers;
   (d) time of day;
   (e) vehicle controls;
   (f) headway; and
   (g) turn signals.
3. The system of claim 2, wherein the vehicle controls include:
   (a) steering wheel;
   (b) brake; and
   (c) accelerator.
4. The system of claim 1, wherein the driver fitness evaluation means alerts the driver when the driver is determined to be unfit to operate the vehicle.
5. The system of claim 1, wherein the driver fitness evaluation means alerts a person at a location remote to the vehicle and driver when the driver is determined to be unfit to operate the vehicle.
6. The system of claim 1, wherein the driver fitness evaluation apparatus prevents the vehicle from operating when the driver is determined to be unfit to operate the vehicle.

7. The system of claim 1, wherein;
   (a) the driver fitness evaluation apparatus classifies the fitness of the driver in one of four classes;
   (b) if the driver is classified in the first class, no consequence results;
   (c) if the driver is classified in the second class, the driver is alerted;
   (d) if the driver is classified in the third class, a person at a location remote to the vehicle and driver is alerted; and
   (e) if the driver is classifed in the fourth class, the driver fitness apparatus causes the vehicle to cease operating.

AMENDED CLAIMS

[received by the International Bureau on 25 January 1995 (25.01.95); original claims 1, 2, 4 and 5 amended; remaining claims unchanged (2 pages)]

1. A system for evaluating fitness of a vehicle driver to operate a vehicle, including:
   (a) a collision warning apparatus for collecting data relevant to determining the operational state of the vehicle and the driver;
   (b) an operational event recorder apparatus coupled to the collision warning apparatus for recording the collected relevant data and recording a driver profile;
   (c) a driver fitness evaluation apparatus coupled to the operational event recorder and the collision warning apparatus for generating the driver profile, and providing a real-time evaluation of the driver's fitness to operate the vehicle by comparing the recorded driver profile with the driver's current performance as indicated by the recorded relevant data.
2. The system of claim 1, wherein the operational state of the vehicle is determined by monitoring:
   (a) speed;
   (b) headlight use and status;
   (c) windshield wipers use and status;
   (d) time of day;
   (e) use and status of vehicle controls;
   (f) headway; and
   (g) turn signals use and status.
3. The system of claim 2, wherein the vehicle controls include:
   (a) steering wheel;
   (b) brake; and
   (c) accelerator.

4. The system of claim 1, wherein the driver fitness evaluation apparatus alerts the driver when the driver is determined to be unfit to operate the vehicle.
5. The system of claim 1, wherein the driver fitness evaluation apparatus alerts a person at a location remote to the vehicle and driver when the driver is determined to be unfit to operate the vehicle.
6. The system of claim 1, wherein the driver fitness evaluation apparatus prevents the vehicle from operating when the driver is determined to be unfit to operate the vehicle.
7. The system of claim 1, wherein;
   (a) the driver fitness evaluation apparatus classifies the fitness of the driver in one of four classes;
   (b) if the driver is classified in the first class, no consequence results;
   (c) if the driver is classified in the second class, the driver is alerted;
   (d) if the driver is classified in the third class, a person at a location remote to the vehicle and driver is alerted; and
   (e) if the driver is classified in the fourth class, the driver fitness apparatus causes the vehicle to cease operating.

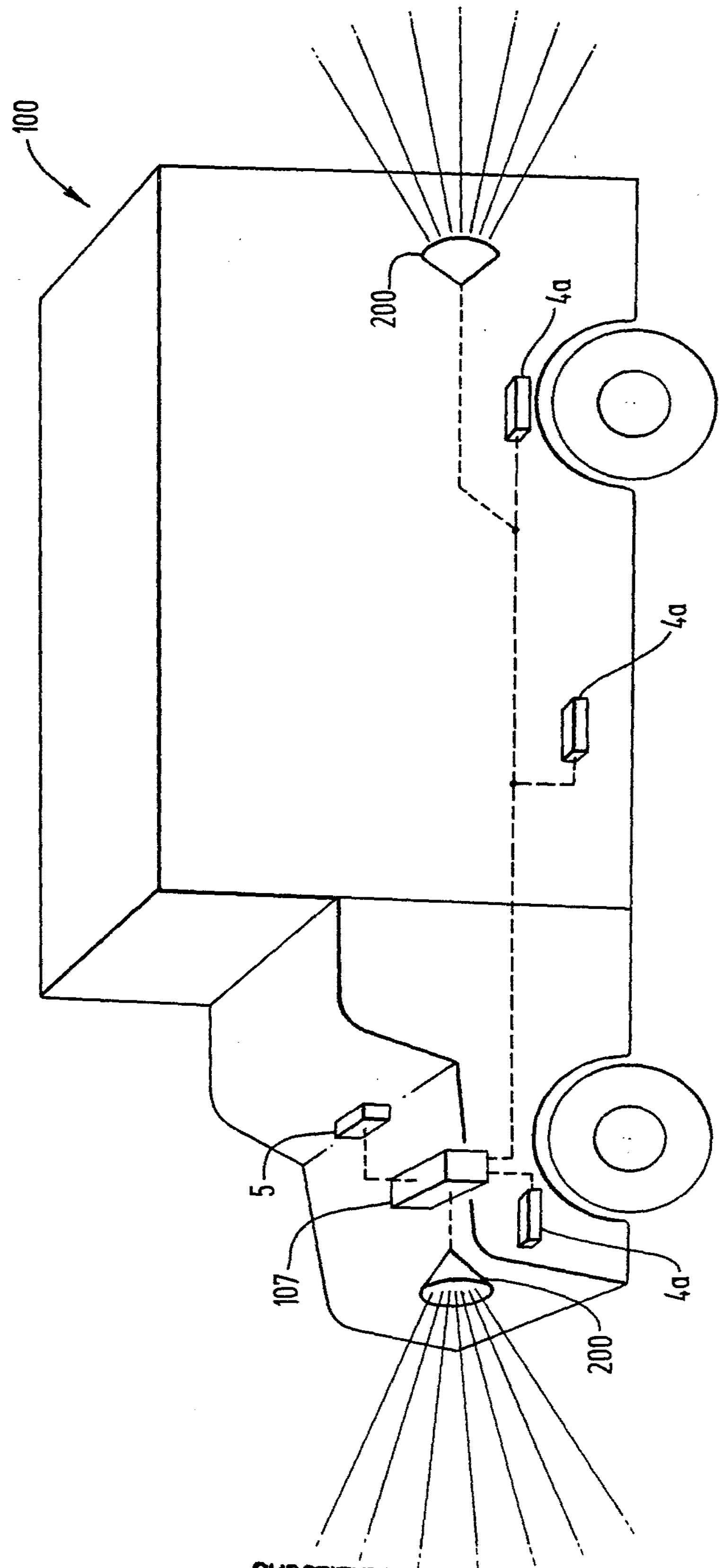


FIG. 1

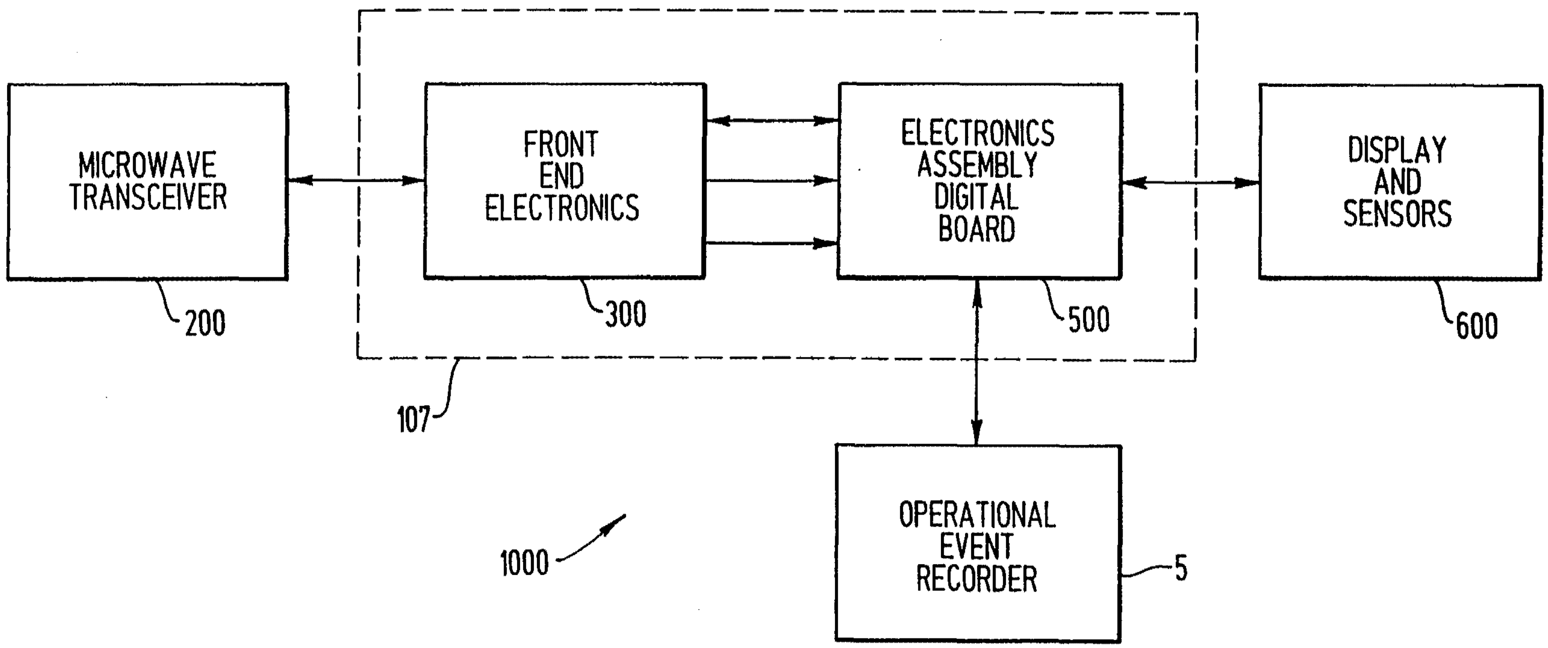

MICROWAVE TRANSCEIVER
200
FRONT END ELECTRONICS
300
ELECTRONICS ASSEMBLY DIGITAL BOARD
500
DISPLAY AND SENSORS
600
107
OPERATIONAL EVENT RECORDER
5
1000

FIG. 2

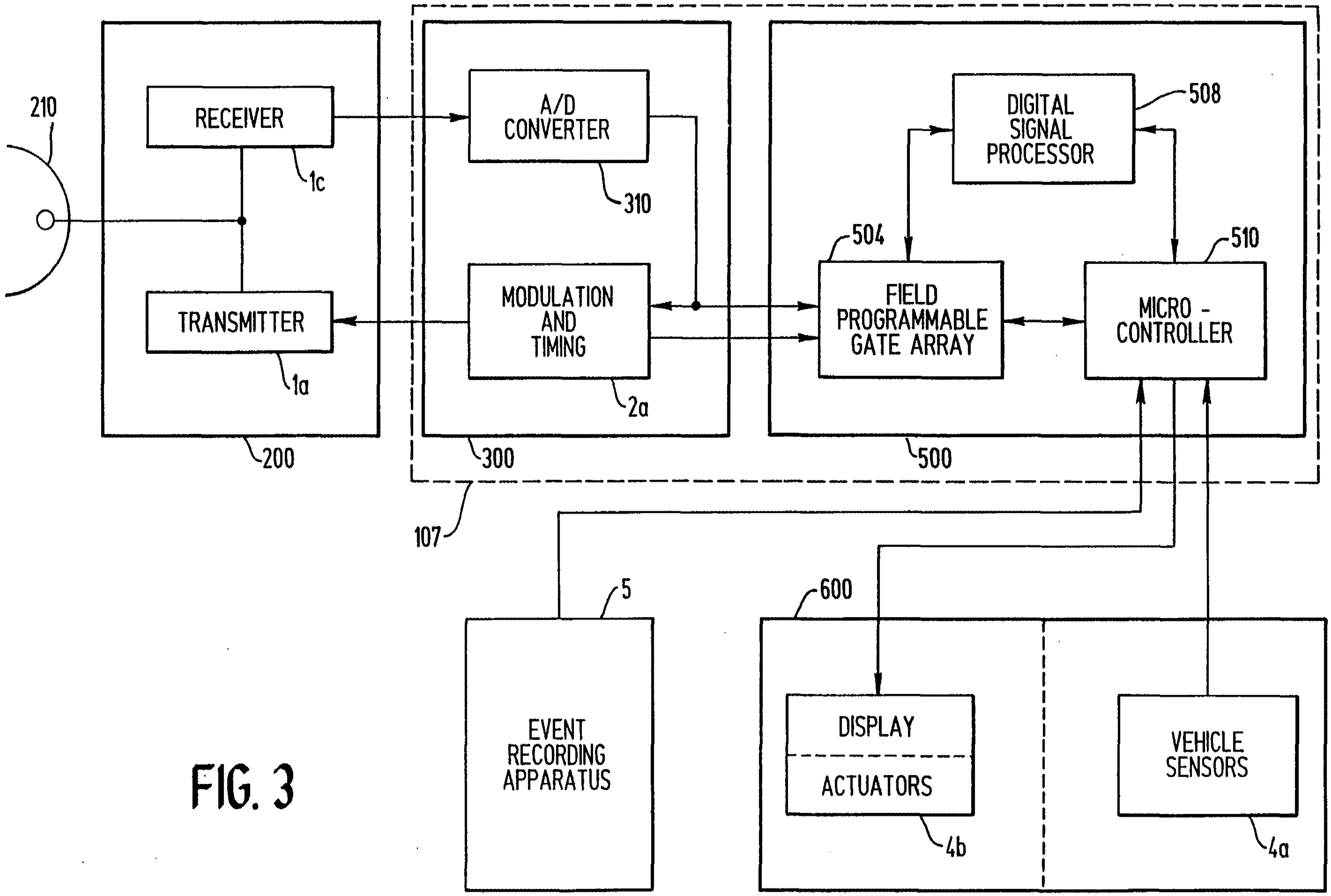

210
RECEIVER
1c
TRANSMITTER
1a
200
A/D CONVERTER
310
MODULATION AND TIMING
2a
300
DIGITAL SIGNAL PROCESSOR
508
504
FIELD PROGRAMMABLE GATE ARRAY
510
MICRO - CONTROLLER
500
107
5
EVENT RECORDING APPARATUS
600
DISPLAY
ACTUATORS
4b
VEHICLE SENSORS
4a

FIG. 3

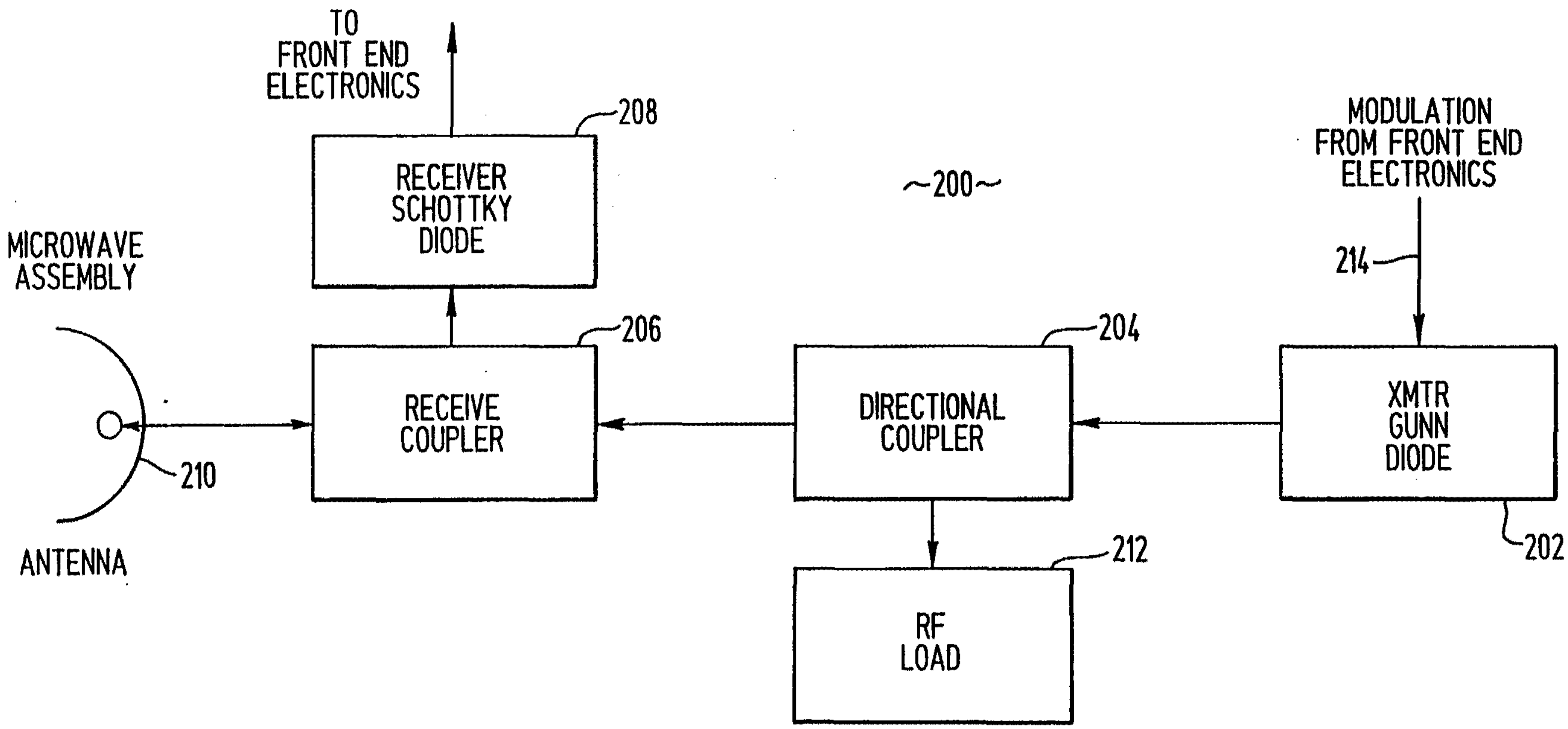

TO
FRONT END
ELECTRONICS
208
RECEIVER
SCHOTTKY
DIODE
~200~
MODULATION
FROM FRONT END
ELECTRONICS
214
MICROWAVE
ASSEMBLY
206
204
RECEIVE
COUPLER
DIRECTIONAL
COUPLER
XMTR
GUNN
DIODE
210
202
212
ANTENNA
RF
LOAD

FIG. 4

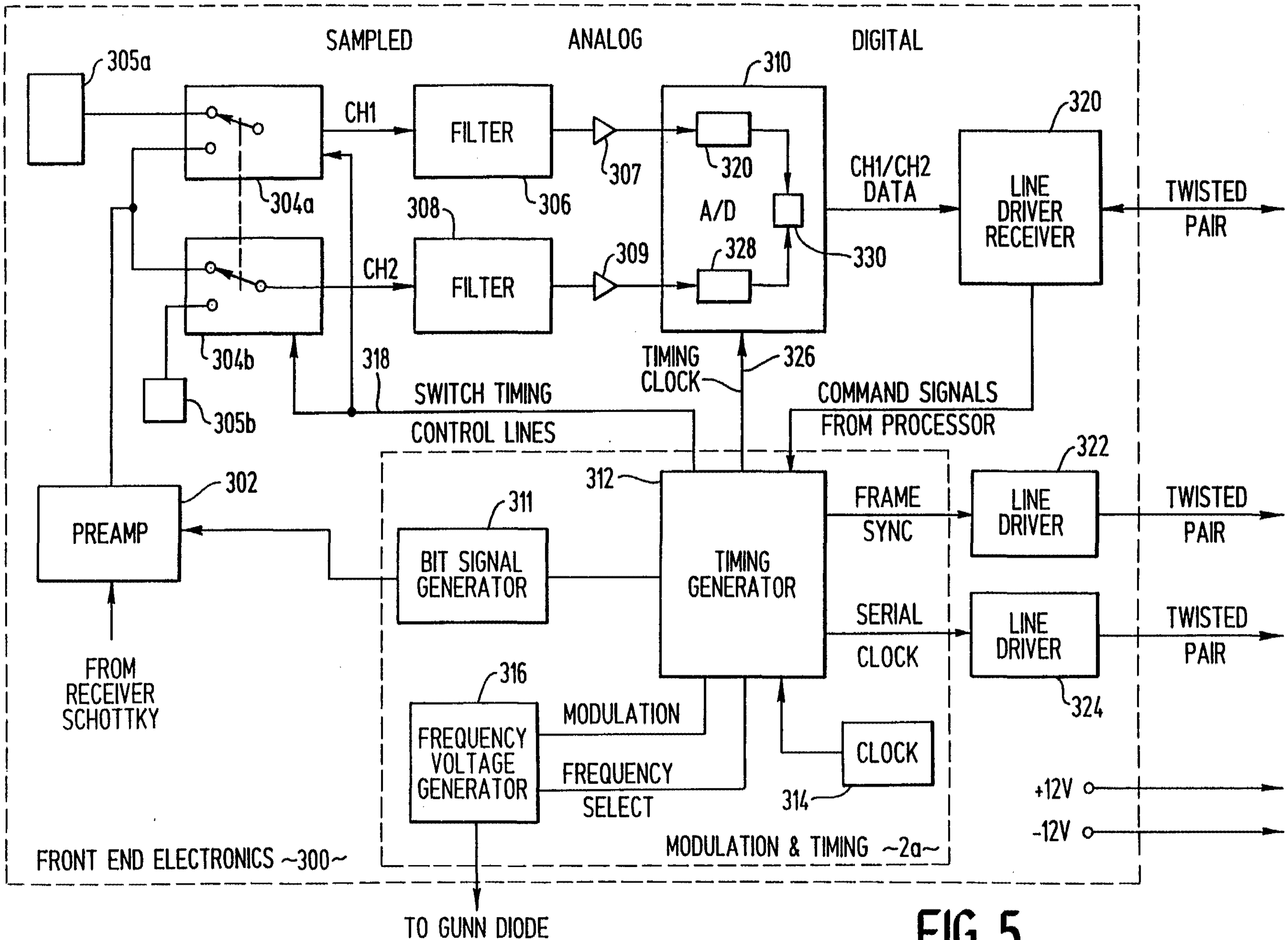

SAMPLED
ANALOG
DIGITAL
305a
310
320
CH1
FILTER
307
320
CH1/CH2
DATA
LINE
DRIVER
RECEIVER
TWISTED
PAIR
304a
308
306
A/D
330
309
328
CH2
FILTER
304b
318
TIMING
CLOCK
326
SWITCH TIMING
CONTROL LINES
COMMAND SIGNALS
FROM PROCESSOR
305b
322
312
302
311
PREAMP
BIT SIGNAL
GENERATOR
TIMING
GENERATOR
FRAME
SYNC
LINE
DRIVER
TWISTED
PAIR
SERIAL
CLOCK
LINE
DRIVER
TWISTED
PAIR
324
FROM
RECEIVER
SCHOTTKY
316
FREQUENCY
VOLTAGE
GENERATOR
MODULATION
FREQUENCY
SELECT
CLOCK
314
+12V
-12V
FRONT END ELECTRONICS ~300~
MODULATION & TIMING ~2a~
TO GUNN DIODE

FIG. 5

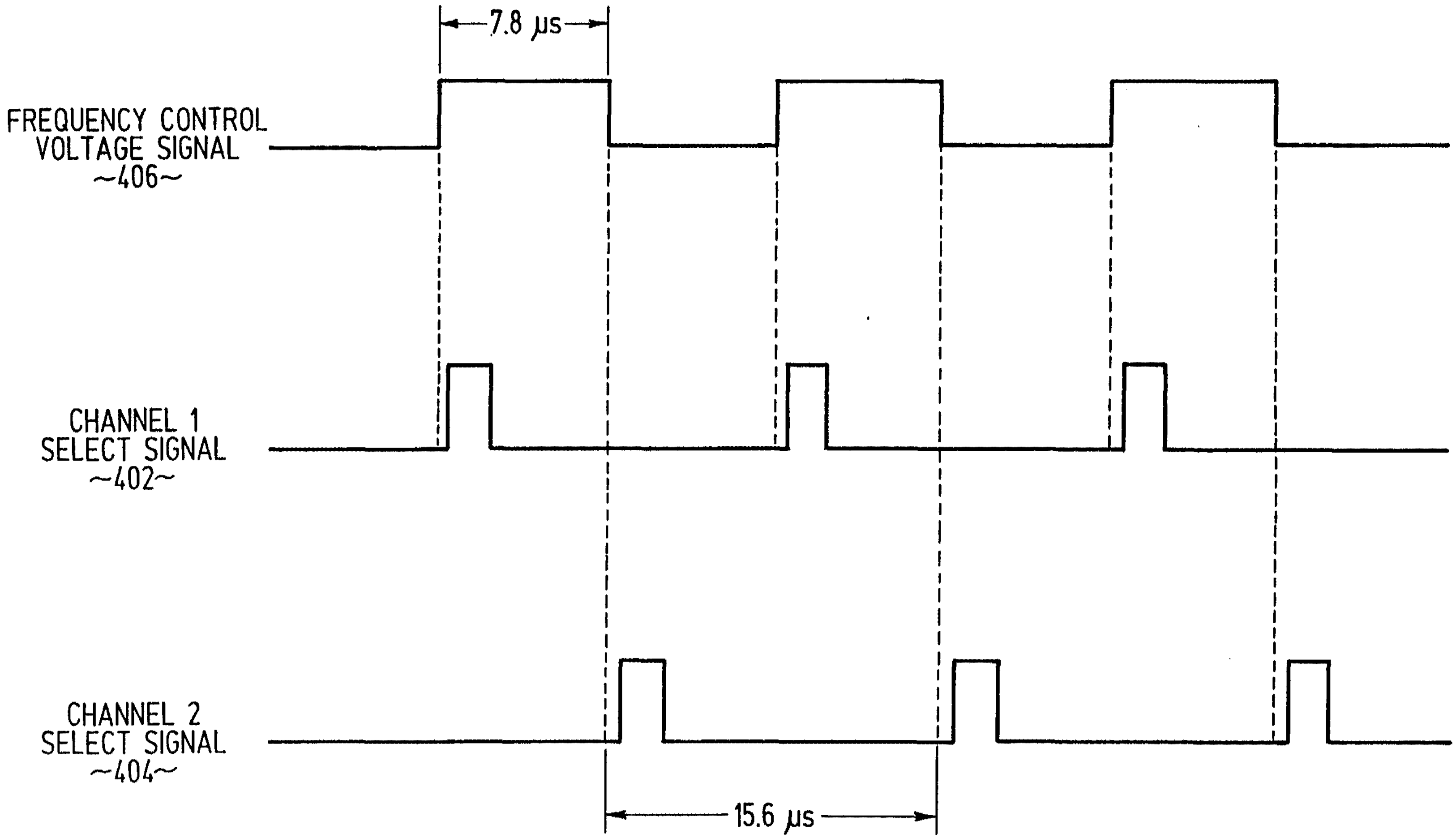

7.8 μs
FREQUENCY CONTROL
VOLTAGE SIGNAL
~406~
CHANNEL 1
SELECT SIGNAL
~402~
CHANNEL 2
SELECT SIGNAL
~404~
15.6 μs

FIG. 6

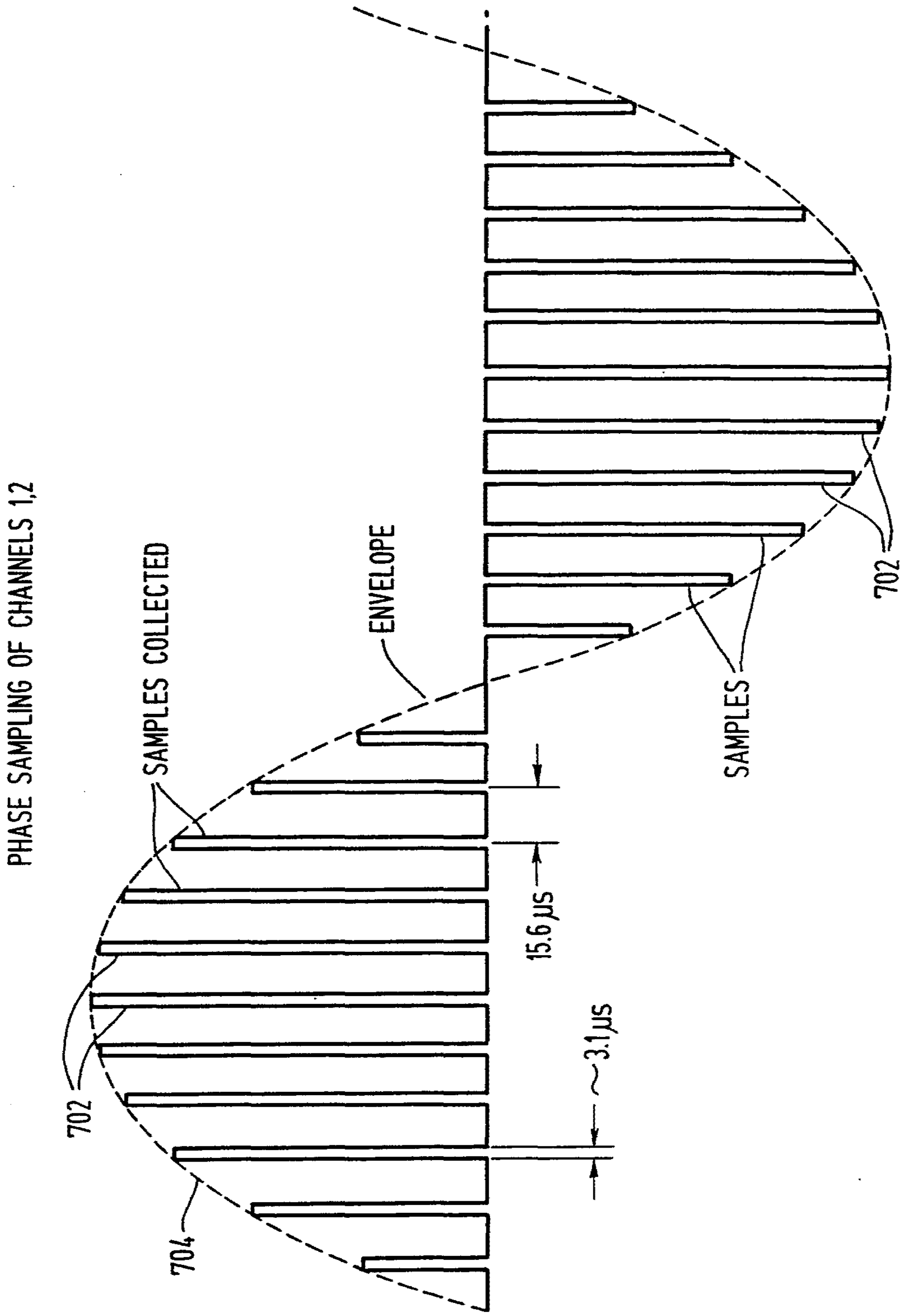
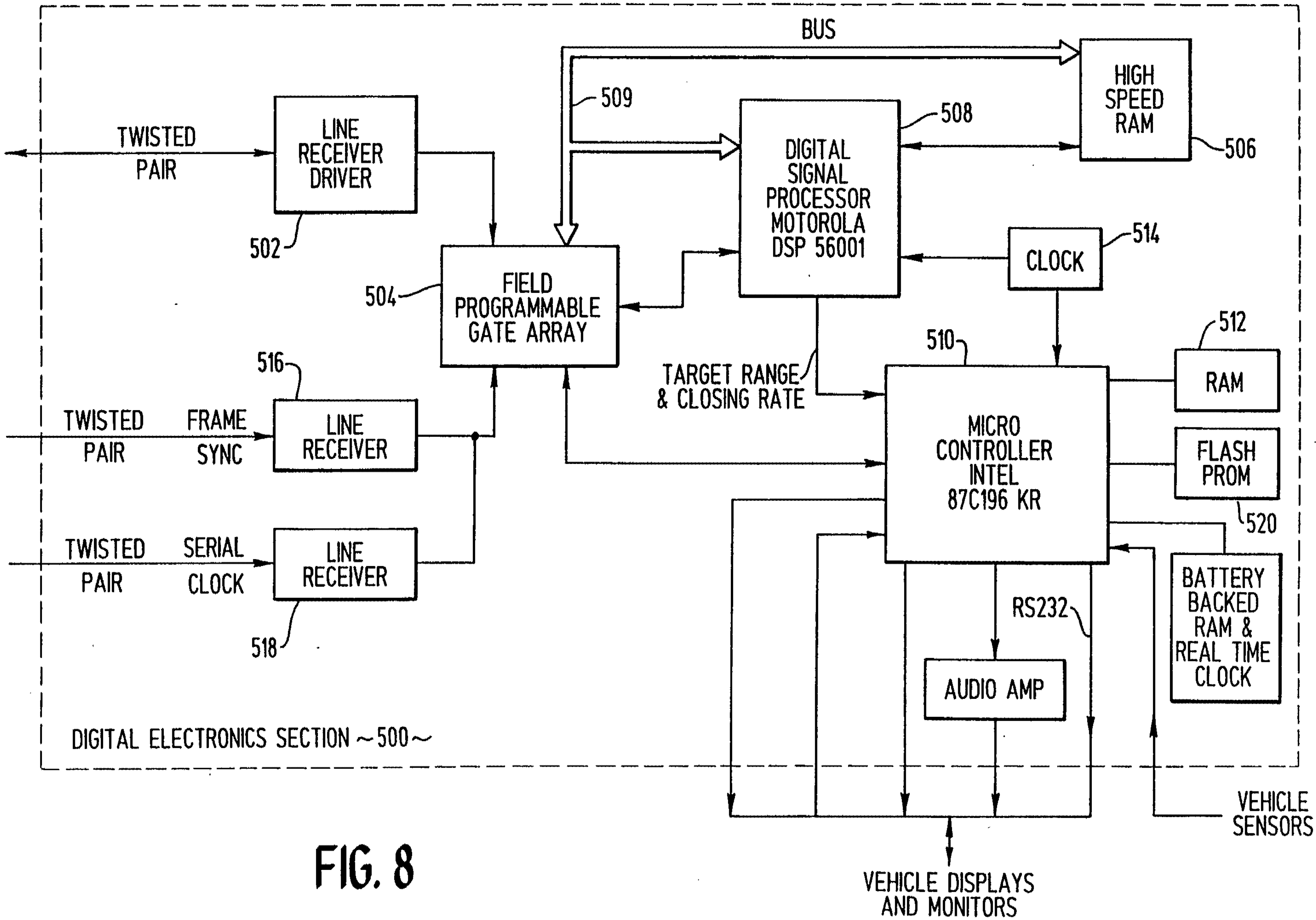

PHASE SAMPLING OF CHANNELS 1,2
SAMPLES COLLECTED
ENVELOPE
SAMPLES
702
702
704
15.6 μs
~3.1 μs

FIG. 7



BUS
HIGH SPEED RAM
506
509
508
DIGITAL SIGNAL PROCESSOR MOTOROLA DSP 56001
TWISTED PAIR
LINE RECEIVER DRIVER
502
504
FIELD PROGRAMMABLE GATE ARRAY
CLOCK
514
512
510
RAM
TARGET RANGE & CLOSING RATE
516
TWISTED PAIR
FRAME SYNC
LINE RECEIVER
MICRO CONTROLLER INTEL 87C196 KR
FLASH PROM
520
TWISTED PAIR
SERIAL CLOCK
LINE RECEIVER
518
RS232
BATTERY BACKED RAM & REAL TIME CLOCK
AUDIO AMP
DIGITAL ELECTRONICS SECTION ~500~
VEHICLE SENSORS
VEHICLE DISPLAYS AND MONITORS

FIG. 8

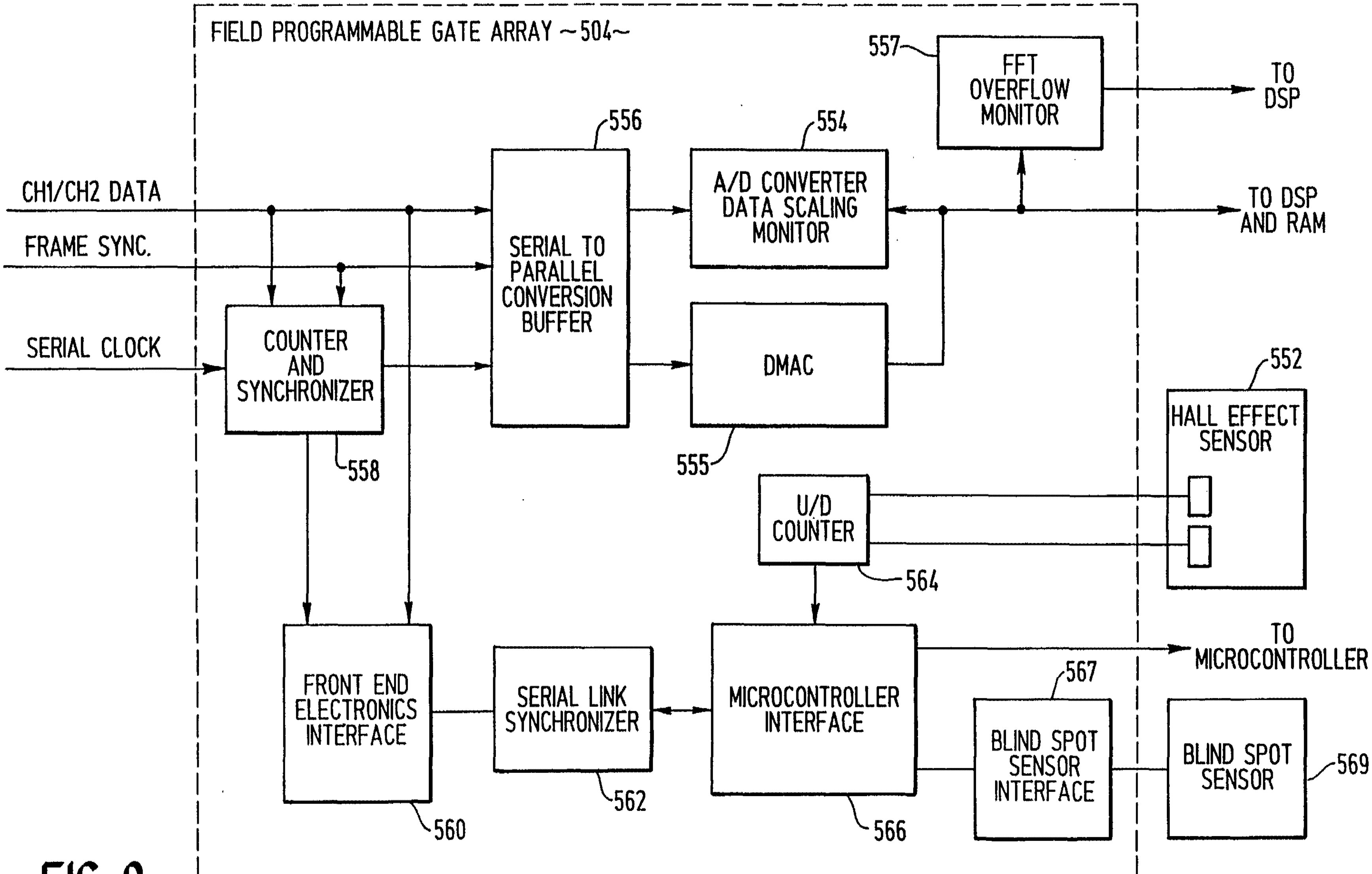

FIELD PROGRAMMABLE GATE ARRAY ~504~
557
FFT OVERFLOW MONITOR
TO DSP
556
554
A/D CONVERTER DATA SCALING MONITOR
TO DSP AND RAM
CH1/CH2 DATA
FRAME SYNC.
SERIAL CLOCK
SERIAL TO PARALLEL CONVERSION BUFFER
COUNTER AND SYNCHRONIZER
DMAC
552
HALL EFFECT SENSOR
558
555
U/D COUNTER
564
TO MICROCONTROLLER
567
FRONT END ELECTRONICS INTERFACE
SERIAL LINK SYNCHRONIZER
MICROCONTROLLER INTERFACE
BLIND SPOT SENSOR INTERFACE
BLIND SPOT SENSOR
569
562
560
566

FIG. 9

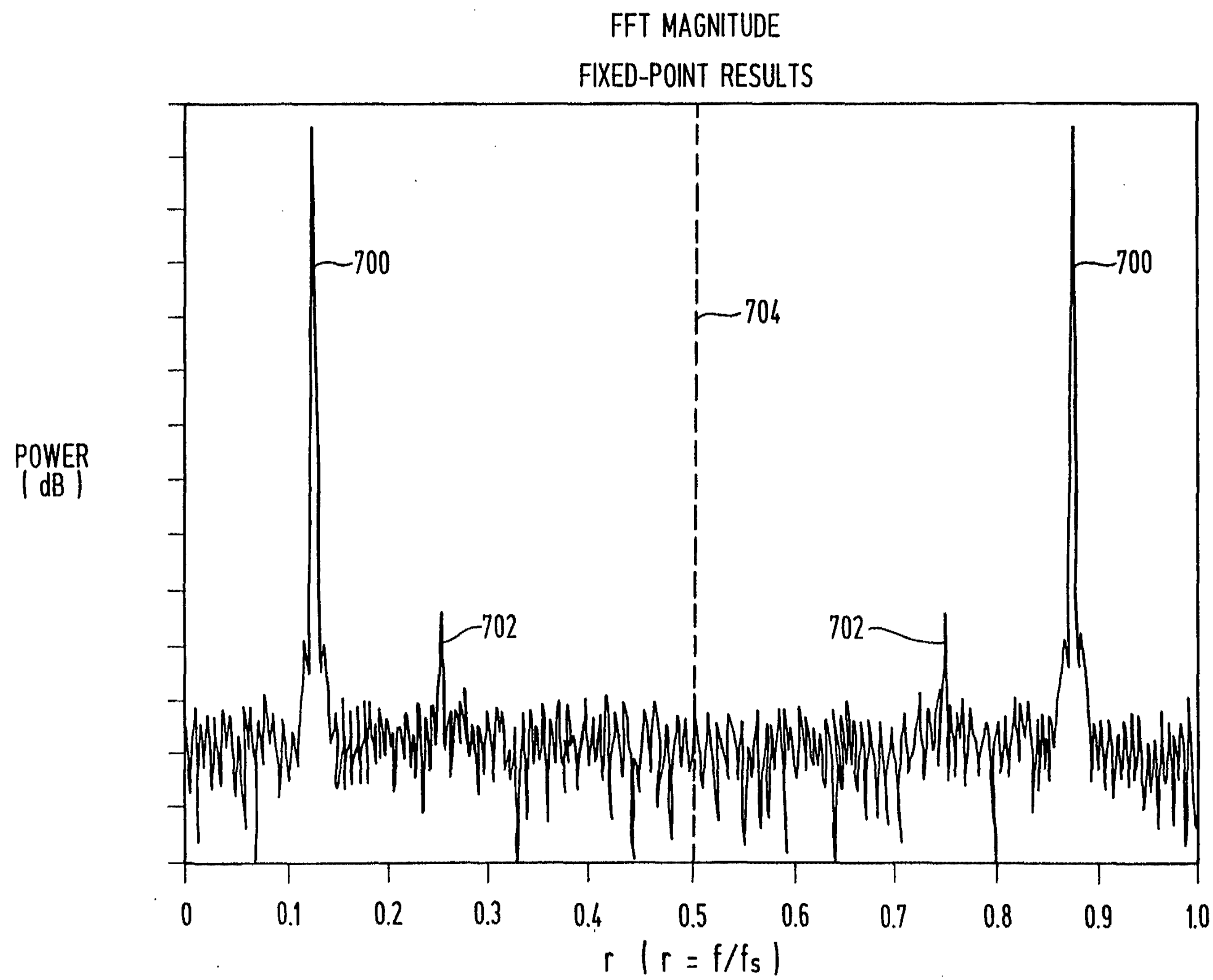

FFT MAGNITUDE
FIXED-POINT RESULTS
POWER (dB)
700
700
704
702
702
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
r (r = f/fs)

FIG. 10

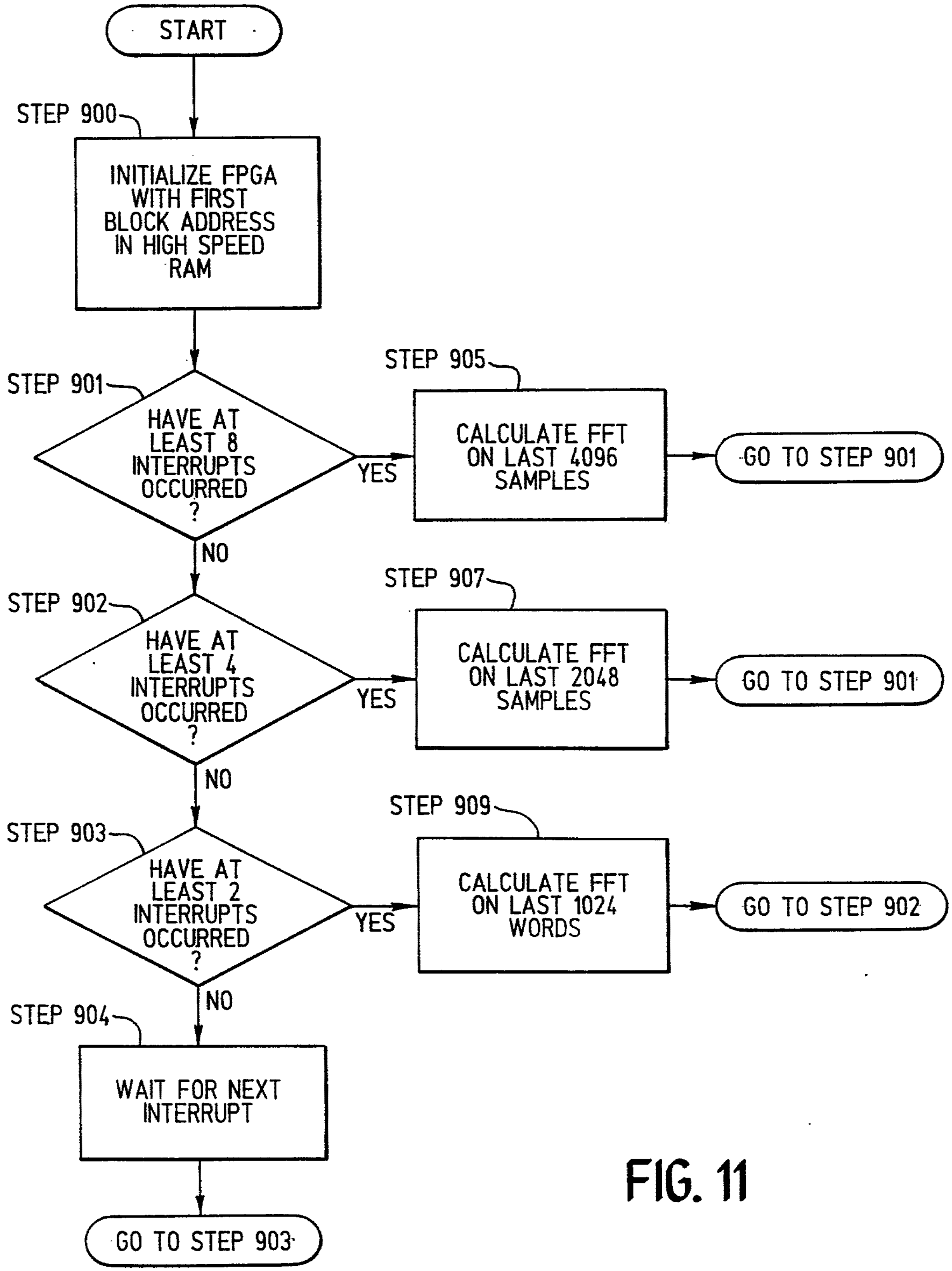
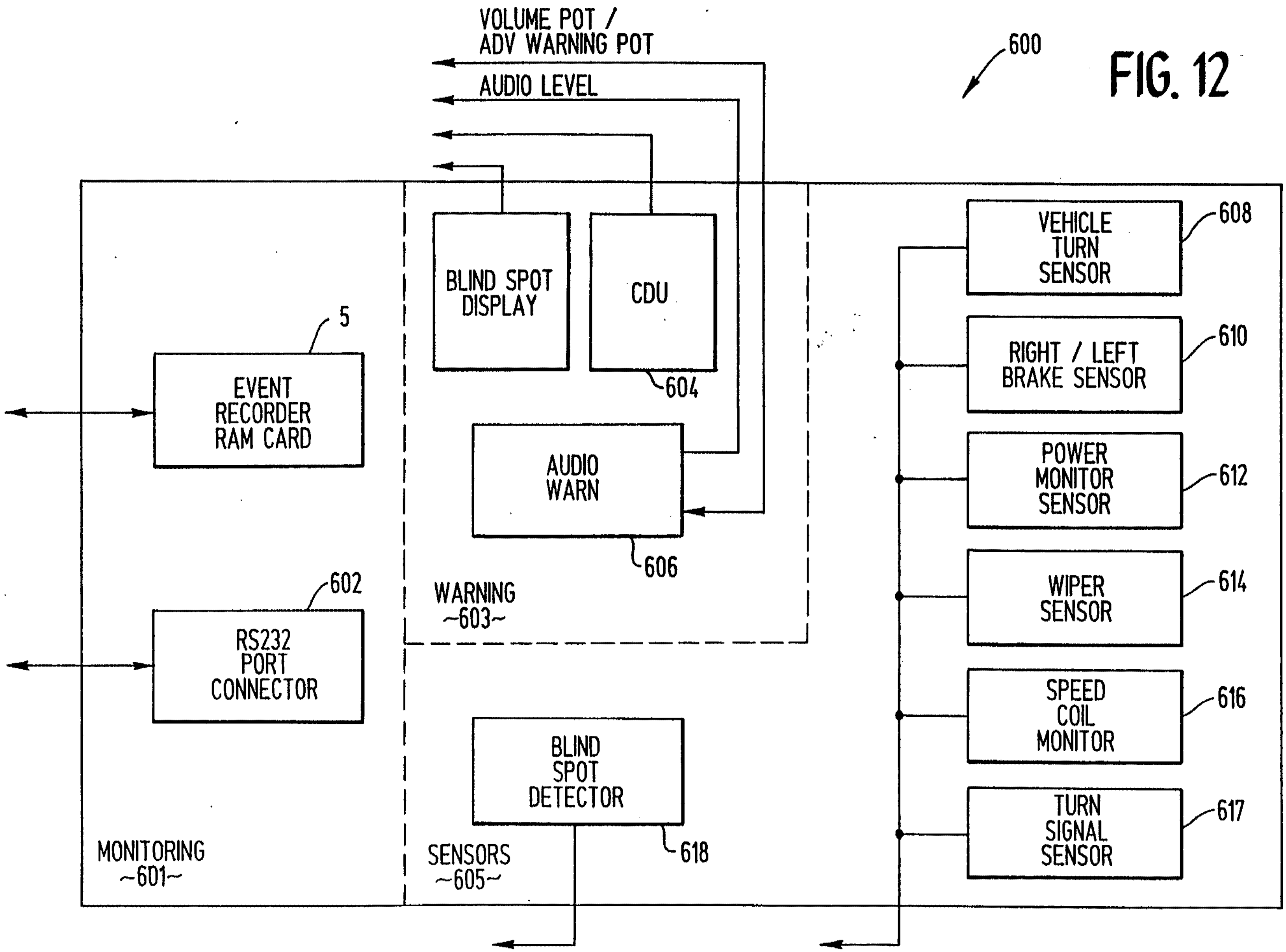
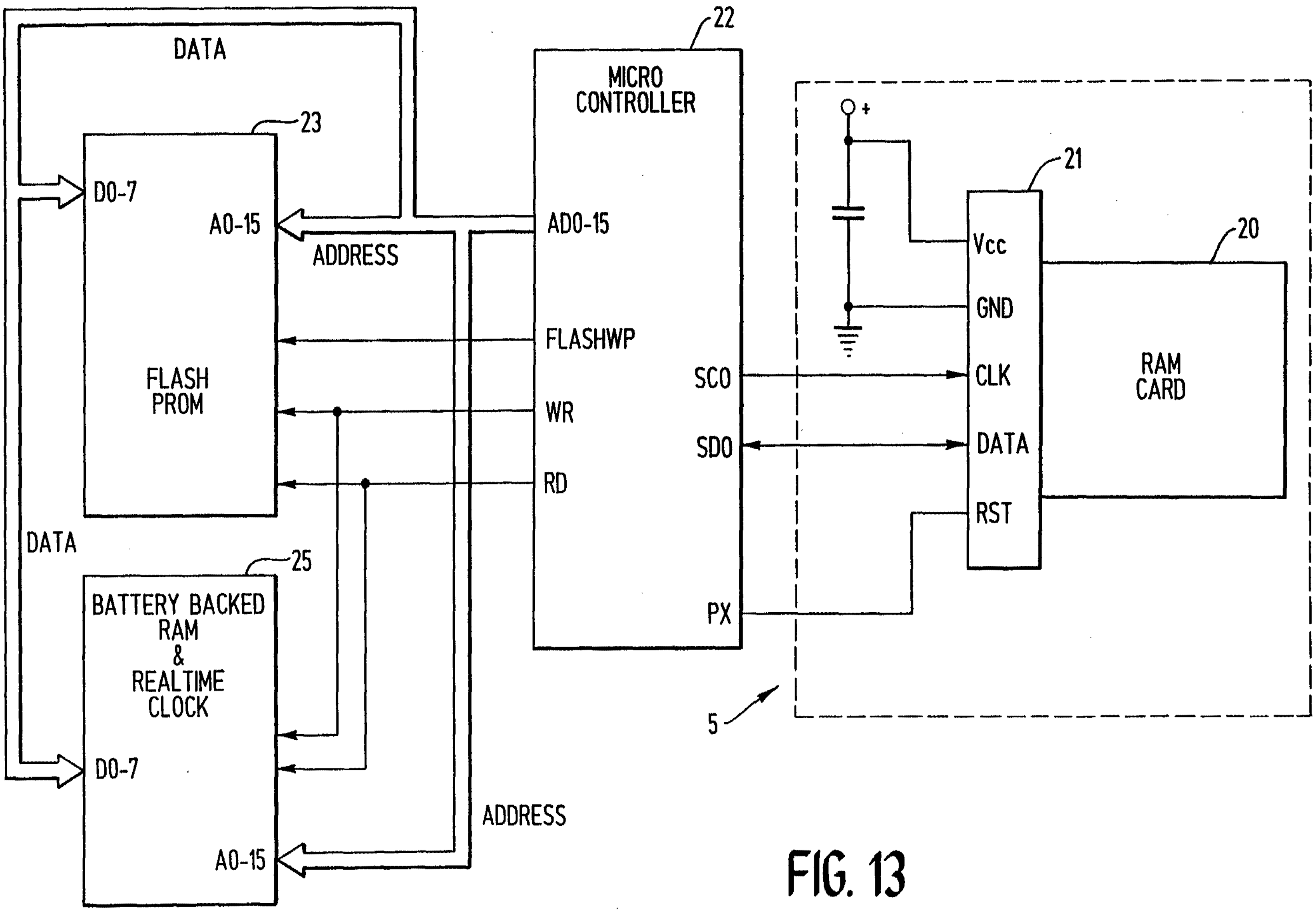

START
STEP 900
INITIALIZE FPGA WITH FIRST BLOCK ADDRESS IN HIGH SPEED RAM
STEP 901
HAVE AT LEAST 8 INTERRUPTS OCCURRED ?
YES
NO
STEP 905
CALCULATE FFT ON LAST 4096 SAMPLES
GO TO STEP 901
STEP 902
HAVE AT LEAST 4 INTERRUPTS OCCURRED ?
YES
NO
STEP 907
CALCULATE FFT ON LAST 2048 SAMPLES
GO TO STEP 901
STEP 903
HAVE AT LEAST 2 INTERRUPTS OCCURRED ?
YES
NO
STEP 909
CALCULATE FFT ON LAST 1024 WORDS
GO TO STEP 902
STEP 904
WAIT FOR NEXT INTERRUPT
GO TO STEP 903

FIG. 11

FIG. 12


VOLUME POT /
ADV WARNING POT
AUDIO LEVEL
600
EVENT RECORDER RAM CARD
5
RS232 PORT CONNECTOR
602
MONITORING ~601~
BLIND SPOT DISPLAY
CDU
604
AUDIO WARN
606
WARNING ~603~
BLIND SPOT DETECTOR
618
SENSORS ~605~
VEHICLE TURN SENSOR
608
RIGHT / LEFT BRAKE SENSOR
610
POWER MONITOR SENSOR
612
WIPER SENSOR
614
SPEED COIL MONITOR
616
TURN SIGNAL SENSOR
617



DATA
23
D0-7
A0-15
ADDRESS
FLASH
PROM
DATA
25
BATTERY BACKED
RAM
&
REALTIME
CLOCK
D0-7
A0-15
ADDRESS
22
MICRO
CONTROLLER
AD0-15
FLASHWP
WR
RD
SC0
SD0
PX
+
21
Vcc
GND
CLK
DATA
RST
20
RAM
CARD
5

FIG. 13

13/18

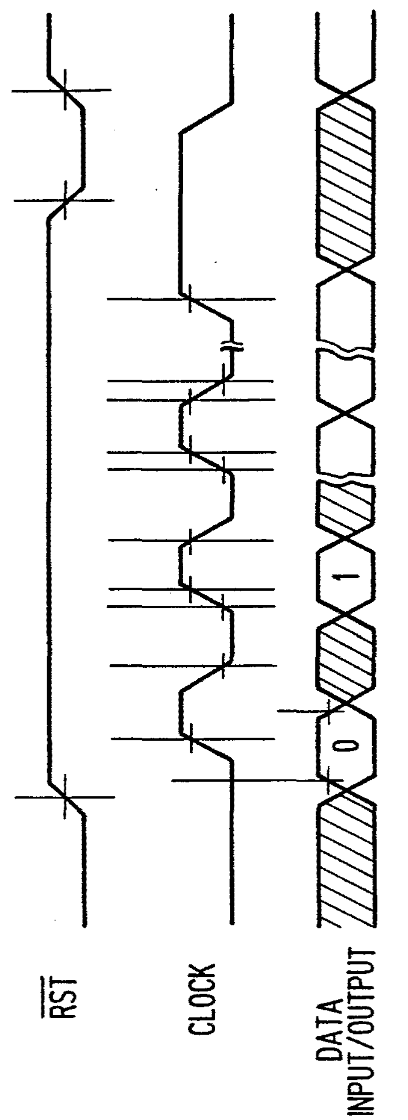

$\overline{\text{RST}}$
CLOCK
DATA INPUT/OUTPUT
0
1

FIG. 14

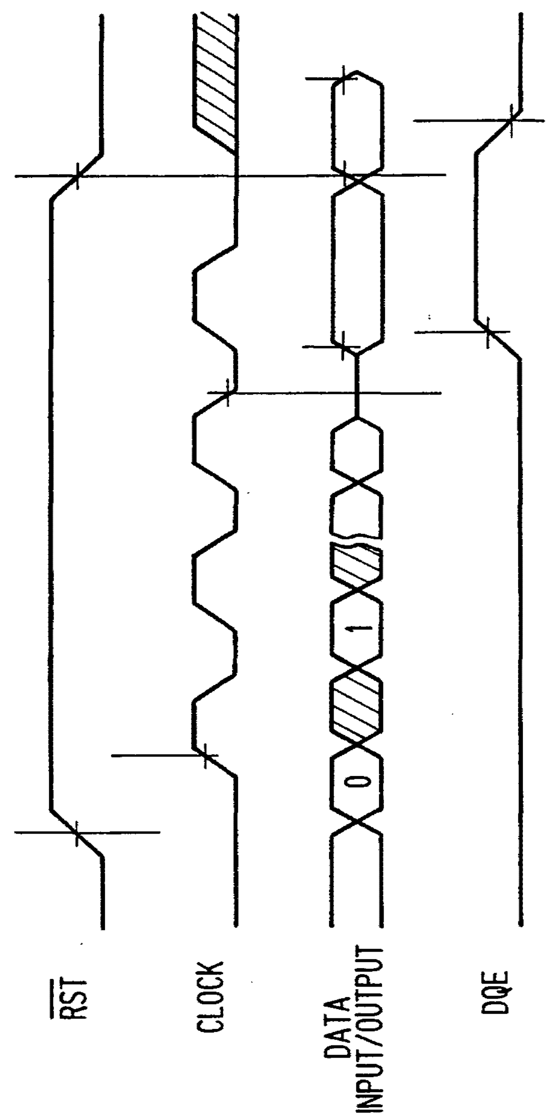

$\overline{\text{RST}}$
CLOCK
DATA INPUT/OUTPUT
DQE
0
1

FIG. 15

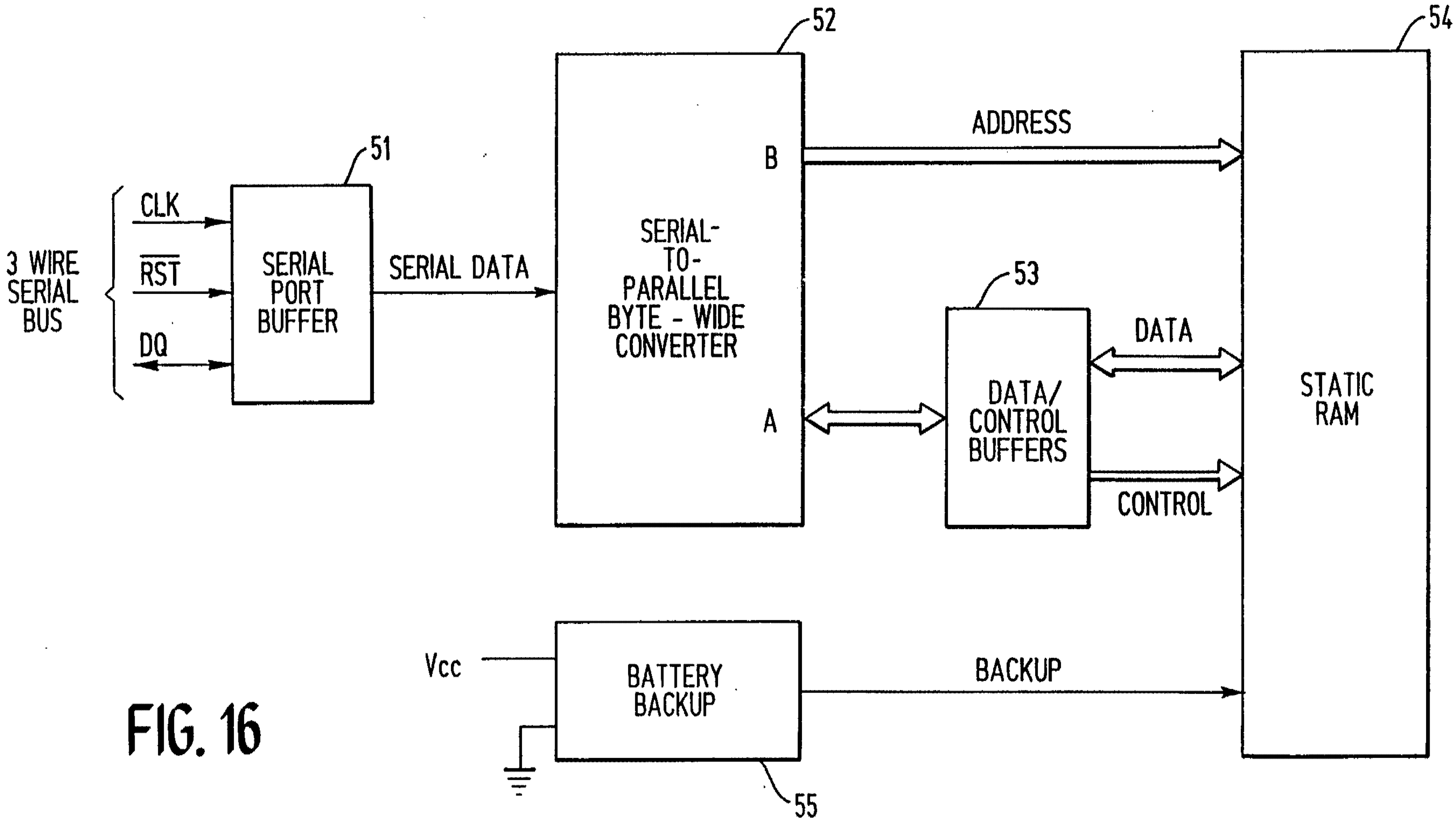
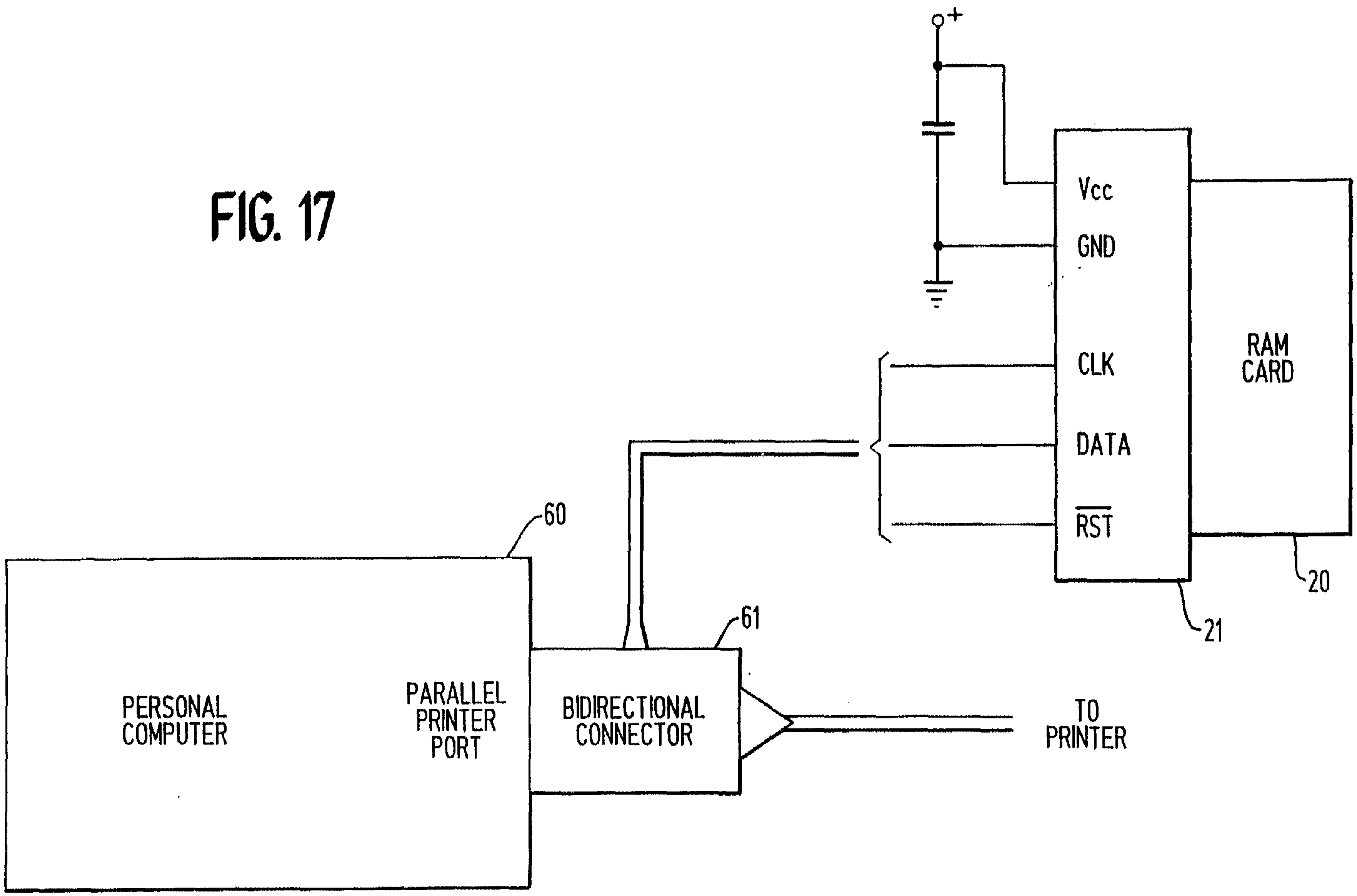

3 WIRE
SERIAL
BUS
CLK
RST
DQ
SERIAL
PORT
BUFFER
51
SERIAL DATA
SERIAL-
TO-
PARALLEL
BYTE - WIDE
CONVERTER
52
B
A
ADDRESS
DATA/
CONTROL
BUFFERS
53
DATA
CONTROL
STATIC
RAM
54
Vcc
BATTERY
BACKUP
55
BACKUP

FIG. 16

FIG. 17


+
Vcc
GND
CLK
DATA
RST
RAM CARD
60
61
20
21
PERSONAL COMPUTER
PARALLEL PRINTER PORT
BIDIRECTIONAL CONNECTOR
TO PRINTER

17/18

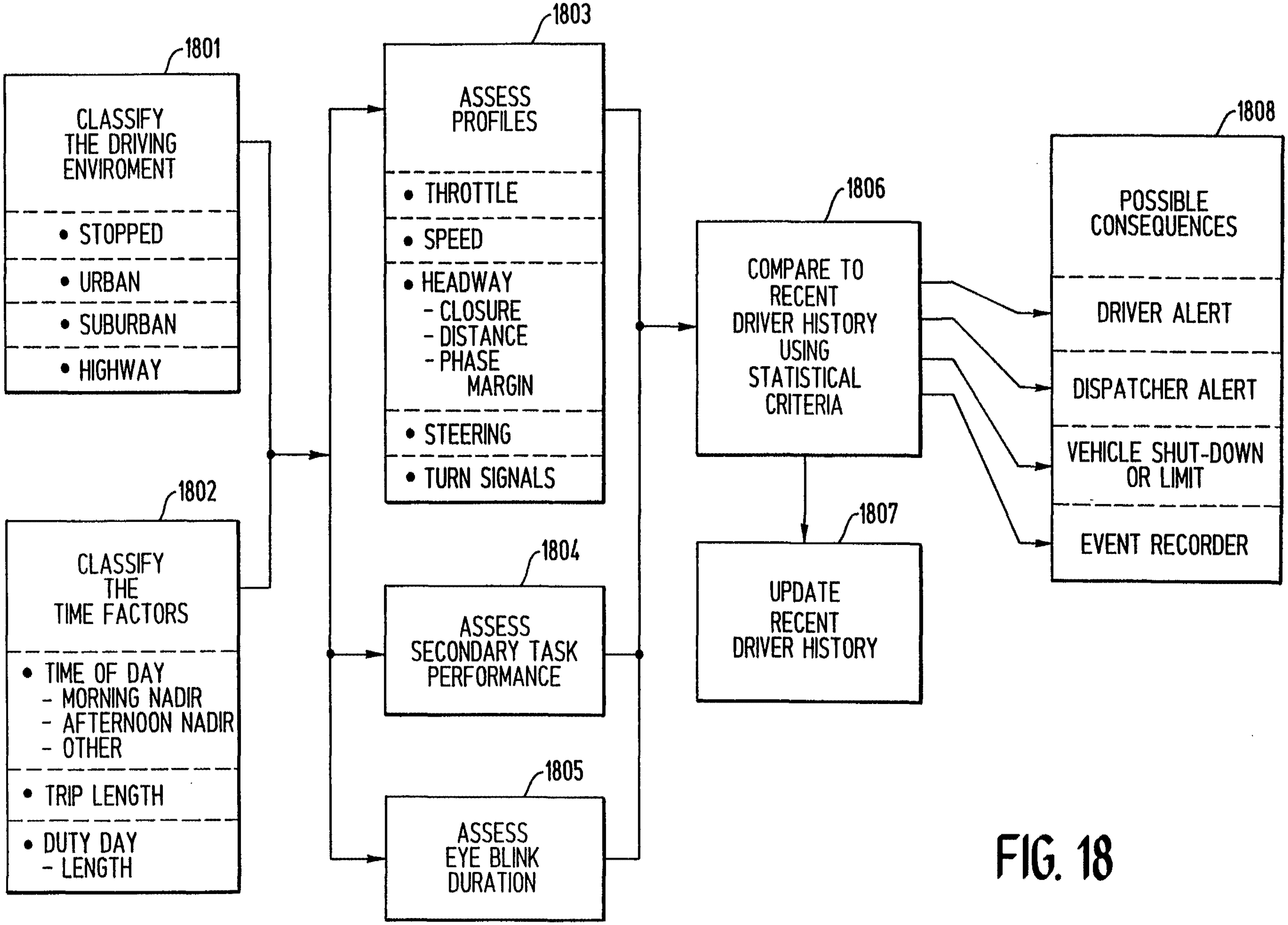

1801
CLASSIFY THE DRIVING ENVIROMENT
• STOPPED
• URBAN
• SUBURBAN
• HIGHWAY
1802
CLASSIFY THE TIME FACTORS
• TIME OF DAY
- MORNING NADIR
- AFTERNOON NADIR
- OTHER
• TRIP LENGTH
• DUTY DAY
- LENGTH
1803
ASSESS PROFILES
• THROTTLE
• SPEED
• HEADWAY
- CLOSURE
- DISTANCE
- PHASE MARGIN
• STEERING
• TURN SIGNALS
1804
ASSESS SECONDARY TASK PERFORMANCE
1805
ASSESS EYE BLINK DURATION
1806
COMPARE TO RECENT DRIVER HISTORY USING STATISTICAL CRITERIA
1807
UPDATE RECENT DRIVER HISTORY
1808
POSSIBLE CONSEQUENCES
DRIVER ALERT
DISPATCHER ALERT
VEHICLE SHUT-DOWN OR LIMIT
EVENT RECORDER

FIG. 18

THE USE OF ASSESSMENT IN VARIOUS DRIVING ENVIROMENTS				
	DRIVING ENVIROMENTS			
PROFILES:	STOPPED	URBAN	SUBURBAN	HIGHWAY
THROTTLE	YES	YES	YES	YES
SPEED	NA	NO	?	YES
CLOSURE	NA	YES	YES	YES
DISTANCE	NA	YES	YES	YES
MARGIN	NA	NO	NO	YES
STEERING	NA	NO	?	YES
TURN SIGNAL	NO	YES	YES	YES
SEC. TASK	NO	NO	NO	YES
BLINKS	YES	YES	YES	YES

FIG. 19

SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/07316

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :G08B 21/00
US CL :180/272; 340/439, 576
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 180/272; 340/439, 576

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

None

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,168,499 (MATSUMURA et al.) 18 September 1979, Figure 1 & col. 2, lines 3-13.	1-7
Y	US, A, 4,500,868 (TOKITSU et al.) 19 February 1985, Figure 1 & Abstract.	1-7
Y	US, A, 4,804,937 (BARBIAUX et al.) 14 February 1989, Figure 1 & Abstract.	5 & 7
Y	US, A, 4,005,398 (INOUE et al.) 25 January 1977, Figure 1 & column 1, lines 33-49.	2-3 & 7
Y	US, A, 4,101,870 (EKMAN) 18 July 1978, column 3, lines 48-64.	2-3

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be part of particular relevance

"E" earlier document published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 SEPTEMBER 1994	30 NOV 1994
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer Glen R. Swann, III
Facsimile No. (703) 305-3230	Telephone No. (703) 305-4385

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(19) World Intellectual Property Organization
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WO 2004/104968 A1

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(71) Applicant *(for all designated States except US)*: **LANDSONAR, INC.** [US/US]; 542 Alvarado Street, San Francisco, CA 94114 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **HUBBARD, Jonathan** [US/US]; c/o LandSonar, Inc., 542 Alvarado Street, San Francisco, CA 94114 (US). **KANTARJIEV, Christopher** [US/US]; c/o LandSonar, Inc., 542 Alvarado Street, San Francisco, CA 94114 (US). **REID, Robert** [US/US]; c/o LandSonar, Inc., 542 Alvarado Street, San Francisco, CA 94114 (US). **TASH, Jonathan** [US/US]; c/o LandSonar, Inc., 542 Alvarado Street, San Francisco, CA 94114 (US).

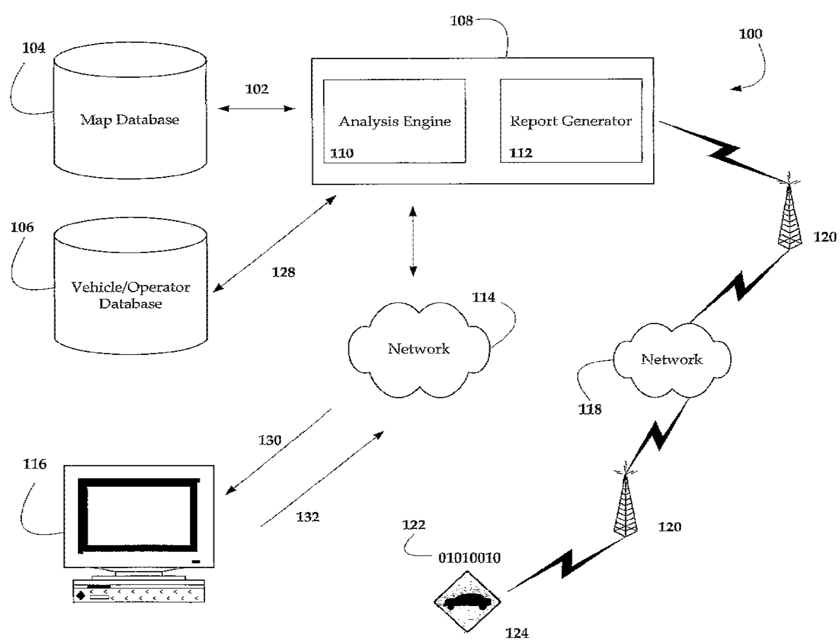
(74) Agents: **YEE, Susan** et al.; Carr & Ferrell LLP, 2200 Geng Road, Palo Alto, CA 94303 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,

[Continued on next page]

(54) **Title:** SYSTEM AND METHOD FOR EVALUATING VEHICLE AND OPERATOR PERFORMANCE



(57) **Abstract:** The present invention relates to the field of safety management of one or more vehicles, and more particularly, to a system and method for analyzing information relating to a vehicle's performance characteristics such as speed against environmental attributes such as speed limits to assess a vehicle and operator's tendency to operate according to preset or other criteria.

WO 2004/104968 A1

SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SYSTEM AND METHOD FOR EVALUATING VEHICLE AND OPERATOR PERFORMANCE

Jonathan Hubbard, Christopher Kantarjiev, Robert Reid, and Jonathan Tash

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the priority benefit of U.S. Provisional Patent Application Number 60/471,021 entitled "Method and System for Evaluating Performance of a Vehicle and/or Operator" filed May 15, 2003 and U.S. Provisional Patent Application Number 60/490,199 entitled "System and Method for Determining and Sending Recommended Departure Time Based on Predicted Traffic Conditions to Road Travelers" filed July 25, 2003. The disclosures of these commonly owned and assigned applications are incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates generally to the field of safety management of one or more vehicles, and more particularly, to analyzing information relating to a vehicle's performance characteristics against map database attributes to assess a vehicle's tendency to operate according to a set of criteria.

Description of Related Art

[0003] The American trucking industry employs nearly ten million people. This includes more than 3 million truck drivers who travel over 400 billion miles per year to deliver to Americans 87% of their transported food, clothing, finished products, raw materials, and other items. Trucks are the only providers of goods to 75 percent of American communities, and for many people and businesses located in towns and cities across the United States, trucking services are the only available means to ship goods. As five percent of the United States' Gross Domestic Product is created by truck transportation, actions that affect the trucking industry's ability to move its annual 8.9 billion tons of freight have significant consequences for the ability of every American to do their job well and to enjoy a high quality of life.

[0004] With the importance of the American trucking industry in mind, it is unfortunate that workers in the American trucking industry experience the most fatalities of all occupations, accounting for twelve percent of all American worker deaths. Approximately two-thirds of fatally injured truckers are involved in highway crashes. Roughly 475,000 large trucks are involved in crashes that result in approximately 5,360 fatalities and 142,000 injuries each year. Of these fatalities, about seventy-four percent are occupants of other vehicles (usually passenger cars), three percent are pedestrians, and twenty-three percent are occupants of large trucks. As there was a twenty-nine percent increase between the years of 1990 and 2000 in the number of registered large trucks and a forty-one percent increase in miles traveled by large trucks, it is evident that the risks involved in the trucking industry are not simply going to go away. If anything, this increase in trucks on the road and miles traveled evidences that the $3 billion in lost productivity to the economy and hundreds of millions of dollars in insurance premiums caused by truck crashes may get even worse.

[0005] Studies and data indicate that driver errors and unacceptable driver behaviors are the primary causes of, or primary contributing factors to, truck-involved crashes. The Federal Motor Carrier Safety Administration reports that speeding (*i.e.,* exceeding the speed limit or driving too fast for conditions) is a contributing factor in twenty-two percent of fatal crashes involving a truck in 2000. Additionally, National Highway Traffic Safety Administration reports that speeding is a contributing factor in twenty-nine percent of all fatal crashes in 2000. More than 12,000 people lost their lives in 2000 in part due to speed-related crashes.

[0006] With the pressure of making on-time deliveries, many drivers are willing to accept the risks of unsafe driving in order to achieve timely arrivals. Unfortunately, the primary tool for preventing unsafe driving—law enforcement—can only be present in so many places at so many times. Even when law enforcement is present, drivers can communicate with one another to inform them of 'speed traps' or other locales where law enforcement presence is high. While drivers may engage in ultra-safe driving in these areas, it does not change the fact that a vast majority of the time these drivers are on the road, they are not subject to any type of third-party supervision or accountability with regard to their driving habits. Thus, additional oversight of driver behavior is required.

[0007] Although causes of crashes are largely human, important solutions may be found in technology to facilitate and augment driver performance. For example, to minimize these costs, conventional telemetric safety solutions are used to observe and measure vehicle tendencies and patterns for improving safety. Generally, these solutions are binary in nature in that they are limited to generating simple triggering alarms, such as whether a particular characteristic is within an acceptable tolerance (*e.g.*, whether a vehicle's speed is in compliance with a pre-set maximum authorized speed).

[0008] Such binary solutions offer only temporary notice (*e.g.*, an audible alarm) to the driver that they are engaged in unsafe driving behavior and when that behavior abates (*e.g.*, the cessation of the alarm). These solutions do not provide an indication of long-term or habitual unsafe driving behavior and can easily be 'muted' or otherwise disabled by the driver whereby any value offered by such an alarm solution is eliminated. These binary solutions, too, often do not inform another party, such as a fleet manager, of such unsafe driving behavior as the driver alone hears the alarm and is made aware of the unsafe behavior.

[0009] High-grade digital mapping systems offering detailed, digital models of the American highway, road, and street networks and developed for the consumer in-vehicle navigation market have provided an opportunity to combine map data with vehicle operation and location data to offer innovative software based services and solutions. Presently available digital map databases, such as those provided by NAVTEQ, can include up to 150 individual road attributes as well as individual points of interest, localities, and addresses. Continuing developments in map database technology allow for allocation of even more attributes to segments of road data including speed limit, school and construction zone information, car pool lane limitations including persons, and hours of operation, prohibitions on turns (*e.g.*, no right turn on red between 6-9 AM), and so forth.

[0010] In the transportation industry, managers of trucking fleets worry about their vehicles and drivers speeding on arterial and surface streets as well as in highway construction zones in addition to violating other traffic ordinances. Not only does such behavior put employees and third-parties at risk, but it is also directly proportional to the costs of insurance premiums that result in an increase in the price of transportation services that trickle-down to customers benefiting from delivery services. Being able to monitor and address unsafe driving behavior would result in a decrease of these incidents and a decrease in insurance costs.

[0011] There presently exists no user-friendly mechanism and or analytic tools for measuring a vehicle's and or a driver's performance given geographic and environmental contexts of that vehicle in determining whether that vehicle or driver is operating outside a margin of safety.

SUMMARY OF THE INVENTION

[0012] The present invention provides a system and method for analyzing certain vector and operational data received from a vehicle in the form of vehicle data against map data from a database, which includes certain road segment attributes. This analysis allows a user to assess tendencies of a vehicle or its operator to operate in an unsafe manner according to criteria defined by the user.

[0013] In an exemplary embodiment, a method provides a software-based service that combines data collected by GPS receivers in vehicles with road speed-limit information from data repositories, which can include data representing high-grade digitized maps (including graphical descriptions and geographic context characteristics describing environs of a segment of a road) in order to monitor drivers for excessive speed. This service is an easy-to-deploy method of predicting and identifying accident-prone drivers before accidents happen thereby providing fleet managers and safety experts from the insurance industry, among others, with a relatively easy-to-use and low-cost tool for improving safety management.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an exemplary system in accordance with one embodiment of the present invention.

FIGURE 2A is an exemplary representation of map data reflecting existence of various road segments.

FIGURE 2B is a detailed view of road segments of **FIGURE 2A** wherein particular road segment attributes are shown.

FIGURE 3 is a flow chart representing an exemplary method of evaluating vehicle and or operator performance.

FIGURE 4 illustrates an exemplary tabular format for reporting analyzed vehicle data in accordance with an exemplary embodiment of the present invention.

FIGURE 5 illustrates another exemplary format for graphically reporting analyzed vehicle data in accordance with an exemplary embodiment of the present invention.

SUMMARY OF THE INVENTION

[0014] Detailed descriptions of exemplary embodiments are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure, method, process, or manner.

[0015] In accordance with one embodiment of the present invention, a system and method analyzes vehicle operational data, vector data, and location data, for example, in conjunction with information from a map database to allow a user to assess whether a vehicle is being operated in a potentially dangerous manner. Such a determination can be made by ranking or rating different drivers and or vehicles according to their propensity for potentially dangerous operation as determined by analyzing specific sets or subsets of data representing a driver's or a vehicle's performance.

[0016] User inputs can define how to evaluate different drivers and or vehicles using vehicle attribute data (*e.g.*, weight, width, height, length, number of axles, load type, number, and types of occupants) and time period or trips over which driver or vehicle should be evaluated. Each of these different drivers can be identified with an operator identifier, which is associated with one or more vehicle identifiers. For example, a driver having Operator ID number 1453 can be associated with truck numbers T1, T4, T15, and T22. Hence, the Operator 1453's driving behavior can be evaluated over each of the vehicles (*i.e.*, T1, T4, T15, and T22) that the driver operates.

[0017] As described herein, vehicle data is comprised of vector data and operational data. Vector data includes positional information (*e.g.*, x-y-z coordinates determined from GPS information, such as longitude, latitude, and elevation over sea-level), velocity information (*e.g.*, speed, and acceleration) and any other information derived from positional-determination means as determined by, for example, a GPS receiver. Operational data includes information relating to operational parameters of the vehicle such as centrifugal force (as measured in 'G's'), rotational engine speed (as measured in 'RPMs'), torque, oil temperature, tire pressure readings, or any other sensor-generated data.

[0018] The vector and operational data received from these vehicles in the form of vehicle data can be collected in real-time and/or at some point in time where data is 'batched' or downloaded at certain intervals of time (*e.g.*, data is downloaded from a fleet vehicle after returning to a fleet base station via infra-red or any other communication medium). This vehicle data is then relayed to a computer for analysis in comparison and/or contrast to map information (*e.g.*, road segments and road segment attributes in a map database). The present invention also envisions a system wherein analysis of vehicle data against map information occurs in real-time wherein the computer and/or database are on-board with the vehicle generating relevant vehicle data.

[0019] The matching vehicle data (*e.g.*, vehicle speed or vehicle weight) and the road segment attribute information (*e.g.*, speed limit or vehicle weight restriction) are analyzed to determine how the vehicle's operation compares to a set of user-defined safety criteria, for example, a set of characteristics entered by the user to generate a report. The system and method can then rate and rank operators and or vehicles according to their propensity to violate predetermined rules set by the user (*e.g.*, a fleet manager).

[0020] In accordance with a specific embodiment, vehicle data can be collected and/or inferred (*e.g.*, derived) from data collected by various types of sensors including in-vehicle GPS receivers, vehicle speedometer, and/or through external inference, such as cell phone, satellite triangulation, or by other known means.

[0021] An exemplary method and system in accordance with the present invention can use a map database containing road segments and road segment attribute information. Roads (or any other thoroughfare) are stored as data in the map database and can be represented as a collection of road segments. Each road segment in the database will be associated with road segment attributes that provide information about a specific road segment such as road type, speed limit, vehicle weight, and/or height restriction, turn restrictions, and so forth.

DETAILED DESCRIPTION

[0022] FIGURE 1 illustrates an exemplary evaluation system 100. A processor 108 of evaluation system 100 is configured to receive vehicle data 122 from a vehicle 124 via any one of relay 120 and network 118. The processor 108 of evaluation system 100 is configured to exchange map data 102 with map database 104 as well as to exchange vehicle/operator data 128 with vehicle/operator database 106. The processor 108 is also configured to deliver evaluation information 130 to a client 116 via local network 114 in response to a client request 132.

[0023] Vehicle 124 can be any type of automobile, truck, or other conveyance such as a water-traversing vehicle. Vehicle 124 generally includes a position and or direction-determining device, such as a Global Positioning System (GPS) receiver, and can include additional hardware and/or software for generating, transmitting, and/or receiving data, such as vector or operational data. While one skilled in the art will appreciate exact operational details of GPS, at a more fundamental level, GPS is a navigation system that provides specially coded satellite signals that can be processed in a GPS receiver enabling the receiver to compute position, velocity, and time. The present invention envisions alternative embodiments wherein other position and/or direction-determining devices (*e.g.*, Dead Reckoning from Qualcomm), are utilized for generating, transmitting, and/or receiving data, such as vector or operational data.

[0024] In one embodiment, at least a portion of the hardware and or software residing, in part, within vehicle 124 can function in a manner similar to DriveRight manufactured by Davis Instruments. DriveRight, and products like it, provide an on-board display console for viewing time, distance, top speed, and average speed. In particular, a portion of the hardware operates as a data port from which vector and or operational data can be retrieved for transmittal from vehicle 124 to processor 108 in the form of vehicle data 122.

[0025] While present products like DriveRight do not take into account geographic data, such as map data from a map database, these products do use vector and/or operational data from the vehicle's own instruments through the vehicle's On-Board Diagnostic system ("OBD")— a computer-based system built into all model year 1996 and newer cars and trucks that monitors performance of the vehicle's major components and emission controls—as well as various unsafe operation sensors to to prepare vehicle data 122.

[0026] This vehicle vector and/or operation data generated by GPS receiver and/or other resident hardware and/or software is transmitted in the form of vehicle data 122 to processor 108 for generating analytical reports in accordance with the present invention. In an exaemplary embodiment, vehicle data 122 is any form of machine-readable data reflecting vehicle vector data and/or operational data such as velocity, position, RPMs, oil temperature, and so forth. Other hardware embodiments for generating vehicle vector and/or operation data can include industry-standard telemetric hardware such as @Road's FleetASAP or Qualcomm's OmniTRACS. OmniTRACS computes position by measuring the round trip delay of synchronized transmissions from two geostationary satellites separated by 12-24 degrees. The network management at the OmniTRACS hub computes the range of each satellite and derives the third measurement needed for position from a topographic model of the earth. These various hardware and/or software embodiments can be implemented at the vehicle 124 and/or remotely in evaluation system 100 as is most appropriate per design of the particular embodiment.

[0027] Relay 120 can be any relay station for receiving and transmitting signals between a vehicle 124 and a processor 108 of evaluation system 100, such as an antenna, cellular phone tower, or any other transmission tower using known or future wireless protocols. Network 118 can be any communications network known in the art configured to transport signals between the relay 120 and the processor 108 of evaluation system 100 such as the Internet or proprietary wireless networks. In some embodiments, relay 120 can be replaced with satellites or any other suitable equivalents for operation with the adapted network 118 for communicating vehicle data 122 between the processor 108 and the vehicle 124.

[0028] An exemplary evaluation system 100 includes, at least, the map database 104, the vehicle/operator database 106, and the processor 108 comprising analysis engine 110 and report generator 112. Map database 104 and vehicle/operator database 106 can include any data structure adapted for storage and access as generated in accordance with exemplary methods of the present invention, and can include optical storage media such as CD-ROM, non-volatile memory such as flash cards, or more traditional storage structures such as a computer hard drive.

[0029] Map database 104 is configured to store and to provide map data 102. Map data includes road segments and road segment attributes as defined by a user. Such road segment attributes can include a posted speed limit, maximum vehicle weight, road type (e.g., two-way traffic, paved, etc.), height restriction, turn restriction (*e.g.*, no right on red during certain time periods), and so forth. Road segment attributes are limited only by an ability to identify a particular segment of road—a road segment—with some sort of empirical data or other statistical limitation such as a speed limit.

[0030] For example, consider a road passing from point A through point B to point C, where the posted speed transitions from 35 mph to 55 mph at point B. The portion of the road between points A and B is a first road segment, and similarly, the portion between point B and C is a second road segment. Road segment attributes '35 mph' and '55 mph' are associated with the related road segments and are analyzed to determine whether a driver has exceeded the posted speed limit over the road from point A to point C.

[0031] Vehicle/operator database 106 is configured to store and to provide vehicle/operator data 128. Vehicle/operator data 128 can comprise weight, width, height, length, number of axles, load type, number and types of occupants for a particular vehicle as well as speeds traveled by a particular vehicle at various times during its scheduled deliveries. Vehicle/operator data 128, as it pertains to a vehicle, is limited only to the extent that it is some identifiable information about a particular vehicle. Vehicle/operator data 128 can also include data for a particular operator or driver such as a 'name,' a 'driver identifier,' or 'employee number.' Like vehicle/operator data 128 relating to a vehicle, such data is limited as it pertains to a driver to the extent that it need only be information about a particular driver. Vehicle/operator database 106 also stores long-term statistical information (*e.g.*, vehicle/operator data 128) describing one or more vehicles' and/or operators' vector, operational, and location data over an extended period of time.

[0032] Processor 108 comprises the analysis engine 110 and report generator 112. Processor 108, analysis engine 110, and report generator 112 are configured to allow access to network 118, map database 104, and vehicle/operator database 106. Processor 108 is further configured to allow access by client 116. Access configuration, in the case of the client 116, can optionally occur via network 114. Network 114 can be a local area network or a wide-area network. More traditional means of access configuration to client 116 may include a bus. Any means of allowing client 116 access to processor 108 is acceptable in the present invention.

[0033] The exemplary processor 108 can be any computing device known in the art, such as a server, central computer, or the like. Processor 108 is able to process instructions from, at least, analysis engine 110 and report generator 112 in addition to client 116. Processor 108 also may interact with map database 104 and vehicle/operator database 106 to the extent it is necessary to retrieve map data 102 and/or vehicle/operator data 128, and to store new data to the databases 104 and 106. Processor 108 may also receive vehicle data 122 from network 118 and or/relays 120 and to request certain data from a vehicle 124 via the same means.

[0034] Analysis engine 110 and report generator 112 can comprise hardware, software, or a combination thereof. Analysis engine 110 and report generator 112 may or may not be in a common housing dependent on the nature of processor 108. Some embodiments may configure analysis engine 110 and report generator 112 on multiple processors 108 to allow for reduced workload on any single processor 108 or to provide for redundancy as to allow for fault tolerance. Any configuration is acceptable in the present invention so long as analysis engine 110 and report generator 112 are able to interact with various elements of the present invention, namely the processor 108, to carry out their allocated responsibilities.

[0035] Analysis engine 110 and report generator 112 manage the analysis and report generation process, respectively, in accordance with an embodiment of the present invention. Client 116, in turn, can be any variety of personal computers, workstations, or other access devices such as a personal digital assistant (*e.g.,* a Palm Handheld from Palm, Inc. or the Blackberry from Research in Motion). Client 116 need only be able to provide the necessary input to access processor 108 and output provided by processor 108.

[0036] Analysis engine 110, specifically, is the software and or hardware that manages the analysis of data retrieved from the vehicle/operator database 106 and map database 104 in response to queries from a user entering input via client 116. Such an analysis can include any Boolean and or logical, arithmetic, mathematical, or other operation for comparing data.

[0037] For instance, if a fleet manager wishes to determine the performance, in terms of speed, of each driver in a fleet of vehicles over a particular road segment, the fleet manager may input driver IDs and a road segment identifier related to that road segment via client 116. Analysis engine 110 causes the processor 108 to fetch map data 102 from the map database 104 representing, at least, posted speed information (*i.e.,* a road segment attribute) for that road segment (*e.g.,* a 45 mph speed limit for a specific stretch of city street). Analysis engine 110 may also instruct processor 108 to fetch vehicle/operator data 128 for a particular group of drivers reflecting their average and maximum speed traveled over the particular road segment of interest from vehicle/operator database 106.

[0038] If, following analysis by analysis engine 110, the vehicle/operator data 128 for a particular driver indicates driving behavior exceeding the posted limit for a particular road segment as identified by map data 102, an indication is generated. This indication is included in a report generated by report generator 112. Report generator 112 is the software and/or hardware that creates and distributes reports according to criteria set by a user. Figures 4 and 5 illustrate exemplary report formats embodying representations of some of the map data 102 and vehicle/operator data 128 gathered by evaluation system 100. This report is delivered to client 116 in the form of evaluation information 130. Evaluation information 130 is machine-readable data that can be reconstructed by client 116 in a form recognizable and understandable to the user such as exemplified in Figures 4 and 5. Reconstruction of evaluation information 130 can be manipulated as to depend on the particular type of user interface being utilized in client 116.

[0039] Delivery of evaluation information 130 as prepared by analysis engine 110 and report generator 112 to client 116 can occur through a point-to-point link such as a bus or any type of network 114 such as a local area network (an Intranet) or a wide-area network 114 (*e.g.*, a wireless network, the Internet, or a large-scale, closed proprietary network).

[0040] An alternative embodiment of the present invention provides for processor 108, analysis engine 110, report generator 112, and map database 104 to be located entirely within a vehicle 124 so that driver may be notified in real-time as to whether the driver is violating any particular road segment attribute such as speed limit.

[0041] FIGURE 2A is an exemplary embodiment of map data 102 as retrieved from map database 104 (FIG. 1). Map data 102 is comprised of road segments 202, 204, 206, 208, 210, 212, 214, 216, 218, 220, and 222. Road segments are identifiable portions of road or highway. Road segments can comprise, for example, a city block or a particular stretch of highway between two mile markers. Road segments can also comprise portions of road or highway with particular or unique features such as a particular road surface (*e.g.*, pavement or gravel), zones (*e.g.*, school or construction), or lane limitations (*e.g.*, no right turn on red or carpool lanes).

[0042] Road segment attributes are associated with the aforementioned road segments 202-222. Road segments attributes are identifiable features of a particular road segment such as a posted speed limit, hours of limited operation, weight restrictions, specific traffic regulations, hazardous cargo requirements, and so forth. One road segment can have multiple road segment attributes. For example, one road segment (like a highway) can have a road segment attribute pertaining to speed limit and another road segment attribute as to hazardous cargo limitations.

[0043] Road segment attributes can be standard information about a particular road segment as might be provided by a commercial digital map producer such as car pool lane information or speed limits. A user can also assign specific road segment attributes through input provided by client 116 (FIG. 1) and stored in map database 104 by the processor 108 for later access and reference.

[0044] FIGURE 2B is a detailed view of certain road segments from FIG. 2, in particular, road segments 218, 220, and 222 and their related road segment attributes 219, 221, and 223.

[0045] For example, road segment 218 is a particular stretch of highway. This segment of the highway, however, is subject to a 65 mph speed limit and the existence of a car pool lane whereby only passenger vehicles with 2 or persons are allowed to travel in the car pool lane between the hours of 6 and 9 AM and 3 and 6 PM. These limitations—speed limit and car pool lane hours—are the road segment attributes 219 for road segment 218.

[0046] Road segment 220 has its own unique set of road segment attributes 221. In this case, a particular stretch of highway has no carpool lane limitations—all three lanes are open to all forms of traffic—but there is presently construction on this stretch of highway whereby the speed limit is reduced to 25 mph. The non-existence of a carpool lane and the construction zone speed limit are the road segment attributes 221 for this particular highway segment.

[0047] By further example, road segment 222 has a 65 mph speed limit, 3 lanes, and a hazardous cargo prohibition. The speed limit, lane information, and cargo prohibition are the road segment attributes 223 for this particular road segment 222.

[0048] A user of client 116 (FIG. 1) can access the processor 108 and request map data 102 (FIG. 1) from map database 104 (FIG. 1). In particular, the user can request data for road segment 218 and its related road segment attributes 219. User can then query vehicle/operator database 106 (FIG. 1) for the driving information of a particular vehicle and its operator on road segment 218 on a particular date and at a particular time. Analysis engine 110 (FIG. 1) can then determine that the particular driver happened to be driving a commercial vehicle in the carpool lane at 4.45 PM (as is prohibited and noted in road segment attribute 219) wherein an indication would be generated. Report generator 112 (FIG. 1) will then report the existence of this indication to client 116 in the form of evaluation information 130 (FIG. 1). User can then, after review of the evaluation information 130, determine whether any sort of warning need be provided to the driver.

[0049] If the vehicle/operator data 128 (FIG. 1) as stored in vehicle/operator database 106 reflects an ongoing trend of violating local traffic ordinances, this indication will also be generated by analysis engine 110 and reported by report generator 112 in the form of evaluation information 130 to the user. The user can then determine whether any sort of disciplinary action—such as termination of the driver's employment—need be taken.

[0050] This type of information would, in the absence of the present invention, be unavailable without the issuance of a citation by local law enforcement or reporting of an illegal traffic behavior by a concerned motorist to a customer complaint line as is often offered through 'How am I Driving?' report lines advertised on backs of commercial trucking units.

[0051] An exemplary method for evaluating vehicle and/or operator performance is shown in FIGURE 3. The evaluation method 300 is initiated by a client request 302 from a user of the client 116 (FIG. 1). The client request 302 is initiated with an intention of receiving evaluation information to perform an evaluation of a vehicle and/or driver's performance. The client request 302 can comprise any number of variables including information concerning a particular driver, a particular vehicle, a particular time of day, or a particular route. The request can include real-time information or a historical record of information as well as performance over a particular road segment or with regard to particular road segment attributes.

[0052] In response to a client request 302, the analysis engine 110 (FIG. 1) will make a map data request 304 via processor 108. Map data request 304 will request specific map data 102 (FIG. 1) from a map database 104 (FIG. 1) in accordance with the variables of client request 302. The map data 102 retrieved from map database 104 in response to map data request 304 is determined by the scope of the aforementioned client request 302 and can include, for example, as little as data pertaining to a particular road segment 202 (FIG. 2A) or a larger return of data, for example, all road segments exhibiting a particular road segment attribute 223 (FIG. 2B).

[0053] Analysis engine 110 also makes a vehicle/operator data request 306 via processor 108 of the vehicle/operator database 106 (FIG. 1) seeking particular vehicle/operator data 128. The vehicle/operator data request 306 is made in accordance with the variables of the client request 302. The vehicle/operator data 128 retrieved from vehicle/operator database 106 is determined by the scope of the aforementioned client request 302 and can include, for example, as little as data pertaining to a particular vehicle/driver on one day or a larger return of data, for example, a vehicle/driver's performance over several weeks.

[0054] Retrieval of data from map database 104 and vehicle operator database 106 by the processor 108 on behalf of the analysis engine 110 in response to a client request 302 can occur serially or in parallel. The present invention is not limited by one field of data being retrieved prior to the second.

[0055] Upon retrieval of data by the processor 108 on behalf of an analysis engine 110, analysis engine 110 will perform an analysis of the various fields of data 308 in accordance with the client request 302. This analysis 308 can include any Boolean and/or logical, arithmetic, mathematical, or other operation for comparing data in response to the client request 302.

[0056] Following an analysis 308, the report generator 112 will take the analyzed data and any indications to generate a report 310. The report is generated in accordance with criteria set by the user in its client request 302. Such a report can include, for example, a particular driver's highest speed along a particular route or a particular driver's time spent traveling above the posted speed limit (speeding) for a particular road segment. The scope of the report generated 310 by a report generator 112 is limited only by the scope of the client request 302 and the available data in a map and vehicle/operator database.

[0057] Following generation of a driver/vehicle report, evaluation information 130, often in the form of a chart or graph, is delivered 312 by the processor 108 on behalf of the report generator 112 to the user making the initial client request 302. Examples of evaluation information are exemplified in Figures 4 and 5.

[0058] The method also allows for retrieval of real-time vehicle/operator information concerning a particular vehicle or driver that may not be immediately available in vehicle/operator database 106. There can exist instances where the processor 108 is unable to retrieve the data requested by an analysis engine 110 because the vehicle/operator data 128 is in real-time and/or has not yet been transmitted to the processor 108 and/or stored in the vehicle/operator database 106. In these instances, the processor 108, on behalf of analysis engine 110, can make a real-time request 314 to a particular vehicle 124 (FIG. 1) via any number of relays 120 (FIG. 1) and or network 118 (FIG. 1) as is necessary. Upon receiving this request, the operative data-collecting component in vehicle 124 will deliver the requested vehicle data 122 via a real-time response 316 through any number of relays 120 and or network 118, as is necessary, to the processor 108 and analysis engine 110.

[0059] Processor 108 can, either serially or in parallel, store the newly received data from the real-time response 316 via a storage step 318 as it is being analyzed 308 by an analysis engine 110. Completion of the evaluation method 300 would then continue via report generation 310 and delivery of evaluation information 312.

[0060] FIGURE 4 illustrates a representative format for reporting, in a table, analyzed map and vehicle/operator data in accordance one embodiment of the present invention. In this exemplary Fleet Summary Report 402, a fleet manager can quickly determine a rank of each of the drivers in a fleet. This report draws the fleet manager's attention to potential problematic drivers who may need closer supervision or training. Exemplary rankings include: percentage of route speeding (404); percentage of streets speeding (406); average speed (408); highest speed on a freeway (410); highest speed on city streets (412); most significant speed related incident (414); and other criterion defined by a user.

[0061] FIGURE 5 illustrates another representative format for graphically reporting analyzed map and vehicle/operator data in accordance with one embodiment of the present invention. The exemplary Graphical Fleet Summary Report 502 shown in FIGURE 5 is designed to draw attention to potentially dangerous incidents. This report 502 graphically presents a detailed path of a vehicle 504, and uses colors or any other visual representation to highlight driver incidents 506. When the user places a computer mouse over the path 504 a window 508 appears giving detailed information on the corresponding incident 506. For example, after obeying the speed limit over segment B (*e.g.*, hence no indications to the contrary), the driver over segment A is shown to be traveling at 112 kph in a 60 kph zone for that road segment. A user utilizing the evaluation method exemplified in FIGURE 3 can obtain this information in real-time or post-transmission.

[0062] By utilizing the exemplary reports of Figures 4 and 5 or any other report generated by the system a fleet supervisor can get a comparative overview of all his drivers according to criteria (pre-set or otherwise). This driver ranking report can then be used to highlight those drivers most in need of closer supervision or training. Insurance companies can encourage their fleet manager clients to use the system and method to lower loss ratios or, in other words, reduces crashes and save lives.

[0063] In addition to the report outlined in FIGURES 4 and 5, other delivery formats such as e-mail-based reports can be used to provide information to a user.

[0064] In some embodiments, known probabilistic approaches can be applied to predict a vehicle's or an operator's future tendencies because embodiments of the present invention overcomes the shortcomings in data quality that traditional binary approaches cannot. Importantly, exemplary methods described herein assess the "geographic context" to telemetric reporting by taking into account, for example, changing speed limit information. In other embodiments, specific weather/construction conditions relating to a specific road segment is considered in the calculus of ranking drivers (*e.g.,* whether it was raining at, or in the vicinity of, a specific road segment, where such meteorological data is retrieved from other databases containing such information).

[0065] One having ordinary skill in the art should appreciate that the methodologies discussed herein take into account that sensor error occurs and underlying map attribute data may be outdated or erroneous (*e.g.,* a speed limit may be been changed). In some embodiments, these errors are detected or accommodated by the system via manual updates to the map database 104 (*e.g.,* a new batch of map information introduced via a CD-ROM or entered manually by hand) or, in some embodiments, by data reported by the driver of a vehicle 124 during transmission of vehicle data 122, which can include data pertaining to new or changed road segment attributes. Some map databases 104 might be connected to an outside network (not shown) to automatically obtain new map data 102 via an Internet connection to a third-party server providing regularly updated map data 102.

[0066] Additionally, more than one type of underlying map database 104 can used to adapt to differences in sets of map data 102 and be used to test the effect of map quality on the report results as maps from some providers contain more attribute error than others.

[0067] In some embodiments, a database can be used to provide information regarding trip time, location, weather, congestion, road construction, types of cargo, etc. to refine the data collected to generate more meaningful reports. That said, an exemplary report in accordance with the present invention could highlight specific incidents and can have a strong deterrent effect and discourage irresponsible driving habits when used by a fleet manager as part of a safety program.

[0068] In other embodiments, additional report elements outlined above can further include inferred vector versus reported vector. Most in-vehicle GPS receivers calculate and record speed but some only record latitude and longitude. The present invention may infer latitude and longitude from speed.

[0069] The above description is illustrative and not restrictive. Many variations of the present invention will become apparent to those of skill in the art upon review of this disclosure. The scope of the present invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the appended claims along with their full scope of equivalents.

WHAT IS CLAIMED IS:

1. A system for evaluating performance of a vehicle comprising:

a processor;

an analysis engine configured to analyze data from a database and generate an indication;

a report generator configured to generate evaluation information;

a map database configured to provide map data; and

a vehicle/operator database configured to provide vehicle/operator data.

2. The system of claim 1 further comprising a client for accessing the processor.

3. The system of claim 2 wherein the evaluation information is delivered to the client.

4. The system of claim 3 wherein delivery of the evaluation information occurs over at least a network.

5. The system of claim 3 wherein the processor delivers the evaluation information in response to a client request.

6. The system of claim 1 wherein the map data comprises at least one road segment attribute associated with at least one road segment.

7. The system of claim 1 further comprising a vehicle wherein vehicle data is generated at the vehicle and transmitted via at least one relay and a network to the processor.

8. The system of claim 7 wherein the vehicle data comprises vector data.

9. The system of claim 7 wherein the vehicle data comprises operational data.

10. A method for evaluating vehicle performance comprising:

retrieving map data from a map database;

retrieving vehicle/operator data from a vehicle/operator database;

analyzing the vehicle/operator data against the map data; and

generating evaluation information.

11. The method of claim 10 further comprising delivering evaluation information.

12. The method of claim 11 wherein delivery of evaluation information occurs over at least a network.

13. The method of claim 11 wherein delivery of evaluation information occurs in response to a client request.

14. The method of claim 10 further comprising generating vehicle data at a vehicle.

15. The method of claim 14 further comprising transmitting the vehicle data to the processor.

16. A method for evaluating vehicle performance comprising:

generating vehicle data;

transmitting the vehicle data to a processor;

retrieving map data from a map database;

analyzing the vehicle data against the map data; and

generating evaluation information.

17. The method of claim 16 wherein transmitting the vehicle data to a processor occurs over at least a relay and a network.

18. The method of claim 16 further comprising delivering evaluation information.

19. A method for evaluating vehicle performance comprising:

retrieving map data from a map database;

attempting to retrieve vehicle/operator data from a vehicle/operator database;

determining the vehicle/operator data is not available;

requesting vehicle data from a vehicle;

transmitting the vehicle data to a processor;

analyzing the vehicle data against the map data; and

generating evaluation information.

20. The method of claim 19 wherein requesting vehicle data occurs over at least a relay and a network.

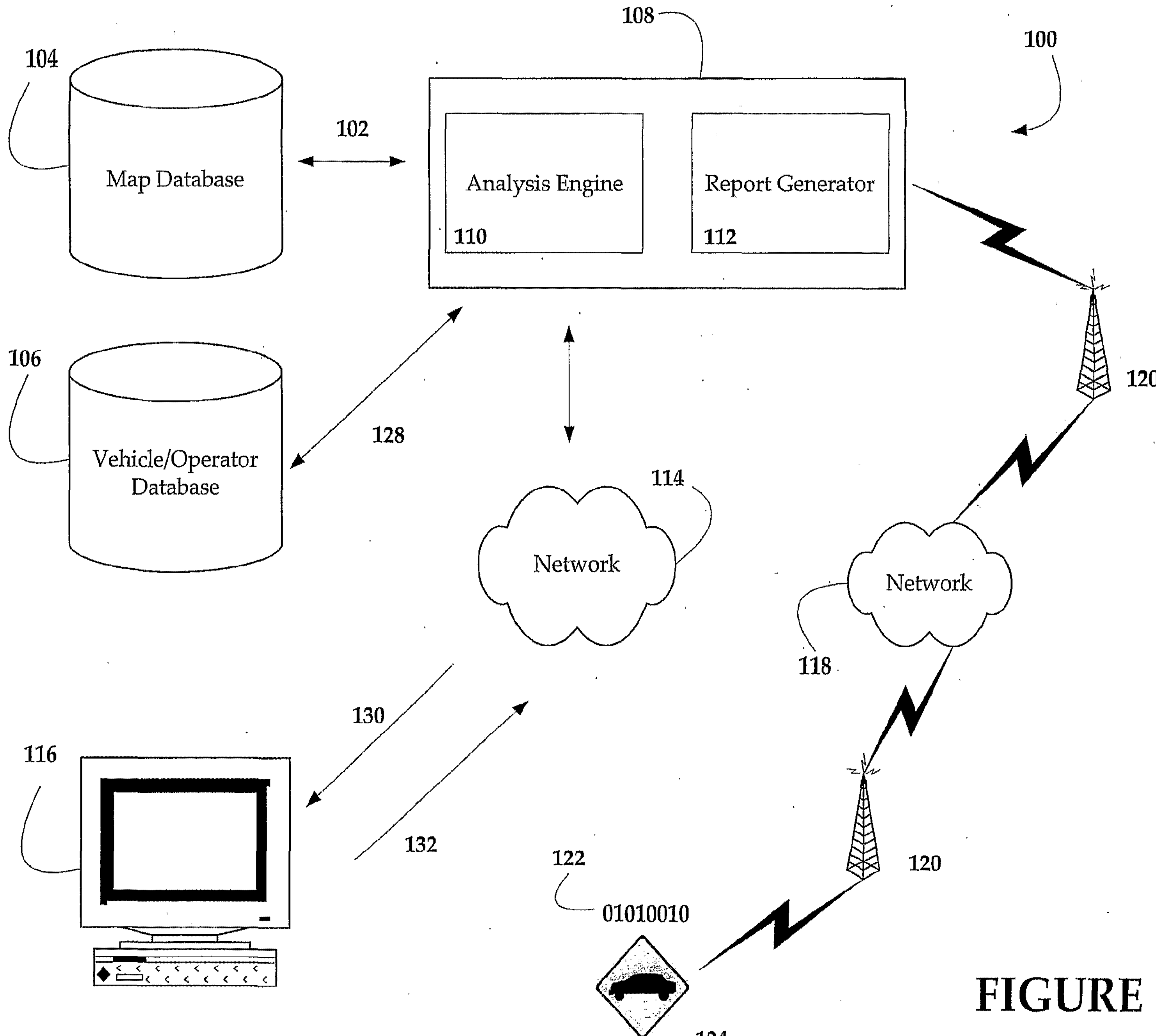

108
100
104
Map Database
102
Analysis Engine
110
Report Generator
112
106
Vehicle/Operator Database
128
120
114
Network
Network
118
130
116
132
122
01010010
120
124

FIGURE 1

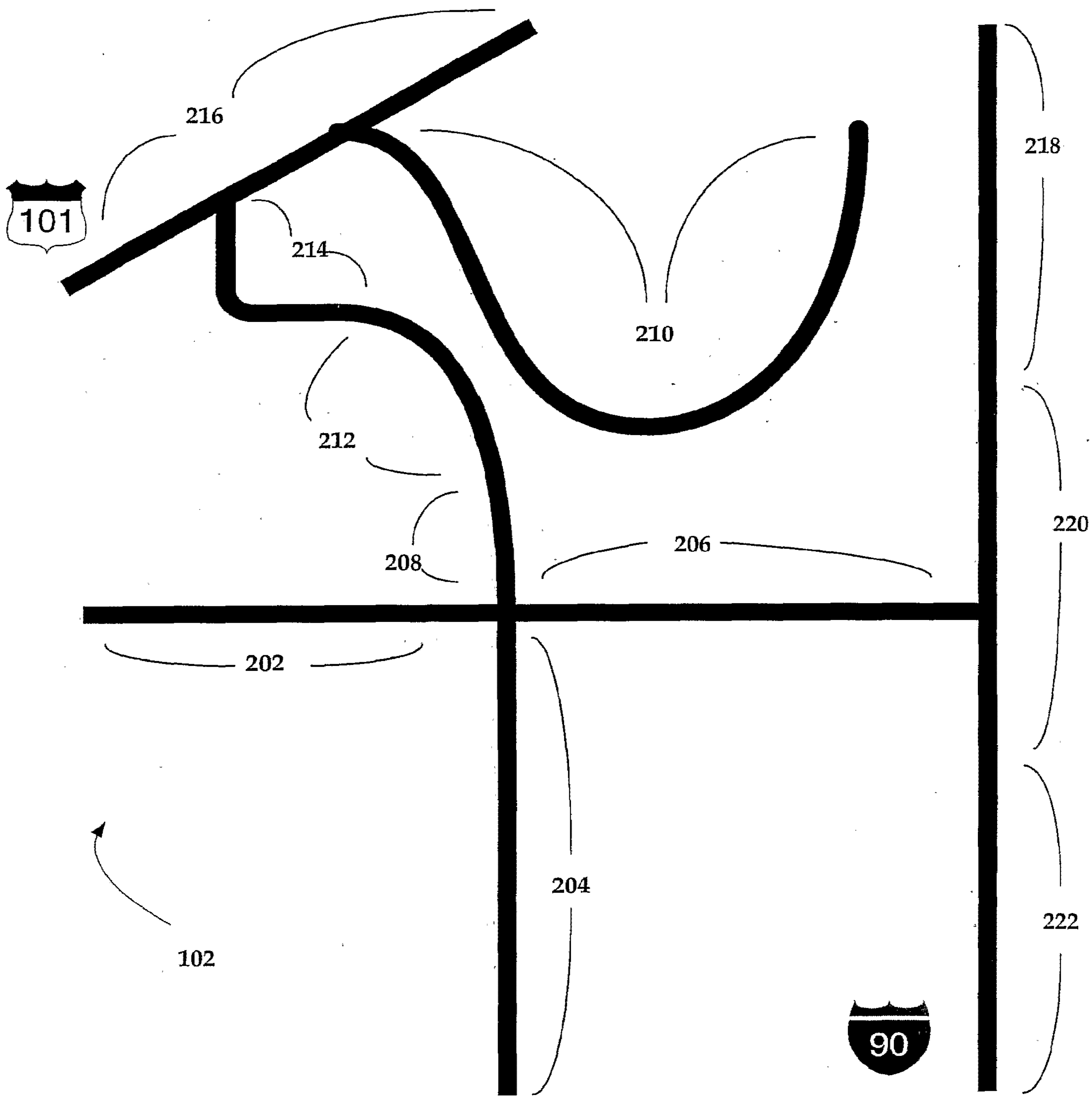


FIGURE 2A

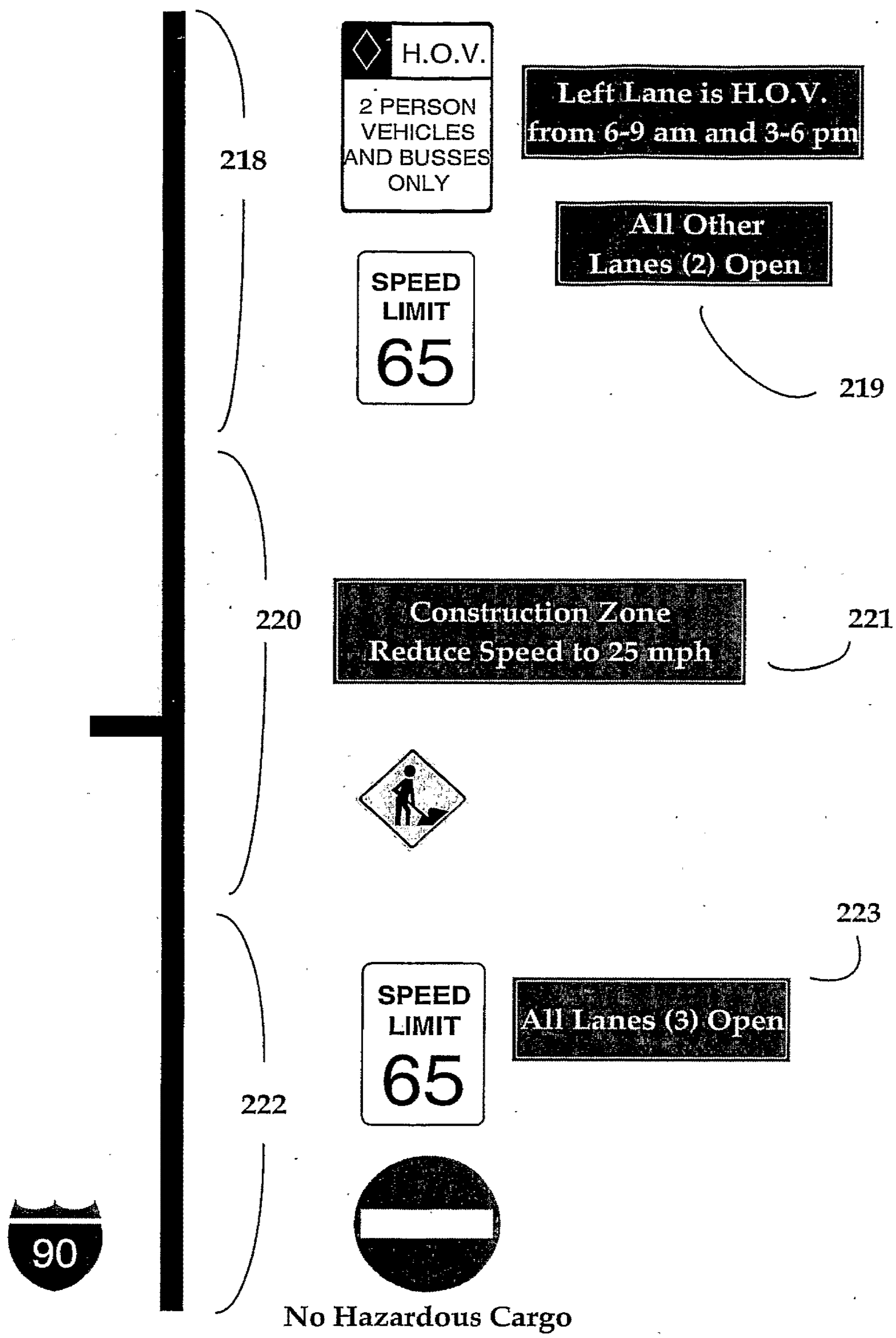

H.O.V.
2 PERSON VEHICLES AND BUSSES ONLY
Left Lane is H.O.V. from 6-9 am and 3-6 pm
218
All Other Lanes (2) Open
SPEED LIMIT 65
219
Construction Zone Reduce Speed to 25 mph
220
221
223
SPEED LIMIT 65
All Lanes (3) Open
222
90
No Hazardous Cargo

FIGURE 2B

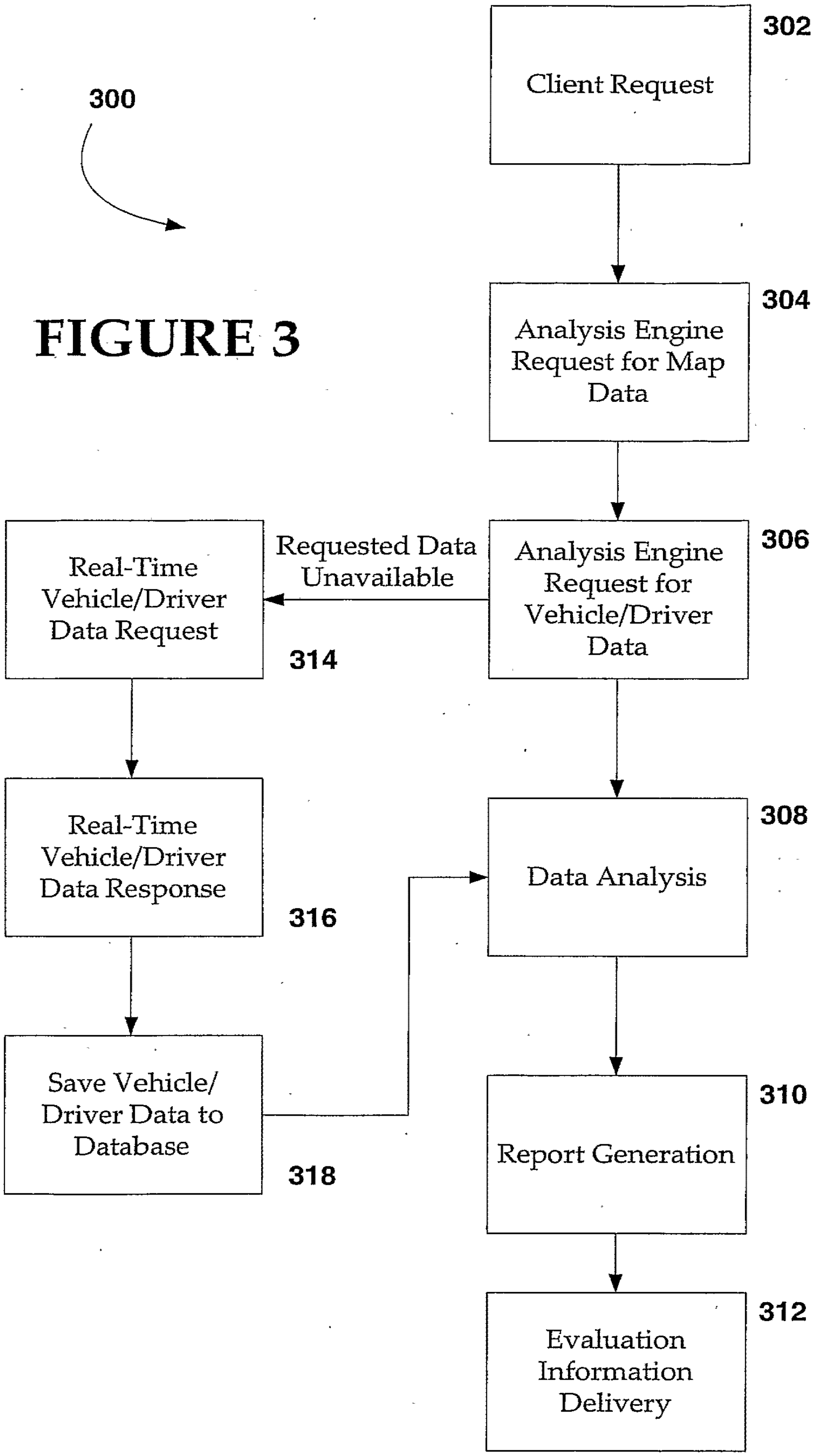

300
Client Request
302
Analysis Engine Request for Map Data
304
Analysis Engine Request for Vehicle/Driver Data
306
Requested Data Unavailable
Real-Time Vehicle/Driver Data Request
314
Real-Time Vehicle/Driver Data Response
316
Save Vehicle/ Driver Data to Database
318
Data Analysis
308
Report Generation
310
Evaluation Information Delivery
312

FIGURE 3

FLEET SUMMARY REPORT

Acme Distributing, Inc.
Fleet Speed Safety Report

Start Date: 6/15/03 12:00AM **Fleet Location:** San Francisco, Calif.
End Date: 6/16/03 12:00AM **Requested By:** T. Jameson

Speed Criteria:
20% above speed limit, minimum 10 MPH
Minimum duration: 10 seconds

							Most Serious Incident		
Vehicle ID	Driver ID	% of Route Speeding	% of Streets Speeding	Average Speed	Highest Speed (Freeway)	Highest Speed (City Streets)	Speed	Posted Speed Limit	Location
									***
Fleet Average	***	31%	19%	39	64	52	***	***	***
664	A. Jackson	45%	24%	44	77	62	62	30	1700 Harrison, San Francisco, CA
407	G. Apple	36%	22%	41	65	53	36	25	1600 Folsom, San Francisco, CA
961	R. Reid	35%	19%	45	72	62	35	25	Route 101, San Francisco, CA
903	J. Hubbard	35%	19%	45	72	62	35	20	Route 101, San Francisco, CA
840	F. Gupta	31%	26%	38	64	52	42	30	San Pablo Ave, Emeryville, CA
333	T. Swartz	31%	26%	38	64	52	42	30	El Camino, Menlo Park, CA
568	D. Strong	30%	15%	39	62	45	58	25	1700 Harrison, San Francisco, CA
214	R. Hill	30%	15%	39	62	45	58	30	I-880, Fremont, CA
682	K. Vlad	28%	18%	36	63	52	33	25	El Camino, Menlo Park, CA
272	A. Lions	26%	16%	37	61	45	**	**	**
789	W. Queen	26%	16%	37	61	45	**	**	**

404 408 412 414

402 406 410

FIGURE 4

GRAPHICAL FLEET SUMMARY REPORT

Single-Driver Speed Incident Map

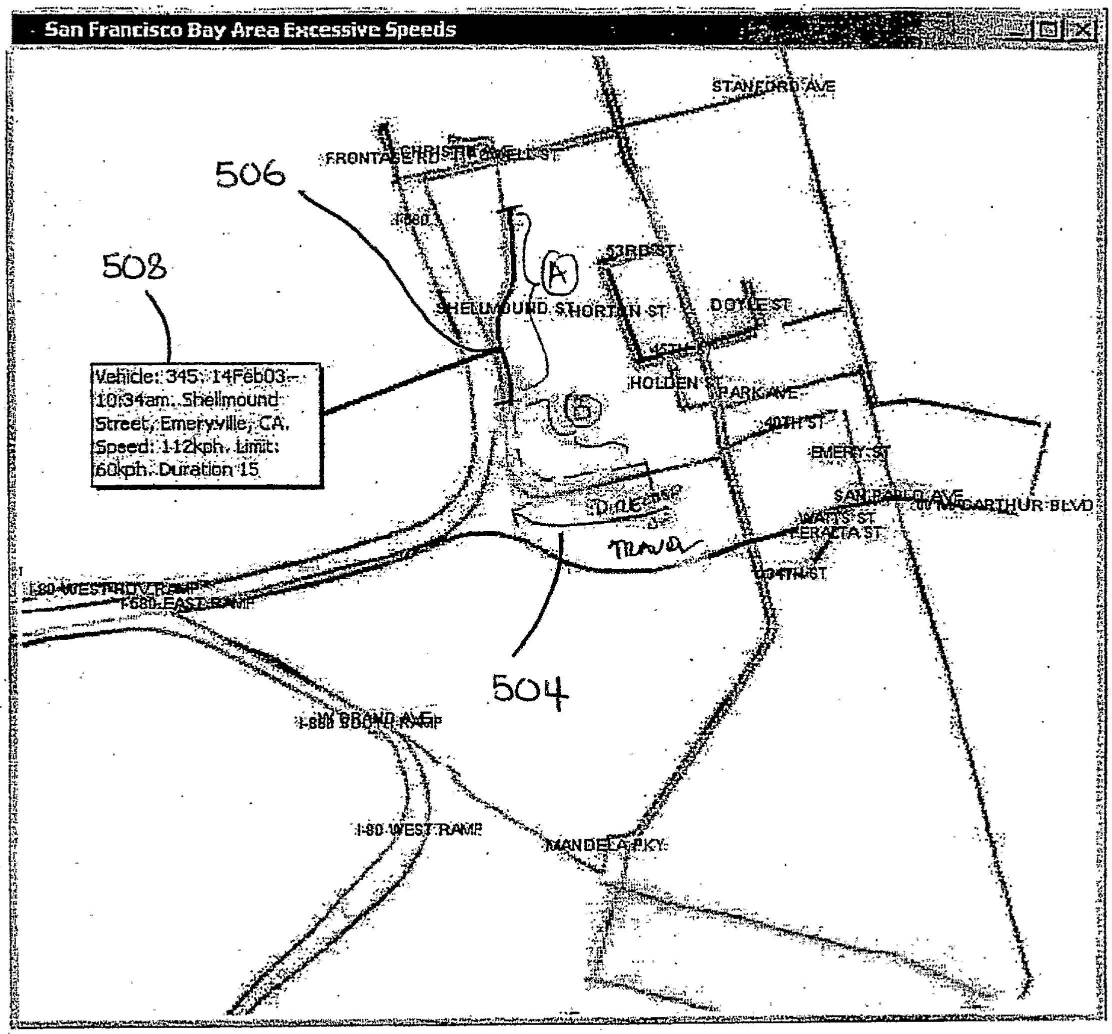


FIGURE 5

502

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/US2004/015364

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08G1/127

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G08G G06F G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/018628 A1 (HOY DAVID R ET AL) 30 August 2001 (2001-08-30) page 5, paragraphs 74,75 page 7; claim 1	1-20
X	US 6 064 970 A (HEINEN JOHN PATRICK ET AL) 16 May 2000 (2000-05-16) figure 6 column 4, lines 40-45 column 11, lines 4-25	1-20
A	US 5 465 079 A (ASBURY JIMMIE R ET AL) 7 November 1995 (1995-11-07) figure 18 column 5, lines 5-40	1-20
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 October 2004	26/10/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Coffa, A

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/US2004/015364

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 499 182 A (OUSBORNE JEFFREY) 12 March 1996 (1996-03-12) figure 1 column 9; claim 1	1-20

Form PCT/ISA/210 (continuation of second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

formation on patent family members

Inter nal Application No
PCT/US2004/015364

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2001018628 A1	30-08-2001	NONE	
US 6064970 A	16-05-2000	US 5797134 A	18-08-1998
		US 2004153362 A1	05-08-2004
		EP 0877992 A1	18-11-1998
		JP 11511581 T	05-10-1999
		WO 9727561 A1	31-07-1997
US 5465079 A	07-11-1995	US 5302956 A	12-04-1994
		AT 195387 T	15-08-2000
		AU 677858 B2	08-05-1997
		AU 7396494 A	14-03-1995
		BR 9407460 A	12-11-1996
		CA 2169262 A1	23-02-1995
		DE 69425500 D1	14-09-2000
		DE 69425500 T2	19-04-2001
		EP 0713595 A1	29-05-1996
		JP 9501784 T	18-02-1997
		WO 9505649 A1	23-02-1995
		AT 186124 T	15-11-1999
		AU 672821 B2	17-10-1996
		AU 5003393 A	15-03-1994
		BR 9306885 A	08-12-1998
		CA 2141546 A1	03-03-1994
		DE 69326896 D1	02-12-1999
		DE 69326896 T2	15-06-2000
		EP 0655141 A1	31-05-1995
		JP 2945821 B2	06-09-1999
		JP 6167565 A	14-06-1994
		KR 254144 B1	15-04-2000
		WO 9404940 A1	03-03-1994
		AU 667399 B2	21-03-1996
		AU 5003193 A	15-03-1994
		BR 9306901 A	08-12-1998
		CA 2141971 A1	03-03-1994
		EP 0655150 A1	31-05-1995
		JP 6223249 A	12-08-1994
		KR 267026 B1	15-09-2000
		WO 9404975 A1	03-03-1994
		US 5581464 A	03-12-1996
US 5499182 A	12-03-1996	NONE	

Electronic Patent Application Fee Transmittal

Application Number:	14620913
Filing Date:	
Title of Invention:	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls
First Named Inventor/Applicant Name:	Darrell Diem
Filer:	Robert S. Babayi
Attorney Docket Number:	GDAC-7

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	2202	6	40	240
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**240**

Electronic Acknowledgement Receipt

EFS ID:	21498968
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	13-FEB-2015
Filing Date:	
Time Stamp:	15:35:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$240
RAM confirmation Number	2025
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	Preliminary_Amendment.pdf	80327 cf4258d666ea3c50d9a6f68311d40273d0b666c7	no	7
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	updated_IDS.pdf	613446 ec94bbdc0cb187ad5d0d554b66551d91f8e65de4	no	6
Warnings:					
Information:					
3	Non Patent Literature	NPL1_Czarnecka.pdf	10535949 98f355b1001363f8e4c18ba2c57fec59222a4b7f	no	5
Warnings:					
Information:					
4	Foreign Reference	Foreign_Ref_1.pdf	1553050 adacc9841af0b665befdeb8b0c526055e26273ae	no	38
Warnings:					
Information:					
5	Foreign Reference	Foreign_ref_2.pdf	3726639 507a271c139a3336ab1826ef3adf384f13836acf	no	87
Warnings:					
Information:					
6	Foreign Reference	Foreign_Ref_3.pdf	1506561 1c801d85c56eae396ed8bc6dc91feff9ce64dce2	no	40
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	30352 f354961685a111adaea61e2fbef09518651cb7af	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	18046324		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/620,913	Filing Date 02/12/2015	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	02/13/2015	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	x $40 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	x $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/SHARAIN MORELAND/

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	GDAC-7
First Named Inventor	Darrell Diem
Title	System and Method for Conveying Event Information Based on Varying Levels of Admi
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

1. ☑ **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. ☑ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification** [*Total Pages* 37]
   Both the claims and abstract must start on a new page.
   (See MPEP § 608.01(a) for information on the preferred arrangement)
5. ☑ **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 21]
6. **Inventor's Oath or Declaration** [*Total Pages* 1]
   (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))
   a. ☐ Newly executed (original or copy)
   b. ☑ A copy from a prior application (37 CFR 1.63(d))
7. ☑ **Application Data Sheet** ** See note below.*
   See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R**
   in duplicate, large table, or Computer Program (*Appendix*)
   ☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission**
   (*if applicable, items a. – c. are required*)
   a. ☐ Computer Readable Form (CRF)
   b. ☐ Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PAPERS

10. ☐ **Assignment Papers** (cover sheet & document(s))
    Name of Assignee ______
11. ☐ **37 CFR 3.73(c) Statement** (*when there is an assignee*) ☑ **Power of Attorney**
12. ☐ **English Translation Document** (*if applicable*)
13. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. ☐ **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. ☐ **Nonpublication Request**
    Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. ☑ **Other:** Information Disclosure Statemtn

***Note**: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 98699 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Robert S. Babayi/	Date	02/03/2015
Name (Print/Type)	ROBERT S. BABAYI	Registration No. (Attorney/Agent)	33471

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	GDAC-7
	Application Number	
Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Darrell		Diem	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Madison	State/Province	AL	Country of Residence i	US

Mailing Address of Inventor:

Address 1	104 Haversham Lane		
Address 2			
City	Madison	State/Province	AL
Postal Code	35758	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	98699
Email Address	robert@babayilaw.com

Add Email Remove Email

Application Information:

Title of the Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls		
Attorney Docket Number	GDAC-7	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	21	Suggested Figure for Publication (if any)	

Filing By Reference :

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	GDAC-7
	Application Number	

Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country i

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

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Customer Number	98699		

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This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14270890	2014-05-06

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14270890	Continuation of	13948785	2013-07-23	8717166	2014-05-06

Prior Application Status	Patented	Remove

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	GDAC-7
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Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13948785	Continuation of	13550788	2012-07-17	8493207	2013-07-23
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13550788	Continuation of	13437725	2012-04-02	8223012	2012-07-17
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13437725	Continuation of	12428008	2009-04-22	8149113	2012-04-03
Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12428008	Continuation of	11335699	2006-01-20	7525425	2009-04-28
Prior Application Status	Expired			Remove	

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
11335699	Claims benefit of provisional	60752879	2005-12-23

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This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) i the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

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Application Number	Country i	Filing Date (YYYY-MM-DD)	Access Code i (if applicable)

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	GDAC-7
	Application Number	

Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	GDAC-7
	Application Number	

Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(●) Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :	
If the Applicant is an Organization check here.	☒
Organization Name	Geofence Data Access Controls LLC

Mailing Address Information For Applicant:

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Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	GDAC-7
	Application Number	

Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

Organization Name	Geofence Data Access Controls LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

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Address 2			
City	Huntsville	**State/Province**	AL
Country i	US	Postal Code	35801
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

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Signature	/Robert S. Babayi/			Date (YYYY-MM-DD)	2015-02-03
First Name	Robert	Last Name	Babayi	Registration Number	33471

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This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent C o o p eration Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls

Inventor: Darrell Diem

Field of the Invention

The present invention relates generally to a system and method for defining an event based on the relationship of an object location and a user-defined zone and managing the conveyance of information related to such object location event among computing devices. More particularly, the present invention relates to defining an object location event based on the location of an object relative to a user-defined zone and managing the conveyance of object location event information among computing devices based on user identification codes associated with the computing devices.

Background of the Invention

Various sources of information are available for determining the location of an object. Such location information sources include Global Positioning System (GPS) receivers, radars, radio frequency identification (RFID) tags, and variety of other technologies that can be used to determine location information pertaining to an object, which might be moving or stationary. Such location information has been used to track vehicles, packages, people, etc. and to enable a variety of location aware applications including location aware toll systems, material handling and supply chain management systems, and the like. Thus far, such location aware applications have mostly involved computing devices specifically programmed to provide location-aware functionality in a useful but predetermined manner. For example, scanners have been used as sources of information to convey the locations of shipping containers as they progress through various stages en route to a destination, where the specific location of a given shipping container on a shipping dock or in a cargo hold can be accessed at any given time via a control system.

Technological advancements in computing devices and information networks, in particular wireless networks, have enabled users of a variety of computing devices such as smart phones, personal digital assistants (PDAs), laptop computers, etc. to access and utilize information in more and more locations. For example, such advances now allow users to wirelessly check their email or to surf the Internet from anywhere that is covered by an appropriate data service. Some computing devices have become equipped with technologies that integrate various sources that provide information about the location of the devices. For example, known mobile devices have been equipped with GPS receivers, which enable the users to know where they are located at any given time.

As sources that offer location information become more useful in computing devices and within information networks, there is a need for a system and method that correlates events with location of objects and conveys information about such events to computing devices.

Summary of the Invention

Briefly, the present invention relates to conveying information relating to an object to one or more users. The invention requires defining a zone by the one or more users. An event is also defined in terms of a condition related to a relationship between an object location and the zone. The condition can relates to entry by the object into the zone, exit by the object from the zone, or proximity of the object to the zone Upon meeting the condition, information regarding the event is conveyed to the at least one of the one or more users. The one or more users can access at least one of the location information, information relating to the zone or conveyed information regarding the event using one or more access control codes. The access control codes can be configured to require multiple levels of access control.

Thus, the present invention relates to a system and method for defining events that are correlated with the location of one or more objects to one or more zones. Hereinafter, such events are referred to as object location events. The object location events can be defined at an application level or a user level. The system and method of the invention also conveys information relating to the object location event to one or more computing devices, which, in an exemplary embodiment of the invention, are associated with corresponding identification codes of one or more users. For example, association of a user identification code with a computing device can be an embedded association (e.g., hard-wired) or it can be based on a user log-in at the computing device. In one embodiment, the object location event relates to information about a location of an object and information about a zone that is defined by a user. The information about the location can be derived from a location information source that is associated with the object. Under this embodiment, the object location event occurs by satisfaction of a defined relationship or condition between the object location information and user-defined zone information. Once the condition is satisfied, information corresponding to the occurrence of the object location event is conveyed to a computing device. In one embodiment of the invention, the information is conveyed to the computing device in accordance with a corresponding user identification code.

In one exemplary embodiment, a user can associate a source of location information with an object and define a zone. Under this arrangement, any other authorized user that has access to information about location of an object and a user-defined zone can also define an object location event for that zone and receive information about occurrence of the event. Under another arrangement, only the user who defines a user-defined zone can define an object location event for that zone.

In a further embodiment, an access code is associated with information about the location of an object. Under this embodiment, the object location information is conveyed to the computing device based upon the user identification code and an access code associated with the location information. Under another arrangement, only the user that associates a source of location information with an object can associate the access code with the object location information as determined by the source of location information.

In yet another embodiment, an access code is associated with the user-defined zone information. Under this embodiment, the user-defined zone information is conveyed to at least one of the computing devices based upon a corresponding user identification code and an access code for the user-defined zone information. Under another arrangement, only the user that defines a user-defined zone can associate the access code with the user-defined zone information.

In still another embodiment, an access code is associated with information about an object location event. Under this embodiment, the information about the object location event is conveyed to at least one of the computing devices based upon a corresponding user identification code and an access code for the object location event information. Under another arrangement, only the user that defines the object location event can associate the access code with the object location event information.

Brief Description of the Drawings

The present invention is described with reference to the accompanying drawings. In the drawings, like reference numbers indicate identical or functionally similar elements. Additionally, the left-most digit(s) of a reference number identifies the drawing in which the reference number first appears.

FIG. 1 illustrates an exemplary information-sharing environment including computing devices having wired or wireless connectivity to the Internet and a map server, and various objects for which location information sources provide object location information;

FIG. 2 illustrates an exemplary map retrieved from the map server of FIG. 1 via the Internet that includes an icon indicating a location of a vehicle relative to three user-defined zones.

FIG. 3 illustrates a first embodiment of a method of the invention where object location event information is conveyed to computing devices based upon user identification codes;

FIG. 4 illustrates a second embodiment of a method of the invention where object location information is conveyed to computing devices based upon an object location information access code and user identification codes, and object location event information is conveyed to computing devices based upon user identification codes;

FIG. 5 illustrates a third embodiment of a method of the invention where user-defined zone information is conveyed to computing devices based upon a user-defined zone information access code and user identification codes, and object location event information is conveyed to computing devices based upon user identification codes;

FIG. 6 illustrates a fourth embodiment of a method of the invention where object location event information is conveyed to computing devices based upon an object location event information access code and user identification codes;

FIG. 7 illustrates a fifth embodiment of a method of the invention where object location information are conveyed to computing devices based upon an object location information access code and user identification codes, user-defined zone information is conveyed to computing devices based upon a user-defined zone information access code and user identification codes, and object location event information is conveyed to computing devices based upon an object location event information access code and user identification codes;

FIG. 8 illustrates an exemplary PDA Application Launch Screen used to begin execution of a Location and Tracking software as implemented according to the present invention;

FIG. 9 illustrates an exemplary Main Screen of the Location and Tracking software from which additional screens are accessed;

FIG. 10 illustrates an exemplary Configuration Screen of the Location and Tracking software used to manage information corresponding to the user of the PDA;

FIG. 11 illustrates an exemplary GPS Screen of the Location and Tracking software used to manage a GPS receiver that is associated with a user's PDA via a Bluetooth connection;

FIG. 12a illustrates an exemplary Tracking Setup Screen of the Location and Tracking software used to control the rate at which GPS data is polled;

FIG. 12b illustrates an exemplary Log File Selection Screen of the Location and Tracking software used to select a log file for storing GPS information;

FIG. 13a illustrates an exemplary Map Screen of the Location and Tracking software used to display a map received from a map server;

FIG. 13b illustrates an exemplary Data Screen of the Location and Tracking software used to manage conveyance of tracking and zone information to specific users based on access codes;

FIG. 13c illustrates an exemplary Zone Screen of the Location and Tracking software used to define user-defined zones;

FIG. 13d illustrates an exemplary Size Screen of the Location and Tracking software used to manage the size and other characteristics of a displayed map;

FIG. 13e illustrates an exemplary About Screen of the Location and Tracking software used to provide a notice concerning Tracking Privacy Issues, software version information, and copyright information;

FIG. 14 illustrates an exemplary Group Screen of the Location and Tracking software used to manage information corresponding to groups of contacts;

FIG. 15 illustrates an exemplary Contact Screen of the Location and Tracking software used to manage information corresponding to contacts;

FIG. 16 illustrates an exemplary Camera Screen of the Location and Tracking software used to manage pictures to be associated with contact location information;

FIG. 17 illustrates an exemplary Big Buttons Screen of the Location and Tracking software used to provide easy access to key application commands while walking or driving;

FIG. 18 illustrates an exemplary Map Viewer Web Page used for displaying maps and other information conveyed by the Location and Tracking software;

FIG. 19 illustrates an exemplary Contact Viewer Web Page used for displaying contact information conveyed by the Location and Tracking software;

FIG. 20 illustrates an exemplary web page-based display of a map overlaid with GPS tracking and zone information conveyed by the Location and Tracking software;

FIG. 21 illustrates an exemplary web page for creation of a zone used by the Location and Tracking software;

FIG. 22 illustrates an exemplary map displayed on a web page depicting logging of contact location information while a contact is within a zone and logging of contact location information when a contact enters or leaves a zone; and

FIG. 23 illustrates an exemplary map displayed on a web page depicting a picture associated with a location of a contact.

Detailed Description of the Invention

The present invention will now be described more fully in detail with reference to the accompanying drawings, in which the preferred embodiments of the invention are shown. This invention should not, however, be construed as limited to the embodiments set forth herein; rather, they are provided so that this disclosure will be thorough and complete and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

The present invention provides a system and method for defining an event that relates to a location of an object and managing the conveyance of related information among computing devices associated with corresponding user identification codes. In accordance with the present invention, an information-sharing environment consists of a computing network including a map server and computing devices. Objects associated with sources of location information provide object location information comprising one or more coordinates. In an exemplary embodiment, the coordinates correspond to one or more determined locations of the objects within an established coordinate system. In the system and method of the present invention, an object can comprise any device, thing, person or entity that can be located or tracked. A user of a computing device can retrieve a map, for example, from a map server and define a user-defined zone on the map. According to one aspect of the invention, an object location event is defined based on a relationship between one or more object locations and one or more user-defined zones, where the occurrence of the object location event is determined when a condition associated with the relationship is satisfied. Thus, an occurrence of the object location event is determined based on object location information and user-defined zone information. In other words, an object location event is determined based on the location of an object relative to a user-defined zone. More generally, an object location event may be determined based on the location(s) of one or more objects relative to one or more user-defined zones. Upon occurrence of the object location event, object location event information is conveyed to at least one computing device based upon a corresponding user identification code(s) associated with the computing device(s).

The present invention can be implemented in a variety of information-sharing environments. The sharing of information may be managed among a small number of users such as a family or group of friends, or among a very large number of users such as among employees of very large business, or among a worldwide user base such as a might be provided via an Internet service. Furthermore, information-sharing environments may involve information-sharing environments within information-sharing environments. That is, one or more smaller information-sharing environments may overlap or coexist independent of each other within one or more larger information-sharing environments.

In one embodiment, one or more administrators may be given privileges to configure the information-sharing environment. Such configuration could include specifying authorized users of the environment and their access privileges, etc. Such configuration can also define groups of users as part of an established organizational structure associated with the information-sharing environment. Pre-defined zones comprising domains can be configured along with events that define relationships between object locations relative to such domains. Moreover, sources of publicly available object location information, such as weather tracking systems; can also be configured for use with the system and method of the present invention. Because smaller information-sharing environments can exist within larger information-sharing information environments, various levels of administrator privileges can exist. For example, an Internet service based on the present invention can be provided and administered such that anyone having access to the Internet can purchase the service and be an authorized user. A purchaser of the service can set up a company-wide information-sharing environment within the larger world-wide information-sharing environment that includes company employees, affiliates, Board members, guests, etc. A division within a company may set up its own information-sharing environment, and so on. A family can set up its own information-sharing environment and an individual may set up his or her own information-sharing environment. As such, each information-sharing environment can be administered so as to manage conveyance of information among computing devices based on user identification codes. Management of users, groups, domains, and publicly available object location information sources is described in greater detail below.

Referring to FIG. 1, information-sharing environment 100 includes computing network 102 having wired and wireless network links 104, 106 and connectivity to the Internet 108 that provides access to a map server 110 and map information 112. Also shown are objects associated with sources that provide object location information. Location information sources are shown including Global Positioning System (GPS) satellites 114a and GPS receivers 114b. Examples of various types of computing devices are shown interfacing with the computing network 102 including a PDA 116a, PDA having a GPS receiver 116b, a wireless smart phone 118a, a wireless smart phone having a GPS receiver 118b, a laptop computer 120a, a laptop computer having a GPS receiver 120b, a personal computer 122a, a personal computer having a GPS receiver 122b, and a digital television 124. Typically, one or more of the computing devices could be used as a control station. FIG. 1 also illustrates various examples of objects (e.g., devices, things, people, vehicles, animals, etc.) that can be associated with location information sources enabling object location information to be conveyed to computing devices. Examples of such objects depicted in FIG. 1 include a fireman 126a, semi truck 126b, crate 126c, car 126d, cow 126e, woman 126f, soldier 126g, child 126h, dog 126i, and a building 126j. Generally, any object can be associated with a location information source in accordance with the present invention including the computing devices themselves. Such objects may be outdoors or indoors and may be included within another object such as, for example, a crate 126c within a semi truck 126b. Such objects may be mobile or fixed. At any given time, mobile objects may be moving or stationary. An object may located in any place, or be any thing. Examples of a place, or thing, in accordance with the invention include a restaurant, gas station, destination, airport, hospital, first aid station, hazardous location, vehicle repair shop, shopping mall, museum, park, residence, business, train station, bus station, post office, bank, police station, first station, department store, or storage bin.

Although FIG. 1 depicts a wireless network tower to represent wireless connectivity, any of various well known forms of networking technologies such as WI-FI, Wireless USB, cellular, Bluetooth, optical wireless, etc. can be used alone or in combination to provide the wired and/or wireless connectivity among the computing devices. Furthermore, any of various other location information sources can be used in place of or in combination with GPS to provide object location information. Alternative location information sources include cellular network based wide area location systems, infrared-based location systems, ultrasound-based location systems, video surveillance location systems, RF signal-based location systems such as WLAN-based location systems, ultra wideband location systems, and near field electromagnetic ranging location systems. GPS systems may be augmented using space based augmentation systems (SBAS) and/or local area augmentation systems (LAAS), radar-based information sources, and a data file. GPS systems can be outdoor GPS sources or indoor GPS sources. Alternatives to GPS also include GLONASS and Galileo. Generally, any form of location information system can be used that can provide a coordinate of an object allowing an icon indicating the object location to be depicted on a map.

In accordance with the present invention, the users of the computing devices each have user identification codes that can be associated with the computing devices in order to manage the conveyance of information to the computing devices based upon the identify of the user and information access privileges. Such user identification codes may be managed by a control station or may be established based on user unique user information. Such codes would typically include an identifier (e.g., a user account name or user number) and can be associated with one or more groups, and one or more information access privilege classifications, etc. For example, a given user may be included in a group indicating members of a family, a company, a club, or an association. Similarly, employees of a company may belong to one or more defined groups within the company (e.g., Management, Engineering, Accounting, etc.). Membership within a group may indicate the user can have access to confidential information such as company proprietary information or classified information such as the coordinates of military assets on a battlefield. Access to confidential information may also be based on an access privilege classification, such as a security clearance level. In accordance with the invention, a user’s access privileges can change by entering or leaving a domain, for example, the premises of a shopping mall, a particular store within a shopping mall, a museum, a restaurant, an airport, etc. The use of domains in accordance with the present invention is described in greater detail below. Furthermore, user identification codes are typically associated with other user information such as the user name, title, address information, email address, phone numbers, etc. As such, user identification codes can be associated with computing devices and used to manage the conveyance of information among the computing devices. Association of a given user identification code with a given computing device may be via a user login process whereby a user enters a user account name and password. Certain computing devices (e.g., a PDA or smart phone) may allow a user identification code to be embedded or programmed into a computing device's memory such that any user of the computing device is considered to be the user owning the device.

In accordance with the present invention, access codes can be associated with information to manage the conveyance of the information to computing devices. Specifically, an object location information access code can be associated with object location information. A user-defined zone information access code can be associated with user-defined zone information and/or an object location event information access code can be associated with object location event information. These access codes can be used in various ways. In one arrangement, an access code specifies the individual users and/or groups of users having access to the information to which the access code is associated. Such an access code would typically include specific user identification codes and/or group codes. For example, by a user logging into a computing device, a given user identification code is associated with the computing device. The user identification code may also be associated with one or more groups having corresponding group identification codes. The user identification code and group identification code(s) are compared to those included in the access code whereby a match would indicate the user is authorized to receive the information. As such, the information is conveyed to those computing devices that are associated with the users having access to the information as specified by the access code.

Under another arrangement, an access code is assigned to information in the form of a user-defined access code (i.e., a password) that a given user must have knowledge of in order to be granted access to the information. With this approach, the user associating the access code with information defines the user-defined access code and then conveys the user-defined access code to other trusted users to which the user desires to have access to the information. Those trusted users must enter the access code into their computing devices in order to be granted access to the information.

Under still another arrangement, an access code specifies the individual users or groups having access to the information to which the access code is associated provided a given user knows the password. As such, the access code may specify one or more users and/or one or more groups that can enter the appropriate password in order to access the information. With this approach there are two conditions that must be met to gain access, being included on the access list and having knowledge of the password allowing access to information to be managed by changing the access list and/or changing the password.

Under yet another arrangement, an access code may include a clearance classification code such as Proprietary, Confidential, Secret, Top Secret, etc. These access codes may also specify individual users or groups and may be used with passwords. For example, employees of a company having at least a Secret clearance classification that know the password are provided access to certain information. Generally, many different variations of access code approaches can be used to practice the present invention.

FIG. 2 illustrates an exemplary map 200 retrieved via the Internet from a map service provider, such as YAHOO!, displayed on a PDA or other computing device. Any map available from any of various map providers via the Internet can be used in accordance with the present invention. Referring to FIG. 2, map 200 depicts an area including a portion of Huntsville, Alabama alongside part of Redstone Arsenal, Alabama. Shown on the map is an icon 202 that indicates the location of a car equipped or somehow associated with a source of location information, such as GPS. The location information source determines the location of the car and conveys the object location information to the computing environment to which the computing device displaying the map is interfaced. Most location information sources include communications capabilities enabling them to convey object location information. Also shown in FIG. 2 are three user-defined zones 204, 206, and 208. Such user-defined zones can be defined using various graphical techniques such as selecting a point and dragging to another point causing a rectangular shaped zone (like 208) to be defined. Alternatively, a point can be selected indicating the center of a circular zone and a dragging action made to define a range of the circular zone (like 206). Various other common drawing techniques such as free form drawing can be used to define a zone not having a basic shape (like 204). Furthermore, non drawing techniques can be employed to define a user-defined zone including use of coordinates stored in a database. For example, the perimeter coordinates of a surveyed property that are stored in a database could be automatically used to define a user-defined zone in accordance with the invention.

In accordance with the present invention, one or more object location events can be defined relating a given user-defined zone to the location of a given object or objects. Occurrence of an object location event can result in generating relevant information (i.e., object location event information) or performing a function (i.e., object location event function). The object location event function can include generating a time/date stamp, send an email, place a call, sound an alarm, etc. Thus, an object location event in accordance with the invention can require the performance or control of a function based on an object location relative to a user-defined zone. An object location event can, for example, be defined to occur when a specific object or any one or more objects enter, leave, or are within a defined proximity of a user-defined zone. An object location event may also be defined to occur periodically as long as an object is outside a user-defined zone or inside a user-defined zone. Alternatively, an object location event may be defined to occur when the location of an object is determined to be within a given proximity of a user-defined zone, for example, within 500 feet of a user-defined zone corresponding to the grounds of a school, a shopping mall, a building, an army base, etc.. An event may also be defined to occur when one or more objects or specific objects have entered or exited one or user-defined zones or specific user-defined zones.

Referring again to FIG. 2, an example scenario is described relating the location of the vehicle 202 to the three user-defined zones 204, 206, and 208. The exemplary scenario involves a mother desiring to track the location of a teenage daughter while she drives the vehicle 202. The vehicle 202 is equipped with a location information source (e.g., a GPS receiver) and is configured to transmit the location of the car at some data rate (e.g., transmits location every 5 seconds) when the car is powered on (i.e., car key is in the on position). The mother sets an object location information access code such that only the mother, specifically, a PDA or other computing device used by the mother, has authorized access to the object location information of the vehicle 202. The mother and daughter discuss her scheduled activity for the day and the corresponding travel among different places the daughter plans to go. According to the daughter's schedule, the daughter is to attend a softball game at a local ballpark, have lunch with friends at a local restaurant, and then go to a library on the campus of a local university to do research for a paper.

After discussing the daughter's plans for the day, the mother, using a PDA, retrieves a map and defines the three user-defined zones relating to three locations the daughter is supposed to be at during the day. Specifically, the mother creates the three user-defined zones 204, 206, 208 corresponding to the ballpark parking lot, restaurant, and university library, respectively, and defines object location events for each user-defined zone. For each of the three user-defined zones 204, 206, and 208, the mother defines an object location event where the mother will receive an email indicating the occurrence and time of the object location events, which correspond to when her daughter's car enters or leaves any of the three user-defined zones. The mother defines each of the three 'leaving user-defined zone' object location events such that when they occur they cause her PDA to make a sound (e.g., beep). The user-defined zones and defined object location events allow the mother to know when the daughter has safely arrived at the three places the daughter is to go that day. Furthermore, when the PDA beeps, the mother knows the daughter is in transit and can view the displayed map on the PDA to watch the icon indicating the location of the car as it travels between the user-defined zones or to home. The emails received based on the defined events provide a record of the daughter's entering and leaving the three user-defined zones and can be used to indicate characteristics of movement including the speed of a vehicle.

FIG. 3 illustrates a first embodiment of a method of the invention where object location event information is conveyed to computing devices based upon user identification codes. Referring to FIG. 3, a first embodiment of a method 300 of the invention consists of six steps 302-312. The first step 302 is to associate user identification codes with computing devices. The association can be an embedded association, for example, programming the user identification code in the memory of the computing device, or it can be accomplished via a log-in process at the computing devices using the user identification codes. The second step 304 is to associate a location information source with an object. Such association may involve equipping or attaching the object with or to the source of location information. A third step 306 is to define a zone. The zone can be defined by a user at any time. A fourth step 308 defines an object location event in terms of a relationship between information relating to the object location and user-defined zone. The fifth step 310 is to determine an occurrence of the object location event for example by detecting entry into, exit from or proximity with the user-defined zone. A sixth step 312 is to convey object location event information to computing devices based upon the user identification codes, for example, by sending an e-mail. The step 312 can also involve performing a function such as generating an alarm.

In accordance with one embodiment of the invention, any user can associate a source of location information with an object, define a user-defined zone, and define an object location event. As such, in relation to the example scenario of FIG. 2, steps 304-308 of method 300 are used by the user (i.e., a mother) to associate a GPS device with her daughter's vehicle and define three user-defined zones corresponding to the ballpark parking lot, restaurant, and university library. The user can also define object location events in terms of conditions that relate to entering into, leaving from or being in the proximity of the three user-defined zones. As stated above, upon the occurrence of the object location events, information can be conveyed to the mother's computing device via emails. Occurrence of event can also result in performance of certain functions, e.g., causing the mother's PDA to beep.

In addition to or alternatively to the event information, object location and/or zone information can be conveyed to the computing devices based on user identification codes, which comprise a first level of access control. The conveyance of any one or combination of the foregoing information, i.e., location, zone and/or event, can be to the same users or groups or different users or groups. A second, third, or additional layers of access control can also be applied to any one or combination of the location, zone and/or event information using corresponding access codes as further described below.

Referring to FIG. 4, another embodiment of a method 400 of the invention consists of six steps 302-312 of the first method 300 along with two additional steps 402,

404. As with the first method 300, the first two steps 302, 304 of method 400 associate user identification codes with computing devices and associate a source of location information with an object. With method 400, however, the added two steps 402, 404 associate an access code with the object location information and convey the object location information to computing devices based upon the access code of the object location information and user identification codes. The final four steps 306-312 of method 400 are the same as those of method 300, including conveying object location event information to computing devices based upon user identification codes.

Thus, FIG. 4 illustrates an embodiment where the object location information can be accessed by those users that have knowledge of the access code of the object location information. Under this embodiment, the user can give the access code to other trusted users for accessing the location information. Those having the knowledge of access code for the location information may or may not have access to other information such as the zone or event. Alternatively, users may be granted access to the object location information based on the access code without having knowledge of the access code.

In accordance with another exemplary embodiment, any one user can associate a location information source with an object, define a user-defined zone, and define an object location event. The user that associates a location information source with an object can also associate an access code with the object location information provided by the source. As such, in relation to the example scenario of FIG. 2, the mother can facilitate the conveyance of the object location information to another trusted user, who has knowledge of the access code, such as the father of the daughter. The mother may or may not allow conveyance of the zone or event information to the father. Alternatively, a user may be granted access to the object location information based on the object location information access code without having knowledge of the access code.

Referring to FIG. 5, a third embodiment of a method 500 of the invention consists of six steps 302-312 of the first method 300 along with two additional steps 502, 504. As with the first method 300, the first three steps 302, 304, 306 of method 500 are to associate user identification codes with computing devices, to associate a location information source with an object, and to define a user-defined zone. With method 500, however, the added two steps 502, 504 also associate an access code with the user-defined zone information. As a result, zone information can be conveyed to the computing devices based upon the access code for the user-defined zone information and user identification codes. The final three steps 308-312 of method 500 are the same as those of method 300, including conveying object location event information to computing devices based upon user identification codes. The event information under this embodiment however may or may be conveyed to those users with knowledge of the user-defined zone information access code. As such, in relation to the example scenario of FIG. 2, the method 500 enables the user (i.e., the mother) to associate a GPS device with her daughter's vehicle, to define three user-defined zones, and to define object location events associated with the three user-defined zones causing, upon the occurrence of the object location events, emails to the sent to the mother and her PDA to beep. By also associating user-defined zone information access codes with the three defined user-defined zones, the mother also enables the user-defined zone information to be conveyed to another user with knowledge of the access code, such as the father of the daughter.

In a further embodiment, steps 402 and 404 of method 400 could also be used with method 500, whereby the user (i.e., the mother) also associates an object location access code with the object location information such that both the mother and father receive the object location information allowing both parents to see the icon indicating the position of the daughter's car in relation to the three user-defined zones. In an alternative embodiment, any user having access to the user-defined zone information is enabled to define an object location event relating object location information to the user-defined zone information. Thus, under one arrangement, only the user who defines a user-defined zone can define an object location event relating to the user-defined zone, while under another arrangement, any user(s) having access to user-defined zone information can define an object location event relating to the corresponding user-defined zone.

FIG. 6 illustrates a fourth embodiment of a method of the invention where object location event information is conveyed to computing devices based upon an object location event information access code and user identification codes. Referring to FIG. 6, a fourth embodiment of a method 600 of the invention consists of five steps 302-310 of the first method 300 along with two additional steps 602, 604. As with the first method

300, the first four steps 302, 304, 306, 308 of method 600 associate user identification codes with computing devices, associate a location information source with an object, define a user-defined zone, and define an object location event in terms of a relationship between object location information and user-defined zone information. With method 600, however, step five 602 associates an object location event information access code with the object location event information relating to the object location event. After step six 310 determines the occurrence of an object location event, step seven 604 conveys object location event information to the computing devices based upon an access code for the object location event information and user identification codes. Thus, by using the object location event information access code, the mother could enable both parents to receive the object location event information corresponding to the object location events defined by the mother. In other words, both parents could receive emails indicating when the daughter entered or exited one of the three user-defined zones. In accordance with a preferred embodiment of the invention, the user that defines object location events can also associate access code for information that correspond to object location events. By also associating object location event information access codes with the defined object location events, the mother can enable the object location event information to be conveyed to another user with knowledge of such access code, such as the father of the daughter. Thus, with the method 600 in relation to the example of FIG. 2, the father would receive the object location event information but may or may not receive object location information or user-defined zone information.

In an alternative arrangement, steps 502 and 504 of method 500 could also be used with method 600 whereby a user (e.g., the mother) also associates an access code with the user-defined zone information for conveyance to another user with knowledge of such access code (e.g., the father). Under such an alternative arrangement, the object location event can be defined by any user(s) having access to the user-defined zone information or only the user that defined the user-defined zone. In either case, only the user that defines an object location event can associate an object location event information access code with object location event information corresponding to the object location event.

FIG. 7 illustrates a fifth embodiment of a method of the invention where object location information is conveyed to computing devices based upon an object location information access code and user identification codes, user-defined zone information is conveyed to computing devices based upon a user-defined zone information access code and user identification codes, and object location event information is conveyed to computing devices based upon an object location event information access code and user identification codes. Referring to FIG. 7, in the method 700, the steps of method 600 are again used with the addition of the two steps 402, 404 of method 400 and the two steps 502, 504 of method 500. With these additional four steps, when referring to the example of FIG. 2, the mother could associate object location information access codes and user-defined zone information access codes with object location information and user-defined zone information, respectively, in such a way as to allow both parents to receive emails, beeps, and view the movement of the daughter's car using their respective PDAs.

In accordance with the present invention, an administrator of an information-sharing environment maintains a database of user information for those having access to the information-sharing environment. Such a database can be maintained on a central or distributed control station that may be a company's computer server or on an individual's personal computer. Information maintained for a user typically includes a user account name and password and a user identification code, and may include a variety of information about the user including the user's name, address, phone number(s), email address(s), company name, title, birth date, etc. A user may be given access privileges to certain classes of information based on the user's position or role within a company or family, a Government security clearance, and/or for other reasons deemed appropriate for a given information-sharing environment.

An administrator can define one or more groups to which a given user can be associated. Groups may be defined in accordance with an organizational structure or hierarchy. For example, an administrator for an information-sharing environment corresponding to a company may define groups for the various organizations within the company, such as legal, accounting, shipping, etc., and for groups of users not based on organization, such as executive, management, administrative, exempt employees, non-exempt employees, etc. After a group has been defined, the administrator can associate individual users with one or more of the defined groups. Similarly, a parent administering an information-sharing environment might define groups such as parents, teenagers, children, drivers, and so forth. Information maintained for a group typically includes a group name and group identification code, and may include a variety of information about the group including the group's address, phone number, email address, website, point-of-contact, etc. As such, a user may be associated with one or more groups defined by an administrator of an information-sharing environment.

In accordance with the present invention, any user can define a group, for example, a group of friends, a study group, etc. Information for such user-defined groups may be maintained in a central database or may be maintained on an individual user's computer. As such, knowledge of the defined group my be available to other users of an information-sharing environment or may be maintained solely for an individual user's benefit.

In accordance with the present invention, one or more location information sources can be associated with an object to provide object location information consisting of a one or more coordinates corresponding to one or more determined locations of the object within an established coordinate system. In accordance with the invention, one or more coordinate systems can be established by an administrator to describe object locations within an information-sharing environment. The coordinate system may be established to accommodate the coordinate system used by any suitable map service. A typical coordinate system is known as the latitude, longitude, and height system. Alternative coordinate systems include the Earth Centered, Earth Fixed Cartesian (ECEF X-Y-Z) coordinate system, Universal Transverse Mercator (UTM) coordinate system, Military Grid Reference System (MGRS), World Geographic Reference System (GEOREF), Universal Polar Stereographic projection (UPS), national grid systems, state plane coordinates, public land rectangular surveys, metes and bounds, etc. A coordinate system may also be established corresponding to a domain, for example, an office building or a shopping mall. Additionally, one or more users may define a coordinate system for example, making the location of a user's home or business or a user's own location the (0,0) reference point within an X-Y coordinate system. As such, computing devices used in accordance with the invention may include means for translating between coordinate systems. Coordinate systems may be based upon the location information source(s) used. For example, a GPS receiver location information source may be placed at a location, for example the entry door of a building, and its GPS location in latitude and longitude and height used as a (0,0,0) reference point for a coordinate system used inside the building along with a second location information source such as UWB system better suited for indoor operation. As such, one or more coordinate systems established by an administrator or by a user of an information-sharing environment can be used to provide object location information.

In accordance with the present invention, when a user associates multiple location information sources with an object, the user can determine whether or how the object location information is used (e.g., combined). In particular, the user can determine how handoffs are to occur between location information sources such as switching among available GPS satellites based on received signal strength or switching between a GPS and UWB system when a user goes indoors, which might be based on loss or degradation of a GPS signal. Handoff among location information sources can be based upon object location information.

In accordance with the present invention, a user that associates an information location source with an object can determine how often object location information is updated. Under one arrangement, the user can determine the rate at which object location information is provided. Under another arrangement, object location information may be provided by the location information source at a certain rate which the user may select as the appropriate update rate or the user may select to update object location information less often or to only maintain (or use) the current object location information. Depending on whether object location information is being logged (i.e., stored) and/or conveyed to other users, decisions concerning the update rate typically involve a tradeoff of available storage capabilities (e.g., in memory, to a physical storage media, etc.) versus granularity of stored object location information and resulting accuracy of its display on a map. For example, object location information stored in a log file once every 5 seconds would allow a more accurate display of the movement of a vehicle than object location information stored once per minute, but the once per 5 second update rate requires twelve times the storage space compared to the space required to store object location information once per minute. When only maintaining the current object location information, the same memory/storage location can be repeatedly rewritten. The selected update rate also determines how often the object location information can be conveyed to users. The user can also determine whether a time stamp is associated with each update to indicate the actual time that an object was at a given location.

As previously described, the user that associates an information location source with an object can also associate an object location information access code with the object location information provided by the information source and can thereby manage the conveying of the object location information to one or more users. As generally described above, an object location information access code can specify individual users or groups allowed access to the object location information, may specify a password a user must know to receive access to the object location information, and/or may include a clearance classification code. As such, the object location information access code determines which user(s) are conveyed the object location information.

In accordance with the present invention, a user that associates an information location source with an object can determine whether to store object location information in a log file, which can be played back. The storage of object location information to a log file may be the result of the occurrence of a defined object location event. For example, a user could define two zones, a first object location event that starts logging object location information when an object exits the first zone, and a second object location event that ends the logging of object location information when the object enters the second zone, thereby allowing the movement of the object between the two zones to be reviewed at a later time. Alternatively, object location information may be provided by a simulation. For example, military officers could define battle plans based upon movement of personnel and equipment having location information sources into and out of defined zones and corresponding object location events. For training purposes, the movement of personnel and equipment could be produced by a simulation that inputs the object location information into the information sharing environment allowing the military officers to react by changing plans, defining new zones, new object location events, etc. Furthermore, object location information may by provided by emergency information sources, which might indicate the location of a fire, flood, earthquake, bridge out, etc. or by weather information sources, which might indicate the location of a severe thunderstorm, tornado, winter storm, hurricane, etc.

In accordance with the present invention, object location information and zone information is displayed on a map received from a map information source. In the example described previously in relation to FIG. 2, a map from an Internet map service was used that shows the streets of the city of Huntsville, Alabama at an appropriate scale for illustrating the movement of the daughter among three locations in the city. Under one scenario, a user could zoom in or out from a street scale to a world scale. Generally, any electronic map can be used in accordance with the present invention as appropriate to meet the informational requirements of the users involved. Furthermore, multiple maps can be used allowing different levels of scale as appropriate for the requirements of the user(s) involved in the sharing of information. A world map might be used, for example, that enables the locations of ships traveling to and from user-defined zones associated with various ports around the world to be displayed. A map of an amusement park might be used by a family visiting the park. A map may correspond to the inside of a building such as an office building or a shopping mall. A map may correspond to a battlefield. As such, map information corresponding to a given electronic map would be accessible to the computing devices of the information sharing environment receiving object location information, zone information, and/or object location event information that is to be displayed on the map. However, certain types of devices may be included in the information sharing environment that do not have the ability to receive or display a map but that can receive useful object location information, zone information, and/or object location event information, nonetheless. For example, an expecting woman might define a zone around her hospital and an object location event causing her Blackberry to call her sister's cellular telephone when her car enters the zone telling her that she has safely arrived at the hospital to deliver her baby.

Various commonly used map display management techniques can be employed in accordance with the present invention. For instance, an automatic zoom level selection scheme may be established where the zoom level defaults to the closest in level that can display all user-defined zones. An automatic centering approach might set the center of the map to correspond to the location of a given object such as the current location of a user or to the average location of multiple objects. Icons can be set to flash to indicate movement or non-movement of an object. Colors of lines or areas indicating a zone may change when an object has entered or exited the zone. Such map display management techniques may be controllable by an administrator and/or by individual users.

In accordance with the present invention, a user can define a user-defined zone on a map that can then be used to define an object location event relating object location information to user-defined zone information. A user-defined zone can be defined graphically using various techniques such as selecting a point and then dragging to another point to define either a rectangular shaped zone or a circular zone, drawing a zone by freehand to create a zone having an oddly shaped boundary, etc. As such, a user-defined zone has a boundary that can be specified in accordance with an established coordinate system. Typically user-defined zone information maintained for a user-defined zone includes a zone identification code and its boundary coordinates and may include a zone name, a zone security level, a zone danger level, etc. Generally, a user that defines a zone can associate zone information with the zone that can be conveyed to other users.

As stated above, a user that defines a zone can also associate a zone information access code with the user-defined zone information corresponding to the user-defined zone and can thereby manage the conveying of the user-defined zone information to one or more users. As generally described above, a user-defined zone information access code can specify individual users or groups allowed access to the user-defined zone information, may specify a password a user must know to receive access to the user-defined zone information, and/or may include a clearance classification code. As such, the user-defined zone information access code determines which user(s) are conveyed the user-defined zone information.

In accordance with the present invention, a user can define an object location event relating object location information to user-defined zone information. An object location event may be something that is to occur whenever a specific object enters and/or leaves a specific user-defined zone or an object location event may be something that is to occur whenever an object is or is not within a specified proximity of a user-defined zone. Under one aspect the invention, the occurrence of an object location event results in the conveyance of object location event information which includes object location information and user-defined zone information. Typically object location event information maintained for a defined object location event includes an object location event identification code and may include an object location event name, a time stamp, an object location event security level, an object location event danger level, etc. Generally, a user that defines an object location event can associate object location event information with the object location event that can be conveyed to other users. Under another aspect of the invention, the occurrence of an object location event results in performance of a function, including the control of a device such as a camera, motion sensor, garage door, web cam, lighting device, etc.

In accordance with the present invention, a user that defines an object location event can also associate an object location event information access code with the object location event information corresponding to the object location event and can thereby manage the conveying of the object location event information to one or more users. As generally described above, an object location event information access code can specify individual users or groups allowed access to the object location event information, may specify a password a user must know to receive access to the object location event information, and/or may include a clearance classification code. As such, the object location event information access code determines which user(s) are conveyed the object location event information.

An important distinction exists between the user-defined zones and object location events of the present invention, and predefined zones (or domains) and predefined object location events that have previously been used in location-aware applications. Predefined zones are used to provide location-aware functionality in a useful but predetermined manner where users of computing devices within the information sharing environment do not define the domain(s) or the events that occur as objects enter or leave the domains. A predefined zone may be a house, a room, a business perimeter, or a predefined area within a much larger area. One or more events involving the location of objects relative to the predefined zone is predetermined. The user of the computing devices in prior art shared information environment participates but does not otherwise control or manage the conveyance of information, which has all been predetermined. For instance, an alarm condition may be set when a person carries an object having a non-deactivated RFID tag into a predefined zone about an exit to a store whereby the alarm condition causes a recorded warning message to play on a loudspeaker. A motion detector may detect a person walking through a predefined area near a building and turn on a light. Kiosks within a zoo may interact with individuals carrying tracking devices that enter predefined areas about the kiosks. A super mall, itself a domain, may be subdivided into its tenant stores or even departments within stores, each a separate domain, and customers carrying tracking devices may be offered specials as they move about the mall.

The user-defined zones of the present invention can be defined by any user of the information sharing environment. User-defined zones can be used in conjunction with domains. For example, three teenage girls, each carrying a smart phone with a location information source, go to a mall where each of the three girls is a member of the mall's interactive shopping club. As they enter the mall, their smart phones automatically interface with the information sharing environment available within the mall. Their phones load the mall's map and begin to indicate their locations within the mall. The girls decide to split up and meet later at their favorite hangout spot within the mall, which is a sitting area near an escalator. One of them defines a user-defined zone on the mall's map corresponding to the sitting area and an object location event whereby the smart phones are sent an email and caused to beep when any of the girls enters the sitting area. They then split up to do some shopping. As they walk about the mall, they walk near kiosks that recognize their presence within predefined areas within the mall (via the smart phones) and the kiosks provide personalized specials such as, "Cindy. Your favorite pre-washed jeans are 30% off!" When one of the girls finishes shopping and goes to the sitting area, the other two girls are automatically emailed and their phones beep so that they know to go meet their friend at the sitting area. With this example, the user-defined zone (i.e., the sitting area) and the object location event (i.e., the emails/beeps) were not predefined as were the personalized specials provided by the kiosks as the girls walked into predefined zones.

Thus, a key distinction between the user-defined zones of the present invention and predefined zones of previous location-aware applications is that the occurrence of object location events and the management of the conveyance of object location event information is determined by the user of the computing device and not by someone else. Take for example, a traveling salesman who wants to make his day more efficient. In accordance with the present invention, prior to venturing out on the road, the salesman determines the nine sales calls he intends to make for the day and defines a user-defined zone about each sales call location. For each user-defined zone he defines object location events related to the location of his car and each zone. The time he enters or leaves each zone is to be recorded and, as he enters each zone, his PDA is to automatically receive the latest, up-to-the-minute customer information maintained by his sales office. For all but his last sales call he defines an object location event for when he leaves the corresponding zone to email his next sales call to let them know that he's en route to their business. The email sent when leaving his fourth call specifically mentions he'll be arriving in about one hour that is to include a lunch break. He also defines an object location event to email his wife letting her know the time when he leaves the zone corresponding to his last sales call thus allowing her to better plan her evening.

In accordance with the present invention, information packages can be associated with object location information, user-defined zone information, and/or object location event information where an information package may include a picture, movie, audio file, document, and/or data file. The information packages may include sensor information received from one or more sensors including those sensors that measure a characteristic of a physical environment, such as temperature, humidity, radioactivity, etc. and/or sensors that measure physical characteristics, such as heart rate, breathing rate, etc. At least one time stamp may be associated with an information package indicating the timing of the information included in the package, for example, the times when pictures were taken or sensor measurements were made. Under one arrangement, any user can associate an information package with object location information, user-defined zone information, and/or object location event information.

In accordance with the present invention, a user that associates an information package with object location information, user-defined zone information, and/or object location event information can also associate an information package access code with the information package and can thereby manage the conveying of the information package to one or more users. As generally described above, an information package access code can specify individual users or groups allowed access to the information package, may specify a password a user must know to receive access to the information package, and/or may include a clearance classification code. As such, the information package access code determines which user(s) are conveyed the information package.

Generally, the present invention enables any user of a multiple user computing environment to define object location events relating object location information to user-defined zones and to manage to conveyance of object location event information based on user identification codes. By also using access codes, multiple users can collaboratively define and manage events and manage the conveyance of corresponding object location information, user-defined zone information, and/or object location event information among computing devices. Moreover, the present invention provides a system and method for generating user-defined location aware applications. Described below are four examples of such user-defined location aware applications that are supported by the present invention.

Parole Officer Support

Parolees have associated with them a location information source. A parole officer can, on a case-by-case basis, identify good locations and bad locations for parolees and define object location events for entering such good and bad locations causing him to be notified of a given parolee visiting the locations.

Pet tracking

A pet has associated with it a location information source. The pet owner defines zones that the pet is supposed to stay in (e.g., a yard) and may define zones in which the pet is not allowed (e.g., a garden). An object location event for leaving the yard sends an email and phones the pet owner. An object location event for entering the garden might cause a siren to go off to scare the pet.

Child tracking

A child has associated with it a location information source. A parent identifies zones in the neighborhood where the child is allowed to play and explicitly not allowed to play. Object location events are defined where the parent is emailed or otherwise notified as the child moves about the neighborhood.

Hiking

Several hikers have associated with them location information sources. The hiking trail as indicated on a map includes user-defined zones corresponding to key locations along the route. Object location events are defined such that each hiker receives an email on their smart phone whenever another hiker enters or exits a zone.

The present invention is implemented by a Location and Tracking software that executes on PDAs, telephones, and personal computers. The Location and Tracking software is used for tracking the location of a user whereby user location information is conveyed to contacts based upon the location of the user relative to one or more zones defined by the user. As such, user location information described below corresponds to object location information generally described above.

The Location and Tracking software is typically used in the LOCATION mode. This means that a GPS connection is active and a polling rate is set to periodically send location packets indicating the location of the user to a central database. If a user sets TRACKING to OFF, location packets only update the current location record. If TRACKING is set to ON, location packet are saved in individual records that can be displayed as a 'Mapped Track' on a user’s PDA, Phone, or PC.

Current and prior user location information for one or more users can be conveyed to one or more users having access privileges to the user location information for display on the one or more users’ computing device(s). The current position of a given user is indicated by a black square. As such, as the user moves, black squares indicate the current and past location of the user thereby showing the movement or path of the user.

Zones comprise geographic boundaries. If the GPS receiver indicates a user’s location passes over a zone boundary, an exit or entry alert is issued. A notification is sent to one or more individuals as defined when the zone is created. Different types of zones can be created with each zone type causing different types of information to be conveyed when a user's location enters, exits, and/or is within a zone. Codes associated with the zones determine which users receive location information. As such, the codes associated with the zones correspond to the zone information access codes and object location event information access codes described generally above. Specifically, by sharing the Phone number and Code other users can 'load' the zone into their device and it will respond with alerts to the defined addressees thereby enabling group tracking and location management.

FIG. 8 illustrates an exemplary PDA Application Launch Screen 800 used to begin execution of the Location and Tracking software. Referring to FIG. 8, a PDA application launch screen 800 typically includes various icons corresponding to programs available for execution such as the Location and Tracking software icon 802. When a user selects the Location and Tracking software icon 802, the Location and Tracking software is executed.

FIG. 9 illustrates an exemplary Main Screen 900 of the Location and Tracking software that appears when the software is launched. The Main Screen 900 is the primary screen from which additional screens of the software are accessed via the buttons labeled Maps, Contacts, GPS, Config, Groups, Camera, and Buttons. Main Screen 900 is also the screen to which the user of the software is returned when closing screens associated with the buttons. The Exit button ends execution of the software and returns the user to the Application Launch Screen 800.

FIG. 10 illustrates an exemplary Configuration Screen 1000 of the Location and Tracking software used to manage information corresponding to the user of the PDA (or other computing device). The user of the program accesses the Configuration Screen 1000 by selecting the Config button of the Main Screen 900. Configuration Screen 1000 provides fields for entering a user data access code, user phone number, log file name, and a user domain or IP address. The screen is also used to toggle logging on and off.

FIG. 11 illustrates an exemplary GPS Screen 1100 of the Location and Tracking software used to manage a GPS receiver that is associated with a user's PDA (or other computing device) via a Bluetooth connection. GPS Screen 1100 includes fields for displaying and controlling GPS device settings, a button for turning the Bluetooth connection on and off, a button for turning the GPS device on and off, and buttons for controlling whether real-time or simulated GPS data is conveyed. GPS Screen 1100 also includes Setup button 1102 used to launch the Tracking Setup Screen.

FIG. 12a illustrates an exemplary Tracking Setup Screen 1200 of the Location and Tracking software used to control the rate at which GPS information is polled, to examine GPS information records, and to turn on or off the TRACKING mode. Tracking Setup Screen 1200 includes Files button 1202 that is used to launch Log File Selection Screen 1204 that is used to select a log file. A log file can be written to and then later read, as controlled by the Use button, to cause a play back of GPS information.

FIG. 12b illustrates an exemplary Log File Selection Screen 1204 of the Location and Tracking software used to select a log file for storing GPS information. Log File Selection Screen 1024 provides a typical Open dialog window allowing a user to open a log file stored at any storage location to which the user (and the user's device) has access.

FIG. 13a illustrates an exemplary Map Screen 1300 of the Location and Tracking software used to display a map received from a map server. The Map Screen 1300 is used to request and locate a map using the current latitude and longitude of the user, to turn the TRACKING mode on or off, to display/edit data location records, to create zones, and to size the map. These various functions are controlled via a row of buttons 1302 at the bottom of Map Screen 1300. The row of buttons 1302 is also displayed on the bottom of Data Screen 1304, Zone Screen 1306, Size Screen 1308, and About Screen 1310.

FIG. 13b illustrates an exemplary Data Screen 1304 of the Location and Tracking software used to manage conveyance of tracking and zone information to specific users based on access codes. It is accessed by selecting the Data button included in the row of buttons 1302 displayed on the bottom of Data Screen 1304, Zone Screen 1306, Size Screen 1308, and About Screen 1310. Specifically, Data Screen 1304 is used to set access codes and to associate email addresses and phone alerts with zones.

FIG. 13c illustrates an exemplary Zone Screen 1306 of the Location and Tracking software used to define user-defined zones. It is accessed by selecting the Zone button included in the row of buttons 1302 displayed on the bottom of Data Screen 1304, Zone Screen 1306, Size Screen 1308, and About Screen 1310. The Zone Screen is used to define a zone and/or to load a zone defined by another user. A user can use the Zone Screen to control whether zone information is shared (i.e., made public) to other users and to control whether the TRACKING mode is on or off.

FIG. 13d illustrates an exemplary Size Screen 1308 of the Location and Tracking software used to manage the size and other characteristics of a displayed map. It is accessed by selecting the Size button included in the row of buttons 1302 displayed on the bottom of Data Screen 1304, Zone Screen 1306, Size Screen 1308, and About Screen 1310. The Size Screen 1308 is used to set the scale (or zoom) of the map, to turn on or off the display of zone boundaries, and to control auto centering of maps.

FIG. 13e illustrates an exemplary About Screen 1310 of the Location and Tracking software used to provide a notice concerning Tracking Privacy Issues, software version information, and copyright information. It is accessed by selecting the About button included in the row of buttons 1302 displayed on the bottom of Data Screen 1304, Zone Screen 1306, Size Screen 1308, and About Screen 1310.

The row of buttons 1302 displayed on the bottom of Data Screen 1304, Zone Screen 1306, Size Screen 1308, and About Screen 1310 also includes a Close button that when selected returns the user to the Main Screen 900.

FIG. 14 illustrates an exemplary Group Screen 1400 of the Location and Tracking software used to manage information corresponding to groups of contacts. The Group Screen 1400 is used to add or remove users from a stored ‘buddy list’ containing the user name, phone number and code for each ‘buddy’. If a public zone is available it can be selected and loaded into the user’s device. Users share access codes in order to share zones. As such, a user tells another user the access code needed to load a zone.

FIG. 15 illustrates an exemplary Contact Screen 1500 of the Location and Tracking software used to manage information corresponding to contacts (i.e., other users). The Contact Screen 1500 allows the user to populate information corresponding to contacts such as name and address information.

FIG. 16 illustrates an exemplary Camera Screen 1600 of the Location and Tracking software used to manage pictures associated with user location information.

The Camera Screen 1600 is used to associate pictures and text with a user and to convey the picture information to other users. The pictures correspond to information packages described generally above, which could also include other forms of information. The Camera Screen 1600 could alternatively be a Device Screen that controlled multiple devices including cameras, motion sensors, garage doors, web cams, etc. and corresponding information as described previously. As described previously, picture or other information packages can be associated with zone information or event information.

FIG. 17 illustrates an exemplary Big Buttons Screen 1700 of the Location and Tracking software used to provide easy access to key application commands while walking or driving.

FIG. 18 illustrates an exemplary Map Viewer Web Page 1800 used for displaying maps and other information conveyed by the Location and Tracking software.

FIG. 19 illustrates an exemplary Contact Viewer Web Page 1900 used for displaying contact information conveyed by the Location and Tracking software.

FIG. 20 illustrates an exemplary web page-based display of a map 2000 overlaid with GPS tracking and zone information conveyed by the Location and Tracking software. In FIG. 20, balloon icons labeled alphabetically that indicate logged locations of a user for which information is available. Also shown are two zones represented by rectangles. When a given balloon is selected, information is displayed, for example, as shown in the information box in the center of the map corresponding to the balloon labeled F. Similarly, information is displayed corresponding to either of the zones when either is selected.

FIG. 21 illustrates an exemplary web page for creation of zones 2100 that can be used with the Location and Tracking software. As shown in FIG. 21, a zone is created by selecting a first point on a map indicated by a first balloon and dragging to another point on a map indicated by a second balloon where the two points correspond to opposite corners of a rectangle representing the user-defined zone boundary.

FIG. 22 illustrates an exemplary map displayed on a web page 2200 depicting logging of user location information while a user is within a zone and logging of user location information when a user enters or leaves a zone. As depicted in FIG. 22, one type of zone 2202 provides user location information periodically while a user is within the zone. Another type of zone 2204 only provides user location information when the user enters or exits the zone.

FIG. 23 illustrates an exemplary map displayed on a web page 2300 depicting a picture associated with a location of a user. As shown in FIG. 23, a balloon labeled F corresponds to a location of a user. An information package consisting of a picture that has been associated with the user's location is available as part of the information displayed when the balloon is selected. In the information window is a thumbnail of the picture which when selected displays the fully enlarged picture.

The Location and Tracking software described herein was provided as a example of the types of applications that are enabled by the present invention. While particular embodiments and several exemplary applications (or implementations) of the invention have been described, it will be understood, however, that the invention is not limited thereto, since modifications may be made by those skilled in the art, particularly in light of the foregoing teachings. It is, therefore, contemplated by the appended claims to cover any such modifications that incorporate those features or those improvements which embody the spirit and scope of the present invention.

What is claimed is:

1. A method for conveying information relating to an object among a plurality of users of a plurality of computing devices, the method comprising the steps of:

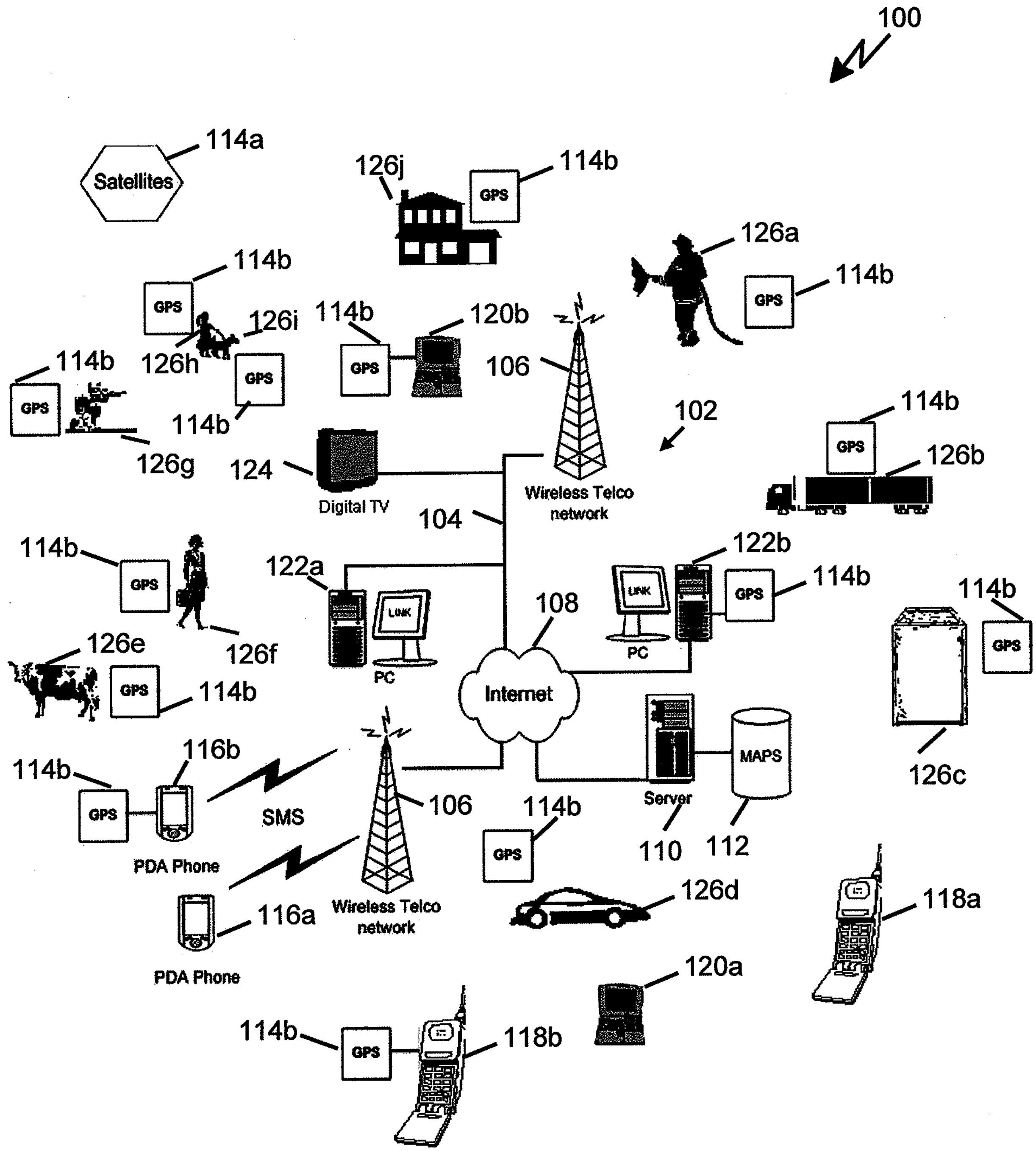
defining a zone by one of the plurality of users, the zone having corresponding zone information accessible using a zone information access code;

defining an object location event in terms of a condition based upon a relationship between the zone and a location of the object, the location of the object having corresponding object location information accessible using an object location event information accessible using an object location event information access code; and

conveying, to one or more of the plurality of users, the information relating to the object comprising at least one of the object location information, the zone information, or the object location event information.

Abstract

An improved system and method for defining an event based upon an object location and a user-defined zone and managing the conveyance of object location event information among computing devices where object location events are defined in terms of a condition based upon a relationship between user-defined zone information and object location information. One or more location information sources are associated with an object to provide the object location information. One or more user-defined zones are defined on a map and one or more object location events are defined. The occurrence of an object location event produces object location event information that is conveyed to users based on user identification codes. Accessibility to object location information, zone information, and object location event information is based upon an object location information access code, a zone information access code, and an object location event information access code, respectively.


100
114a
Satellites
126j
114b
GPS
126a
114b
GPS
114b
GPS
126i
126h
114b
120b
GPS
106
114b
GPS
126g
114b
GPS
102
124
Digital TV
Wireless Telco network
114b
GPS
126b
104
114b
GPS
122a
122b
114b
GPS
126f
126e
GPS
114b
PC
108
PC
114b
GPS
Internet
114b
116b
GPS
PDA Phone
SMS
106
114b
GPS
Server
MAPS
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116a
PDA Phone
Wireless Telco network
126d
118a
120a
114b
GPS
118b

FIG. 1

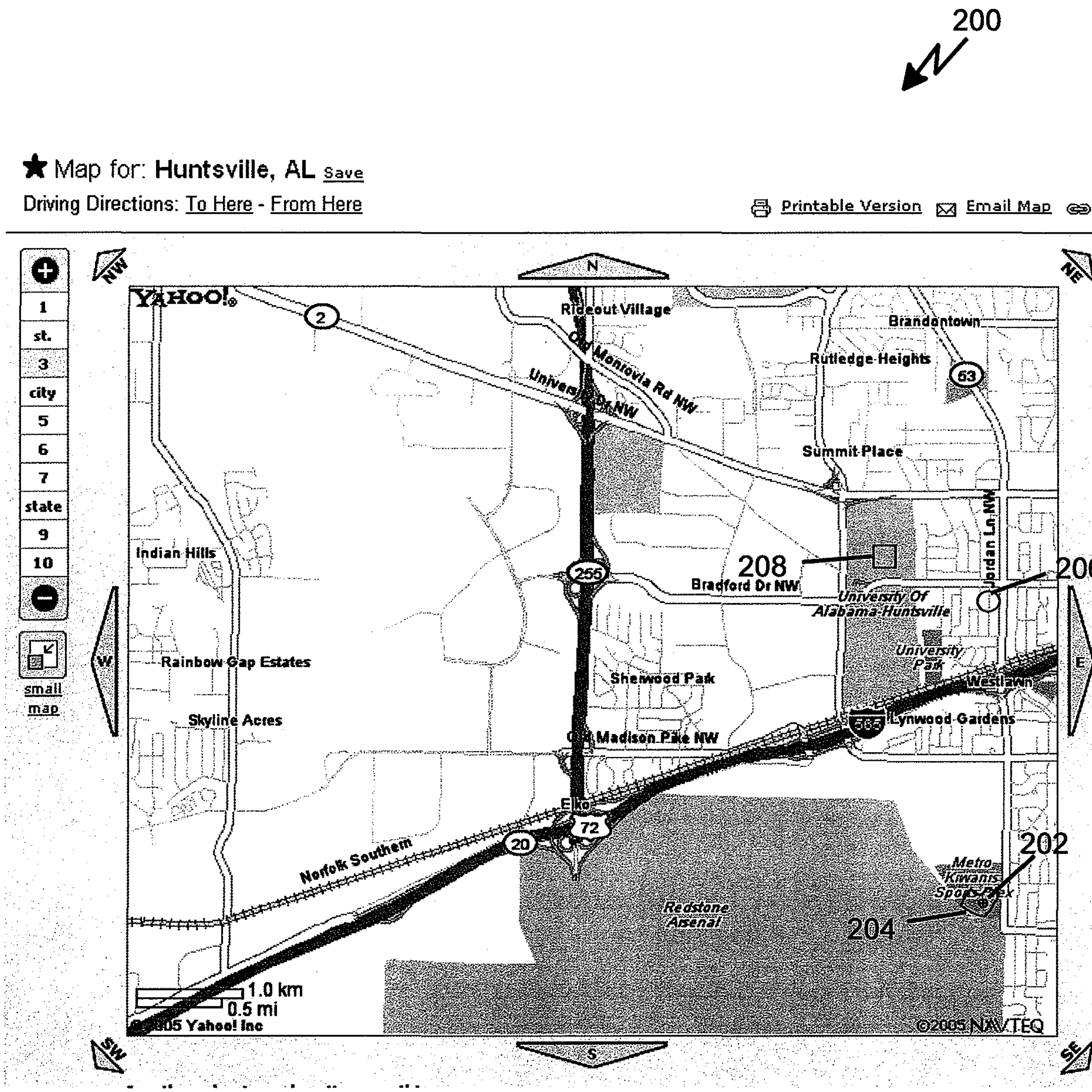

200
Map for: Huntsville, AL Save
Driving Directions: To Here - From Here
Printable Version
Email Map
1
st.
3
city
5
6
7
state
9
10
small map
N
S
E
W
NW
NE
SW
SE
YAHOO!
Rideout Village
Brandontown
Rutledge Heights
Old Monrovia Rd NW
University Dr NW
Summit Place
Jordan Ln NW
Indian Hills
208
Bradford Dr NW
206
University Of Alabama-Huntsville
University Park
Westlawn
Rainbow Gap Estates
Sherwood Park
Lynwood Gardens
Skyline Acres
Old Madison Pike NW
Elko
Norfolk Southern
202
Metro Kiwanis Sports Plex
Redstone Arsenal
204
1.0 km
0.5 mi
©2005 Yahoo! Inc
©2005 NAVTEQ

FIG. 2

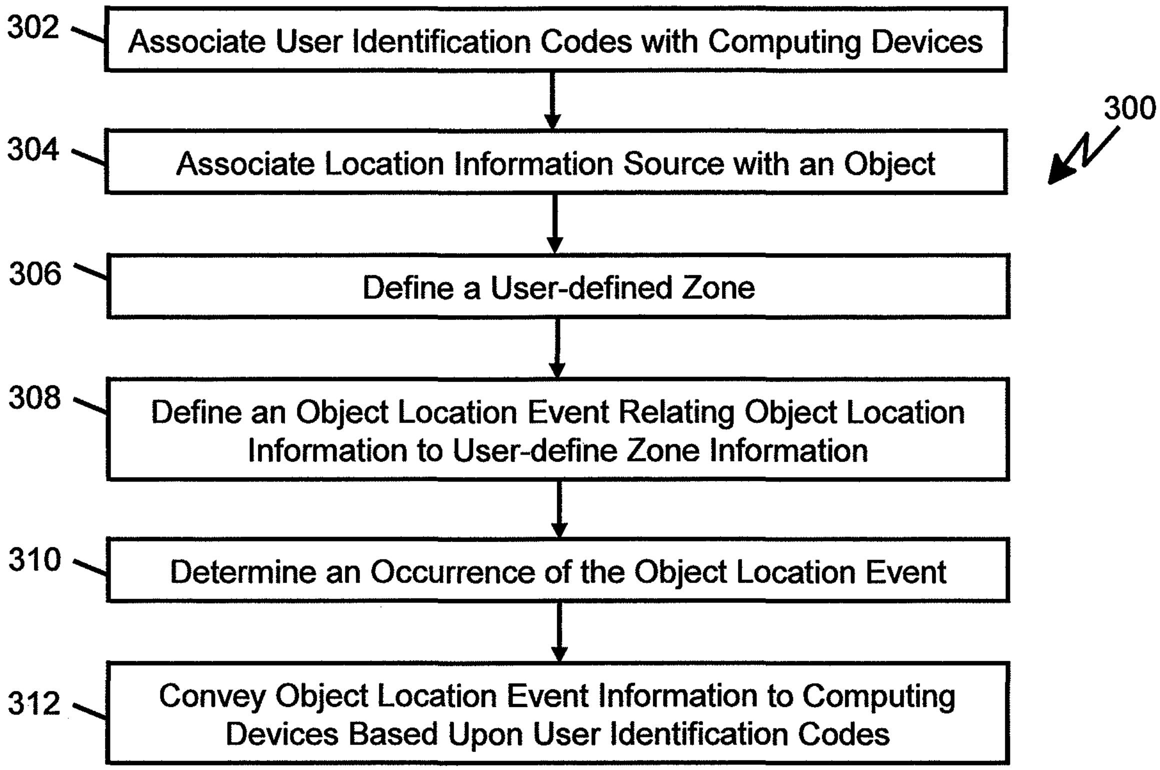

302
Associate User Identification Codes with Computing Devices
304
Associate Location Information Source with an Object
300
306
Define a User-defined Zone
308
Define an Object Location Event Relating Object Location Information to User-define Zone Information
310
Determine an Occurrence of the Object Location Event
312
Convey Object Location Event Information to Computing Devices Based Upon User Identification Codes

FIG. 3

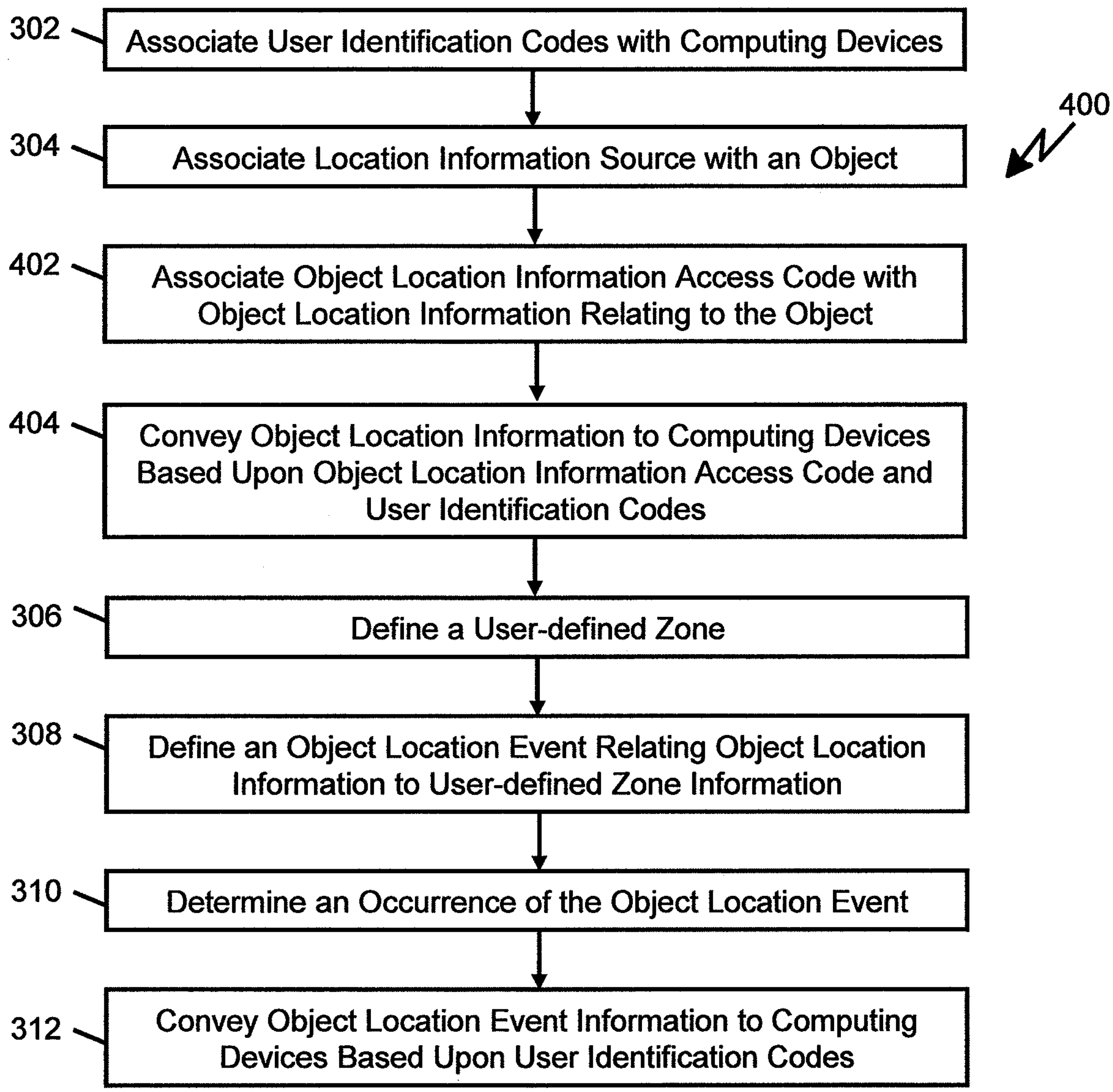

302
Associate User Identification Codes with Computing Devices
304
Associate Location Information Source with an Object
400
402
Associate Object Location Information Access Code with Object Location Information Relating to the Object
404
Convey Object Location Information to Computing Devices Based Upon Object Location Information Access Code and User Identification Codes
306
Define a User-defined Zone
308
Define an Object Location Event Relating Object Location Information to User-defined Zone Information
310
Determine an Occurrence of the Object Location Event
312
Convey Object Location Event Information to Computing Devices Based Upon User Identification Codes

FIG. 4

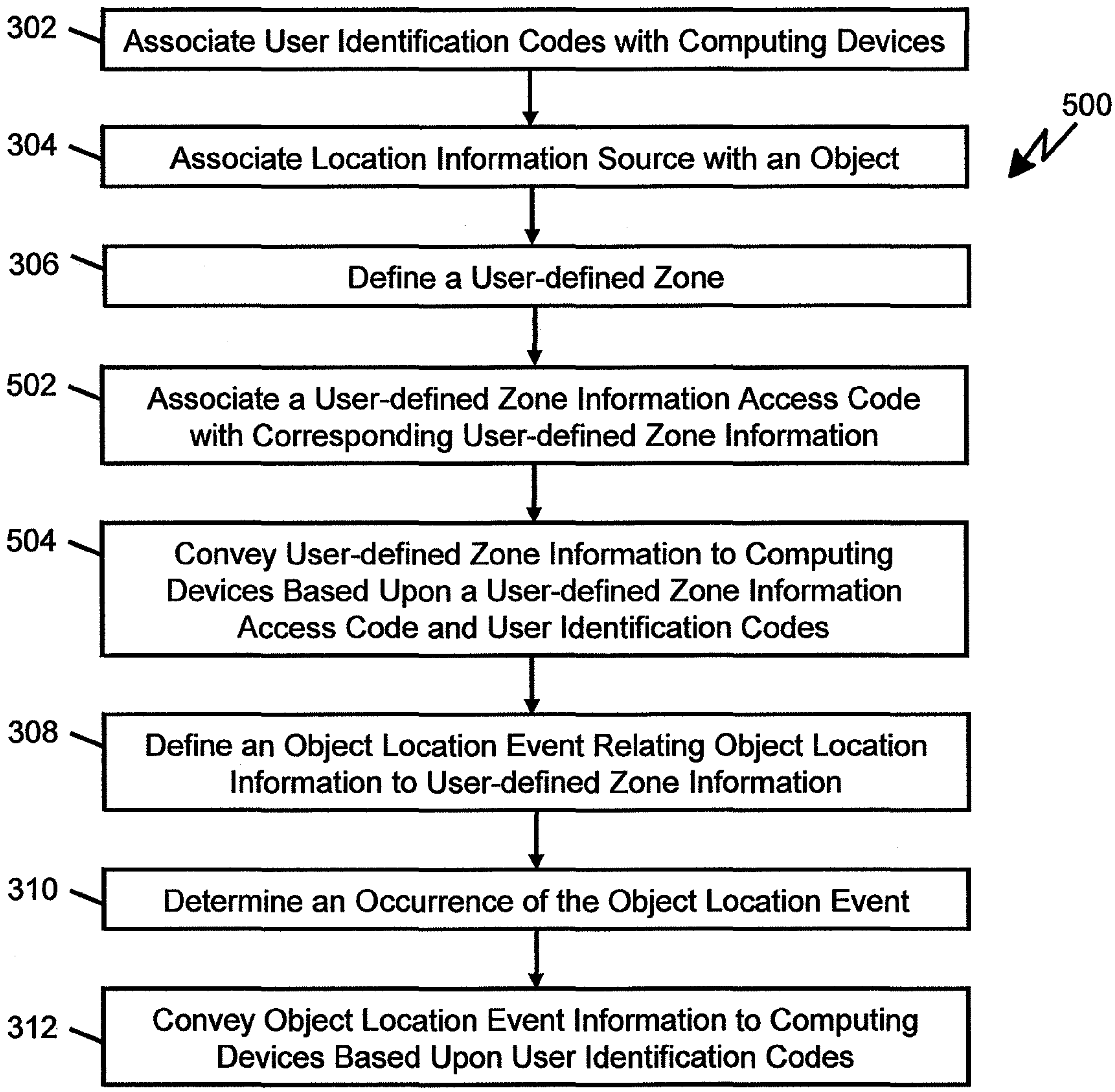

302
Associate User Identification Codes with Computing Devices
304
Associate Location Information Source with an Object
500
306
Define a User-defined Zone
502
Associate a User-defined Zone Information Access Code with Corresponding User-defined Zone Information
504
Convey User-defined Zone Information to Computing Devices Based Upon a User-defined Zone Information Access Code and User Identification Codes
308
Define an Object Location Event Relating Object Location Information to User-defined Zone Information
310
Determine an Occurrence of the Object Location Event
312
Convey Object Location Event Information to Computing Devices Based Upon User Identification Codes

FIG. 5

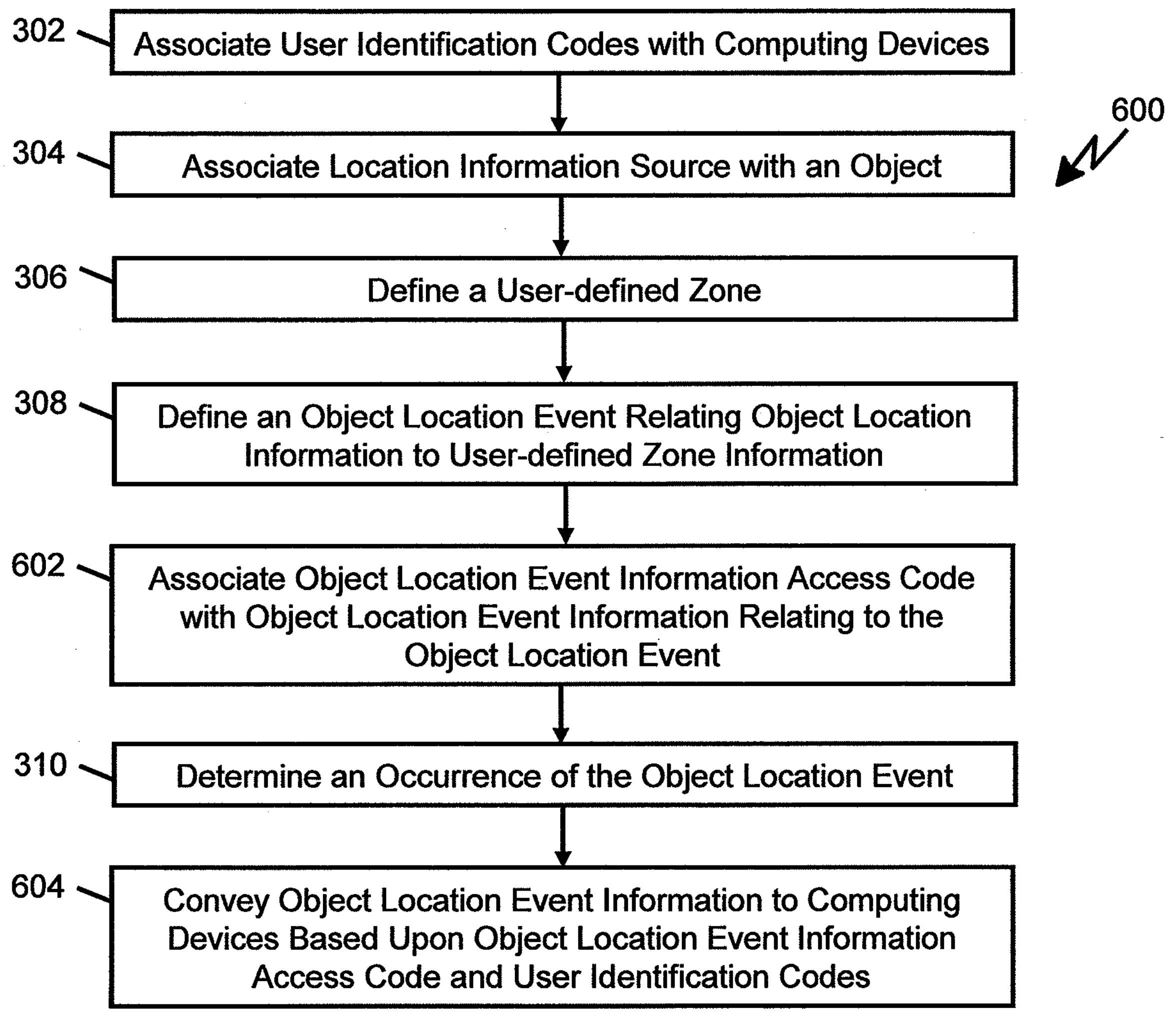

302
Associate User Identification Codes with Computing Devices
304
Associate Location Information Source with an Object
600
306
Define a User-defined Zone
308
Define an Object Location Event Relating Object Location Information to User-defined Zone Information
602
Associate Object Location Event Information Access Code with Object Location Event Information Relating to the Object Location Event
310
Determine an Occurrence of the Object Location Event
604
Convey Object Location Event Information to Computing Devices Based Upon Object Location Event Information Access Code and User Identification Codes

FIG. 6

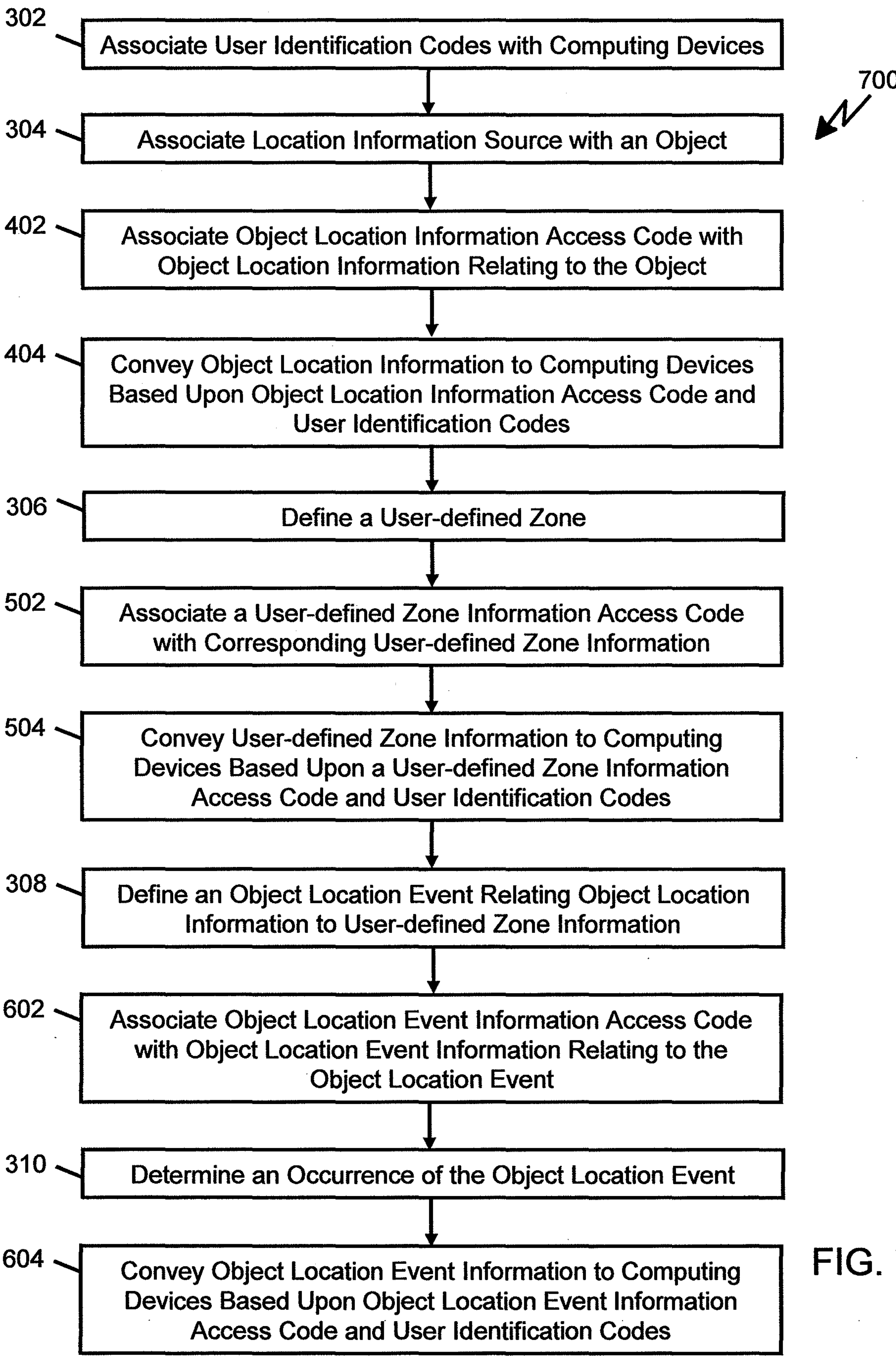

302
Associate User Identification Codes with Computing Devices
700
304
Associate Location Information Source with an Object
402
Associate Object Location Information Access Code with Object Location Information Relating to the Object
404
Convey Object Location Information to Computing Devices Based Upon Object Location Information Access Code and User Identification Codes
306
Define a User-defined Zone
502
Associate a User-defined Zone Information Access Code with Corresponding User-defined Zone Information
504
Convey User-defined Zone Information to Computing Devices Based Upon a User-defined Zone Information Access Code and User Identification Codes
308
Define an Object Location Event Relating Object Location Information to User-defined Zone Information
602
Associate Object Location Event Information Access Code with Object Location Event Information Relating to the Object Location Event
310
Determine an Occurrence of the Object Location Event
604
Convey Object Location Event Information to Computing Devices Based Upon Object Location Event Information Access Code and User Identification Codes

FIG. 7

Application Launch Screen

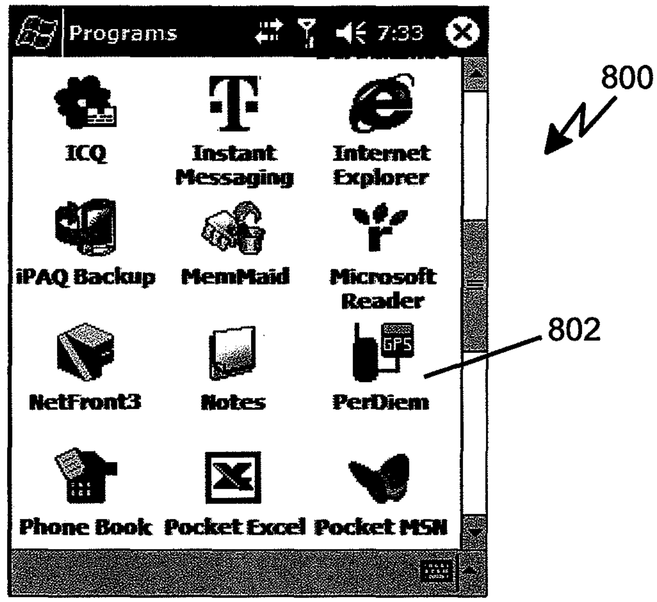


FIG. 8

Main Screen

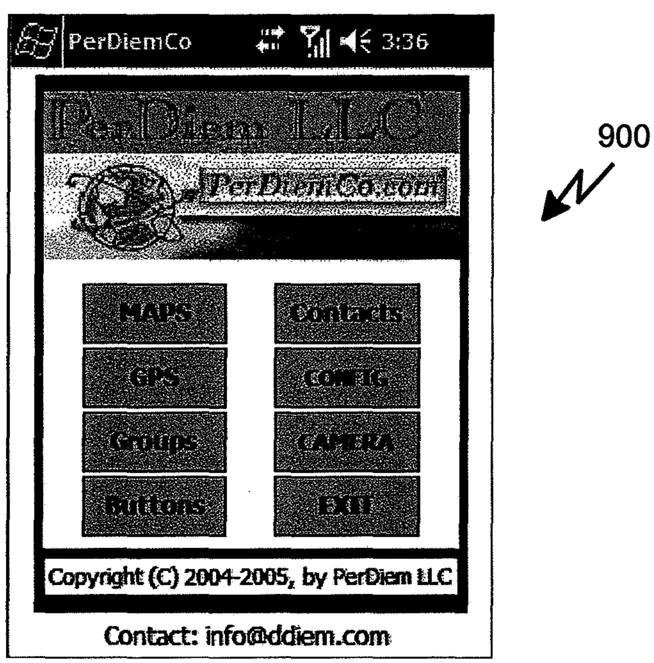


FIG. 9

Configuration Screen

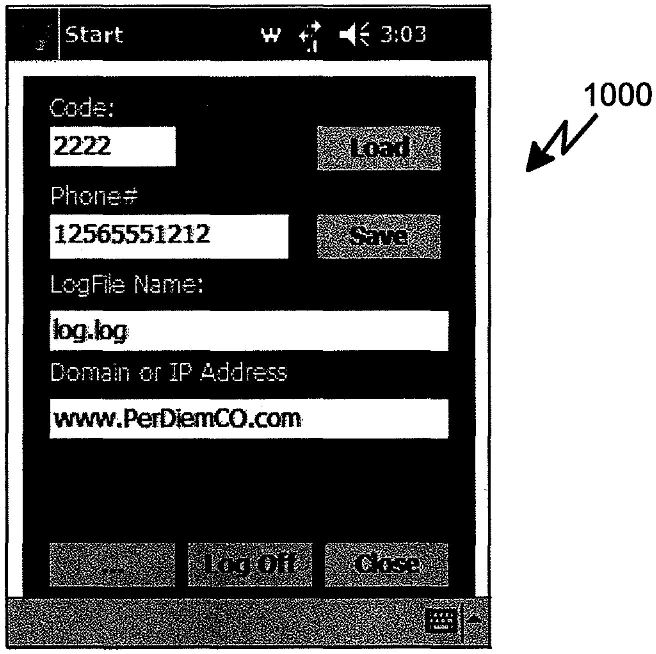


FIG. 10

GPS Screen

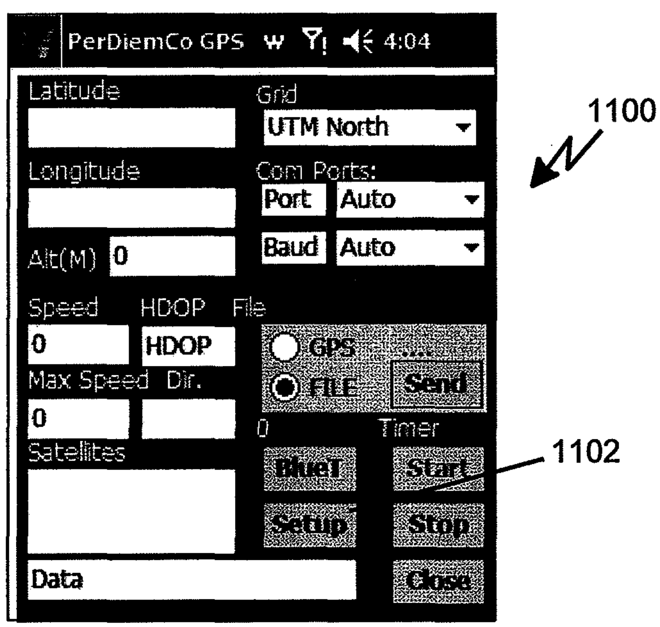


FIG. 11

Tracking Setup Screen

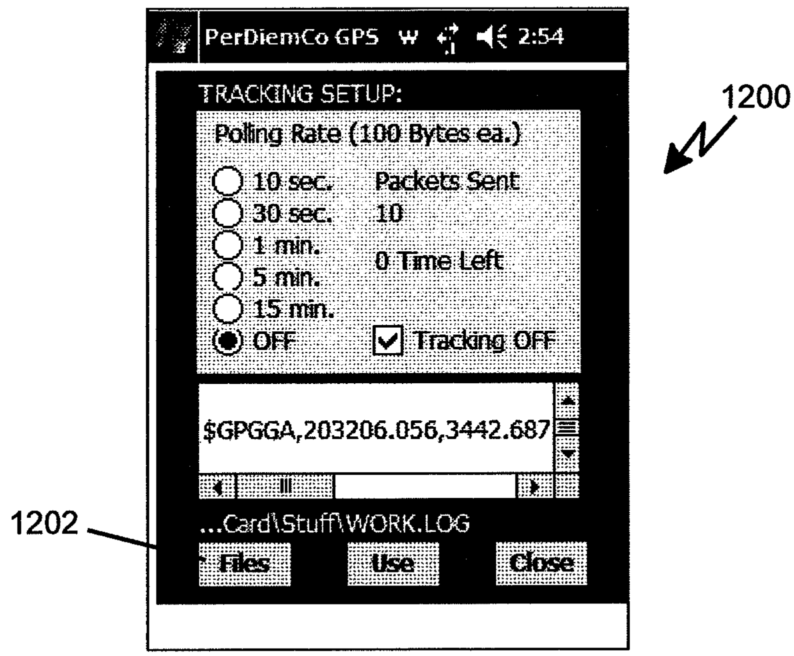


FIG. 12a

Log File Selection Screen

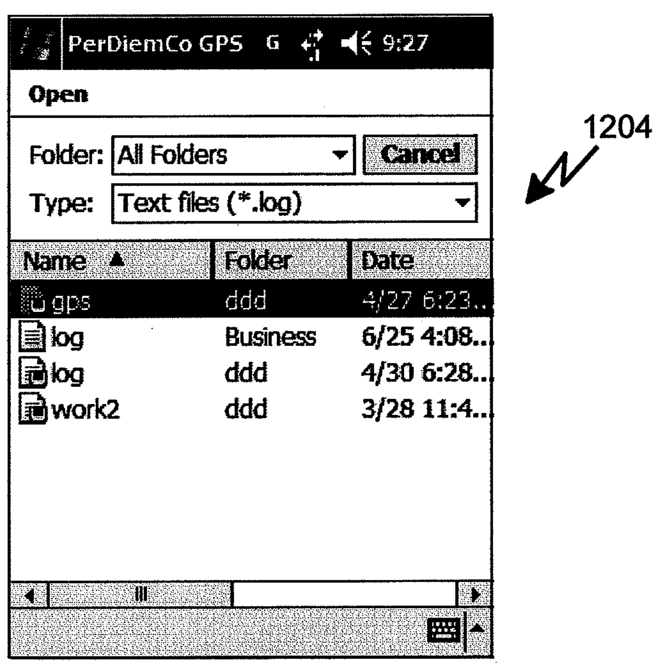


FIG. 12b

Map Screen

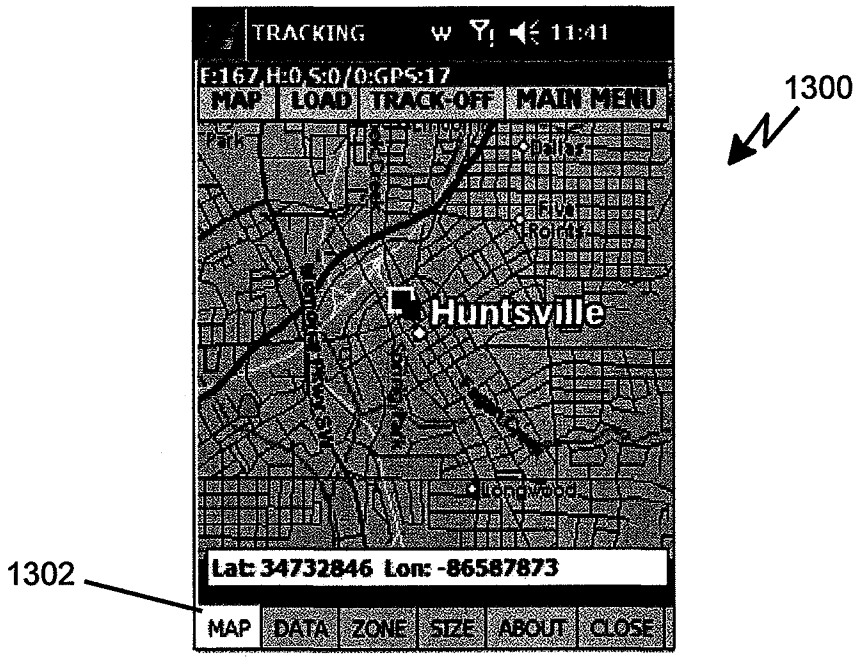


FIG. 13a

Data Screen

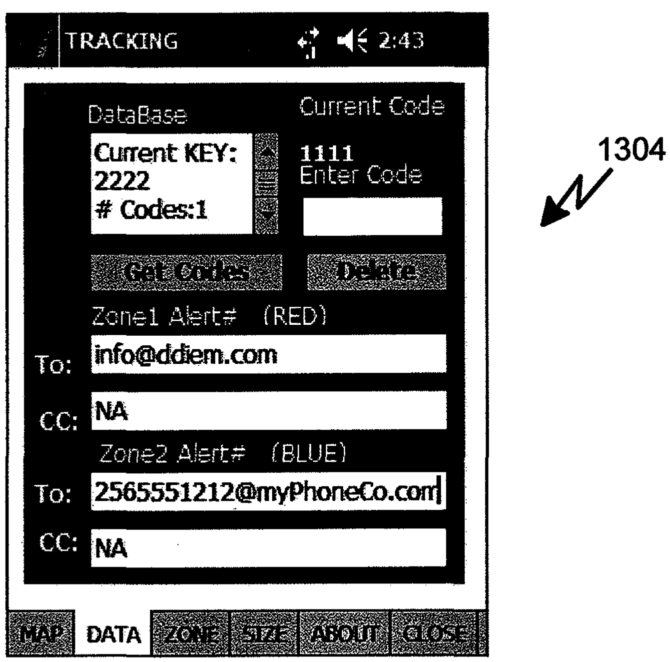


FIG. 13b

Zone Screen

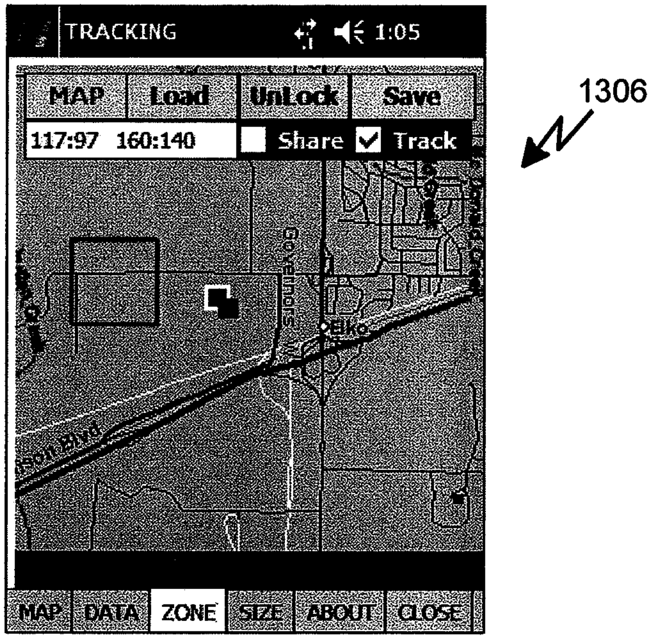


FIG. 13c

Size Screen

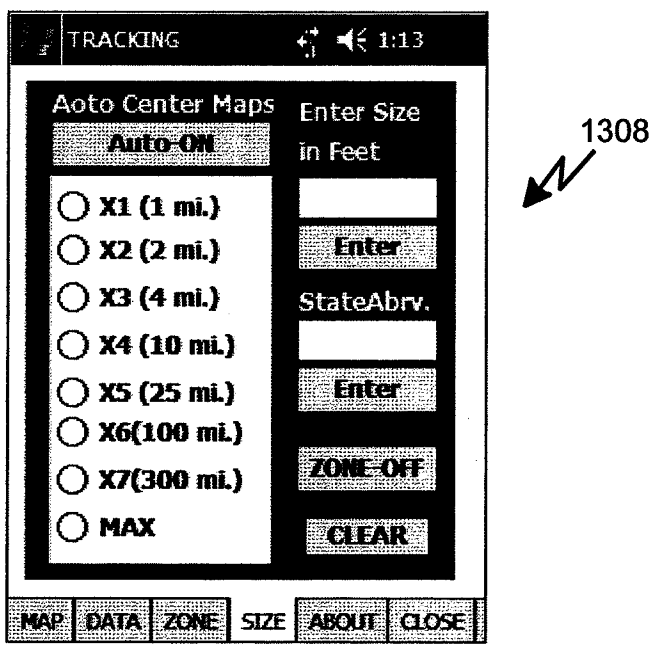


FIG. 13d

About Screen

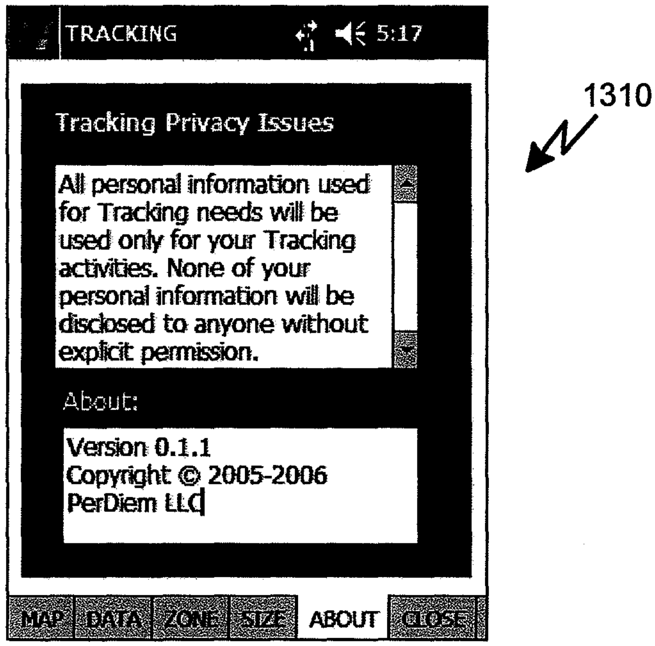


FIG. 13e

Group Screen

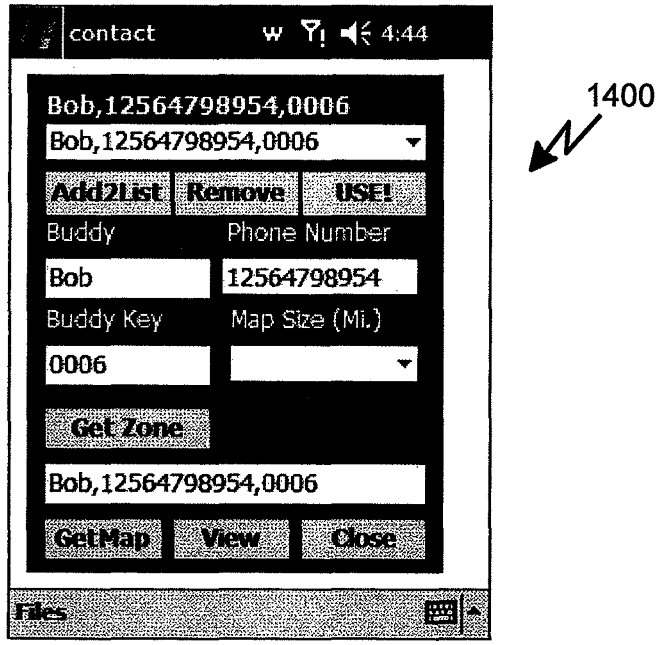


FIG. 14

Contact Screen

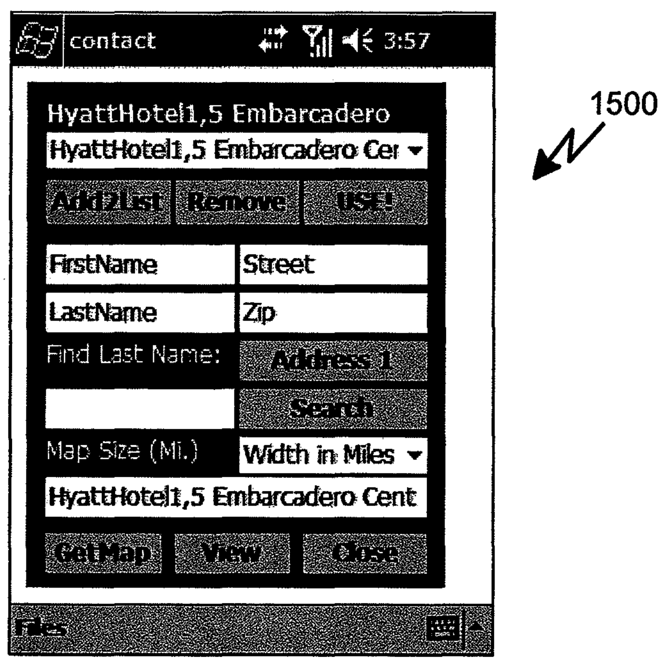


FIG. 15

Camera Screen

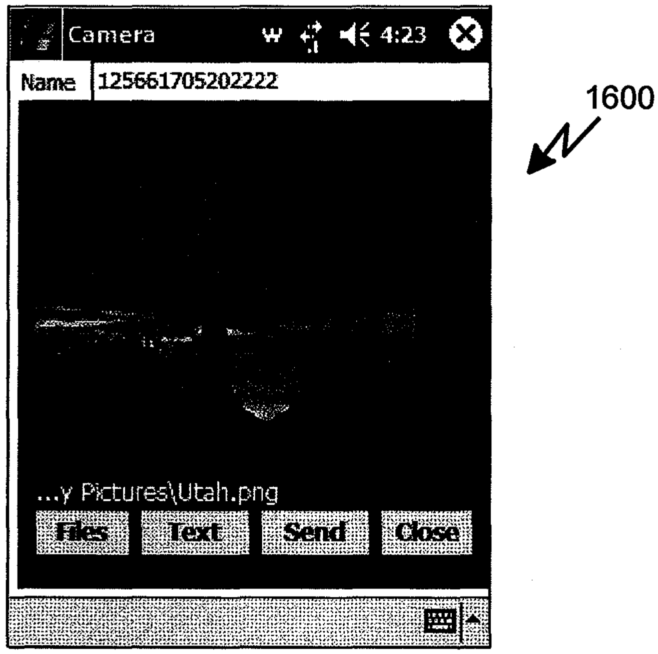


FIG. 16

Big Buttons Screen

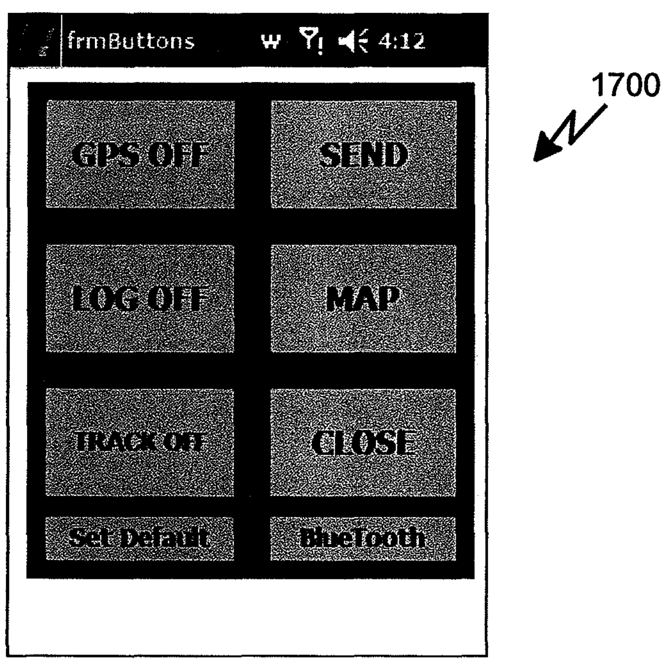
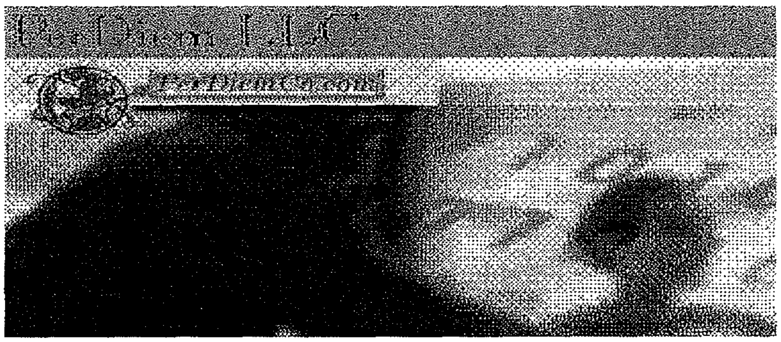


FIG. 17

Map Viewer Web Page

1800



PerDiemCo Map Viewer for displaying Maps created with PerDiemCo Tracking Software.

Member links require a user login Code!

Location Map	Location Map
Track Map	Track Map
Photo Map	Photos
MEMBER LogIn	LogIn
Member Map	Groups
Member Zone Tool	Zone Tool
Member Photo Map	Photo Maps
Member Photo Edit	Picture Edit
MEMBER LogOut	LogOut

FIG. 18

Contact Viewer Web Page

1900

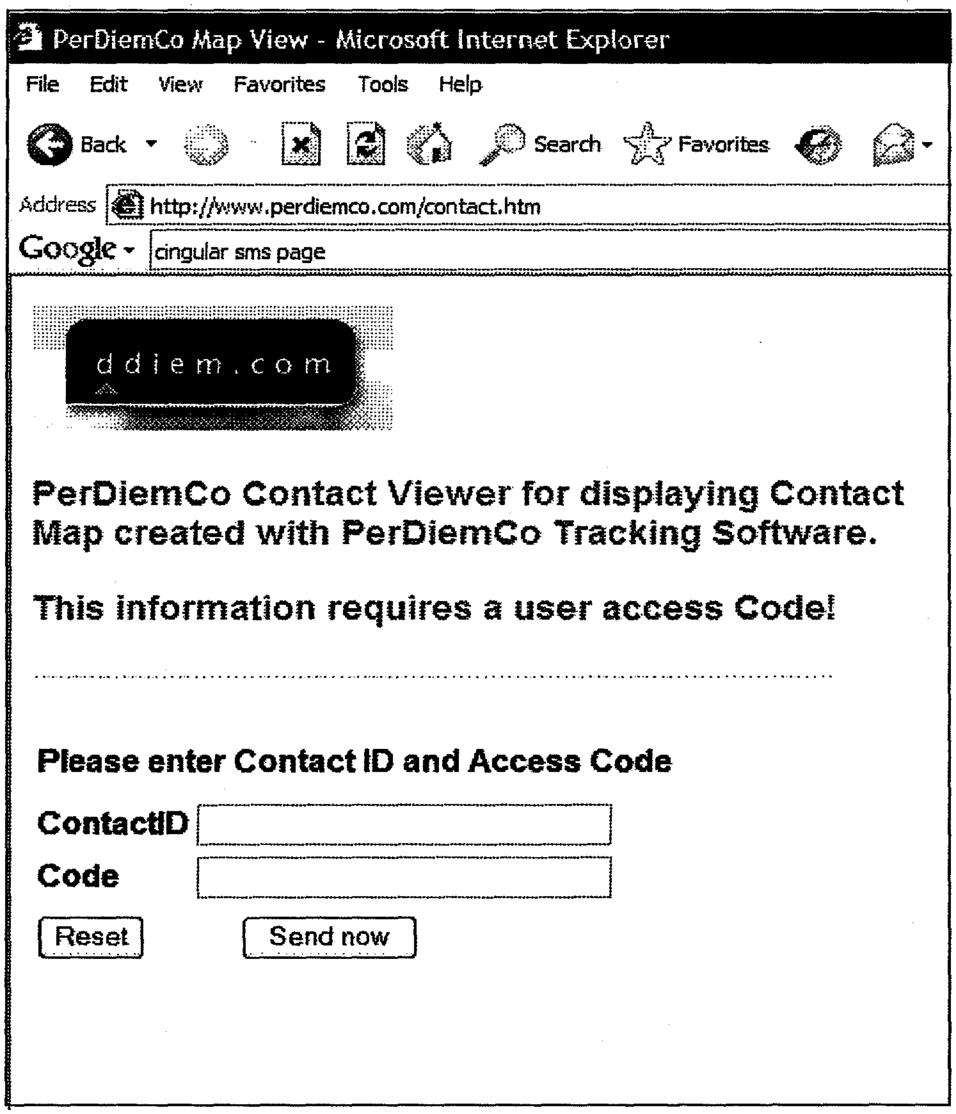


FIG. 19

GPS Tracking and Zone Data

2000

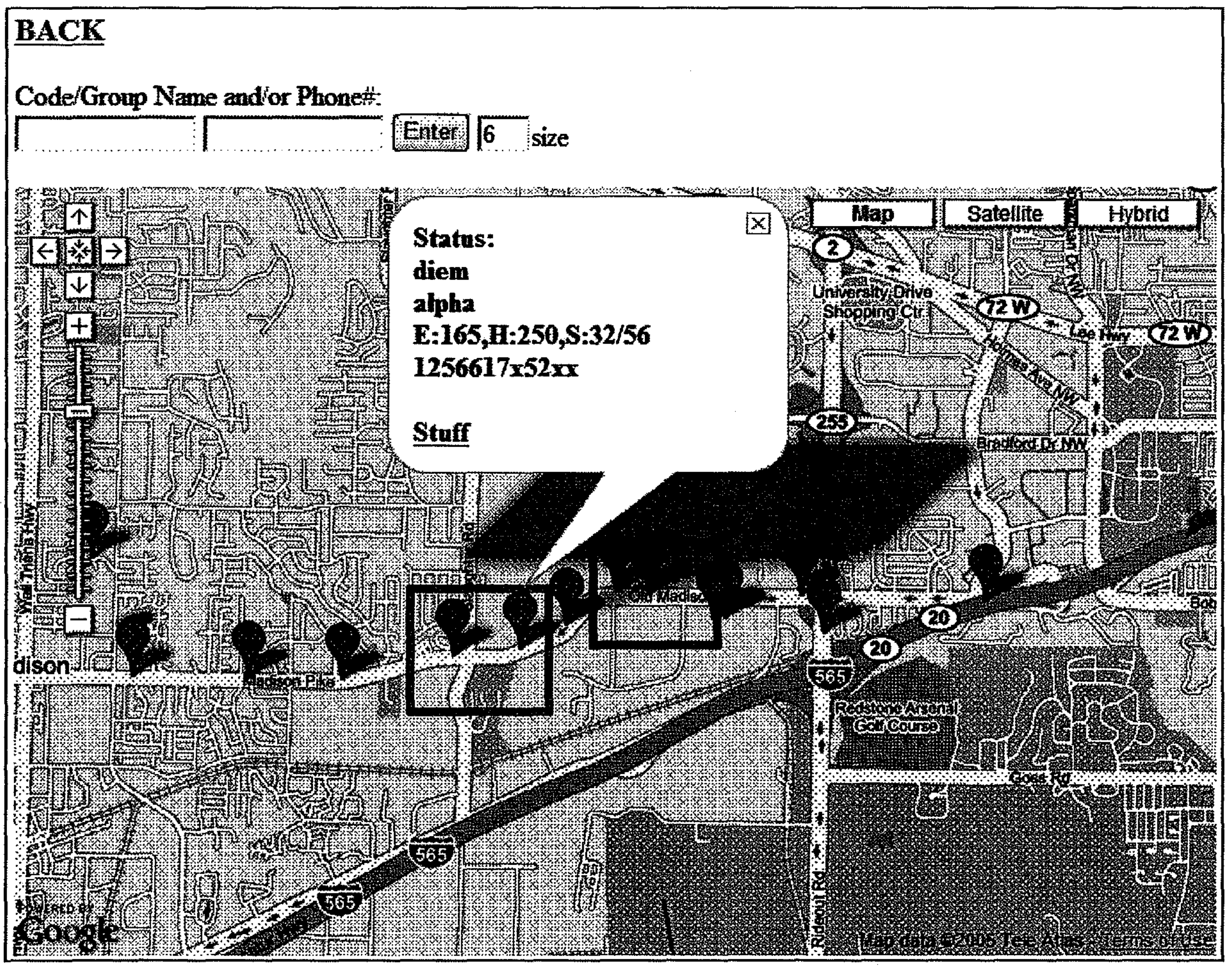


FIG. 20

Zone Creation

2100

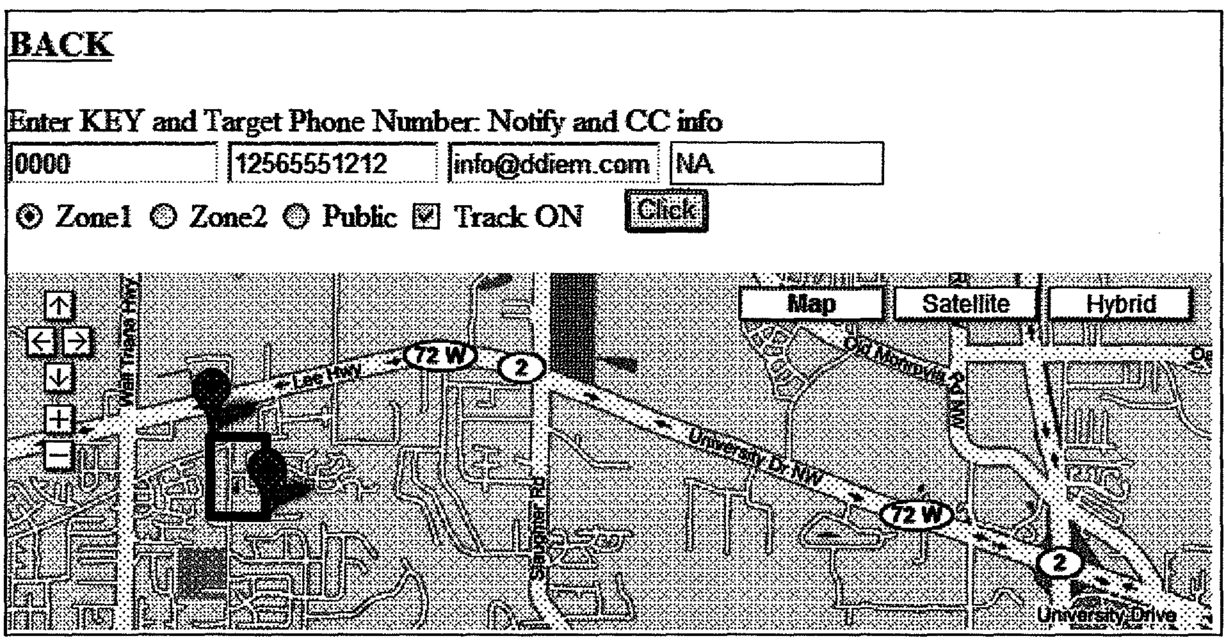


FIG. 21

Zone-based Logging

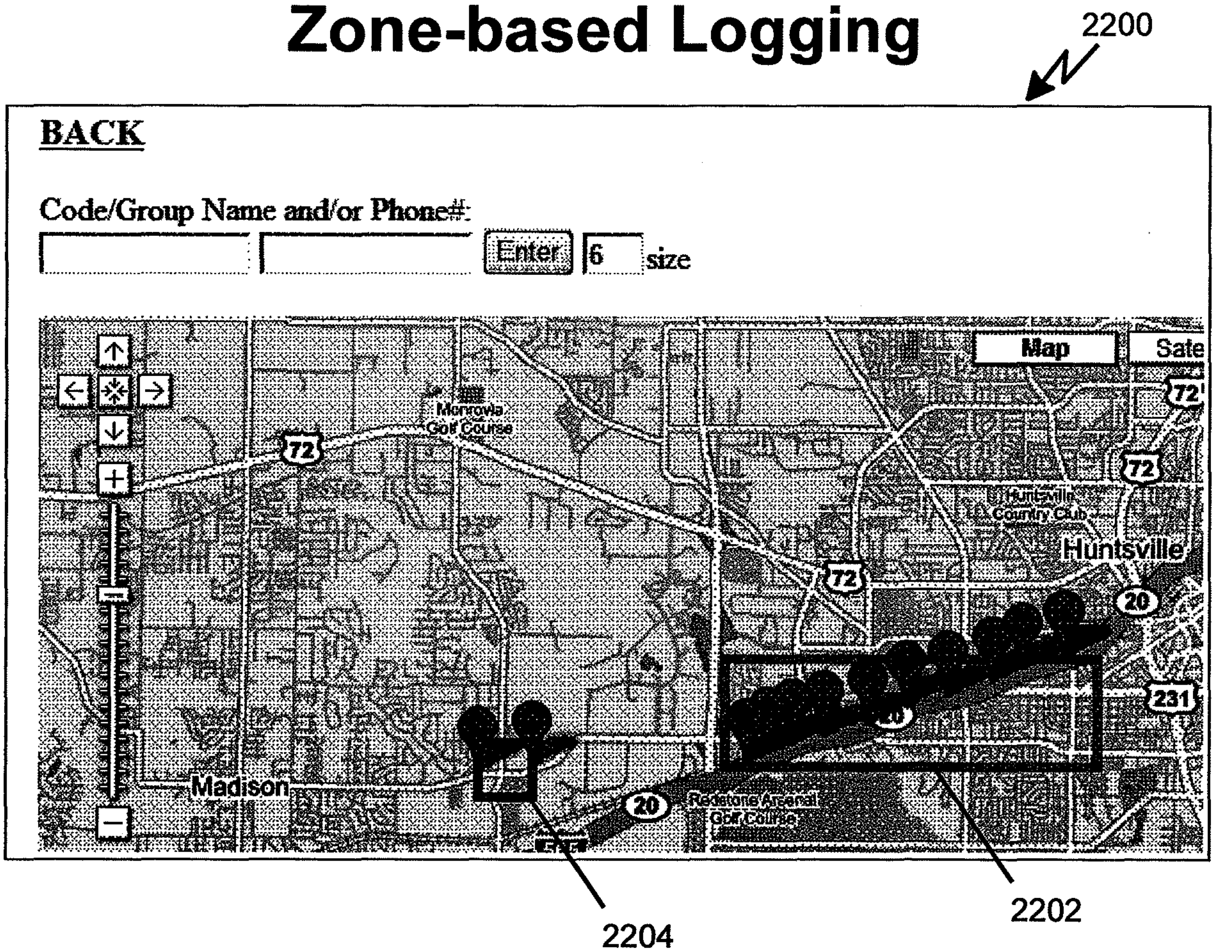


FIG. 22

Picture Associated with Location

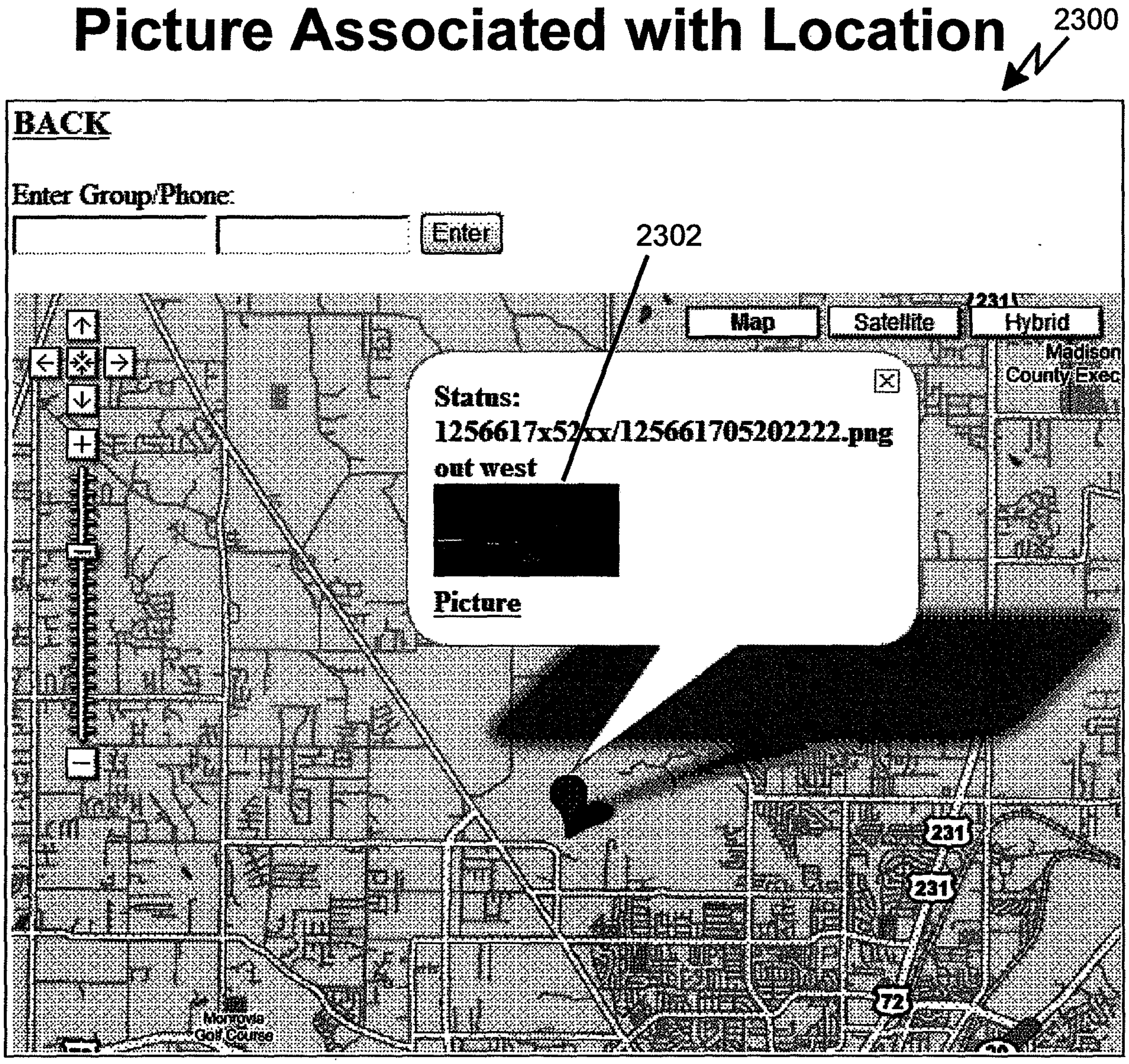


FIG. 23

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	A LOCATION INFORMATION SHARING SYSTEM AND METHOD FOR CONVEYING LOCATION INFORMATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

[X] The attached application, which claims priority to US Application # 11/335699, or

[ ] United States application or PCT international application number ____________ filed on ____________ .

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Darrell Diem   Date (Optional): ____________

Signature: Darrell Diem

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 98699

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[ ] The address associated with Customer Number: 98699

OR

[ ]

Firm or Individual Name			
Address			
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Country			
Telephone		Email	

Assignee Name and Address: Geofence Data Access Controls LLC
416 Zandale Drive
Huntsville, AL 35801

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	Mark D. Roberts	Date	7/19/2014
Name	Mark D. Roberts	Telephone	256 527 2696
Title	President		

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	Application Number	
	Filing Date	2015-02-12
	First Named Inventor	Darrell Diem
	Art Unit	
	Examiner Name	
	Attorney Docket Number	GDAC-7

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7317927		2008-01-08	Staton et al.	
	2	7598855		2009-10-06	Scalisi et al.	
	3	7269426		2007-09-11	Kokkonen et al.	
	4	8547222		2013-10-01	Aninye et al.	
	5	7672677		2010-03-02	Howard et al.	
	6	8504057		2013-08-06	Choi et al.	
	7	5757916		1998-05-26	MacDoran et al.	
	8	6553308		2003-04-22	Uhlmann et al.	

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	Attorney Docket Number	GDAC-7

	9	6618593		2003-09-09	Drutman et al.	
	10	6687504		2004-02-03	Raith	
	11	6801850		2004-10-05	Wolfson	
	12	6806814		2004-10-19	Iverson et al.	
	13	6813501		2004-11-02	Kinnunen et al.	
	14	6847892		2005-01-25	Zhou et al.	
	15	6850252		2005-02-01	Hoffberg	
	16	6867733		2005-03-15	Sandhu et al.	
	17	6879835		2005-04-12	Greene et al.	
	18	6888936		2005-05-03	Groen et al.	
	19	6952181		2005-10-04	Karr et al.	

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	20	7000015		2006-02-14	Moore et al.	
	21	7116985		2006-10-03	Wilson et al.	
	22	7123926		2006-10-17	Himmelstein	
	23	7130611		2006-10-31	Kimura et al.	
	24	7181227		2007-02-20	Wilson et al.	
	25	7190960		2007-03-13	Wilson et al.	
	26	7203752		2007-04-10	Rice et al.	
	27	7236100		2007-06-26	Obradovich et al.	
	28	7259668		2007-08-21	Casey	
	29	7275102		2007-09-25	Yeager et al.	
	30	7295119		2007-11-13	Rappaport et al.	

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	31	7327258		2008-02-05	Fast et al.	
	32	7336964		2008-02-26	Casey	
	33	7359716		2008-04-15	Rowitch et al.	
	34	7379729		2008-05-27	Holland et al.	
	35	7423535		2008-09-09	Chung et al.	
	36	7474896		2009-01-06	Mohi et al.	
	37	7489993		2009-02-10	Coffee et al.	
	38	7503074		2009-03-10	Dublish et al.	
	39	7509116		2009-03-24	Fan et al.	
	40	7518500		2009-04-14	Aninye et al.	
	41	7522634		2009-04-21	Casey et al.	

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	42	8095115		2012-01-10	Van de Groenendaal	
	43	7525426		2009-04-28	Edelstein et al.	
	44	7525484		2009-04-28	Dupray et al.	
	45	7526800		2009-04-28	Wright et al.	
	46	7787872		2010-08-31	Minborg et al.	
	47	7791472		2010-09-07	Agrawal et al.	
	48	8498814		2013-07-30	Irish et al.	
	49	8260239		2012-09-04	Moton et al.	
	50	7366522		2008-04-29	Thomas	
	51	7801506		2010-09-21	Haave et al.	
	52	7382248		2008-06-03	Black et al.	

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	53	7102510		2006-09-05	Boling et al.	
	54	6838998		2005-01-04	Brown et al.	
	55	6243039		2001-06-05	Elliot	
	56	7283827		2007-10-16	Meadows et al.	
	57	7219234		2007-05-15	Ashland et al.	
	58	7533157		2009-05-12	Hu et al.	
	59	6363411		2002-03-26	Dugan et al.	
	60	7577667		2009-08-18	Hinshaw et al.	
	61	5263158		1993-11-16	Frederick	
	62	7027808		2006-04-11	Wesby	
	63	7277018		2007-10-02	Reyes et al.	

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	64	7460020		2008-12-02	Reyes et al.	
	65	7469139		2008-12-23	Van de Groenendaal	
	66	6691032		2004-02-10	Irish et al.	
	67	7138913		2006-11-21	Mackenzie et al.	
	68	7164986		2007-01-16	Humphries et al.	
	69	5982281		1999-11-09	Hoyt	

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	1	20070060108	A1	2007-03-15	East et al.	
	2	20070087828	A1	2007-04-19	Robertson	
	3	20070149208	A1	2007-06-28	Syrbe et al.	

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Attorney Docket Number	GDAC-7

	4	20080065320	A1	2008-03-13	Irish et al.	
	5	20070156664	A1	2007-07-05	Norton et al.	
	6	20050215243		2005-09-29	Black et al.	
	7	20050210104		2005-09-22	Torvinen, Marko	
	8	20090065578		2009-03-12	Peterson et al.	

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	1	2002017656	WO	A2	2002-02-28	Von Scheele et al.		☐

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	1	BARKHUUS et al., Location-Based Services for Mobile Telephony: a study of users' privacy concerns, Proceedings of Interact 2003, ACM Press, Pages 709-712, Zurich, Switzerland	☐

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	2	HEWLETT-PACKARD DEVELOPMENT COPANY, Location-based Services, Consumer research findings from HP and Openwave, March 2004, U.S.	☐
	3	MALY et al., A Privilege Management and Enforcement System for Distributed Resource Sharing, 1996.	☐

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	Attorney Docket Number	GDAC-7

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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OR

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☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Robert S. Babayi/	Date (YYYY-MM-DD)	2015-02-12
Name/Print	Robert Babayi	Registration Number	33471

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(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 February 2002 (28.02.2002)

PCT

(10) International Publication Number
WO 02/17656 A2

(51) International Patent Classification[7]: H04Q 7/00

(21) International Application Number: PCT/US01/25894

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(25) Filing Language: English

(26) Publication Language: English

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09/643,602 22 August 2000 (22.08.2000) US

(71) Applicant *(for all designated States except US)*: **ERICSSON INC** [US/US]; 7001 Development Drive, Research Triangle Park, NC 27709 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **VON SCHEELE, Claes** [SE/US]; 103 Oxpens Court, Cary, NC 27503 (US). **PLANTIER, Eric** [FR/FR]; 7, Av de l'Opera, F-720001 Paris (FR). **CAMP, JR., William, O** [US/US]; 400 N. Boundary Street, Chapel Hill, NC 27514 (US). **RYDBECK, Nils, R.** [SE/US]; 202 Rutherglen Drive, Cary, NC 27511 (US).

(74) Agent: **CROUSE, Robert, N.**; Myers Bigel Sibley Sajovec, P.A., P.O. Box 37428, Raleigh, NC 27627 (US).

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WO 02/17656 A2

(54) Title: METHODS, MOBILE USER TERMINALS, AND SYSTEMS FOR CONTROLLING ACCESS TO MOBILE USER TERMINAL LOCATION INFORMATION

(57) Abstract: Access to mobile user terminal location information can be controlled by receiving a request from a requestor for location information associated with the location of the mobile user terminal at a location server that maintains the location information. The location server determines whether the requestor is authorized to receive the location information from the location server. The location server transmits an authorization that allows the requestor to receive the location information from the location server in response to determining that the requestor is authorized to receive the location information from the location server.

METHODS, MOBILE USER TERMINALS, AND SYSTEMS FOR CONTROLLING ACCESS TO MOBILE USER TERMINAL LOCATION INFORMATION

CROSS-REFERENCE TO RELATED APPLICATION

The present application is related to commonly assigned U.S. Patent Application No. ___________, entitled *Systems, Methods, and Computer Program Products For Identifying Items of Interest That Are Geographically Proximate To Wireless Communicator Users,* (Attorney Docket 8194-444/P12462), filed concurrently herewith, the entire disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

The present invention relates to the field of communications in general, and more particularly, to mobile communications.

Some location information systems have been combined with radiotelephones as described, for example in U.S. Patent No. 5,663,734 entitled *GPS Receiver and Method for Processing GPS Signals* which is assigned to the present assignee, in U.S. Patent No. 5,982,324 to Watters *et al.*, entitled *Combining GPS with TOA/TDOA Of Cellular Signals To Locate Terminal*, in U.S. Patent No. 5,479,482 to Grimes entitled *Cellular Terminal For Providing Public Emergency Call Location Information*, and in U.S. Patent No. 6,061,561 to Alanara *et al.* entitled *Cellular Communications System Providing Cell Transmitter Location Information,* the entire disclosures of which are incorporated herein by reference.

Unfortunately, access to a the radiotelephone's location information may be unprotected. For example, in some conventional systems, the user may be unaware that location information is being transmitted by the radiotelephone. Accordingly, there is a need for improved methods, mobile user terminals, and systems that report location information.

SUMMARY OF THE INVENTION

Embodiments according to the present invention can provide location information associated with a mobile user terminal by receiving a request from a requestor for location information associated with a location of the mobile user terminal at a location server that maintains the location information. A determination can be made as to whether the requestor is authorized to receive the location information from the location server. If the requestor is determined to be an authorized requestor, an authorization can be transmitted that allows the requestor to receive the location information from the location server. Accordingly, access to location information associated with the radiotelephone can be controlled by the user by determining whether a requestor is authorized to receive information prior to transmission of the location information.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram that illustrates embodiments of radiotelephones according to the present invention.

FIG. 2 is a block diagram that illustrates embodiments of methods, radiotelephones and systems according the present invention.

FIG. 3 is a flowchart that illustrates methods of operating location servers according to the present invention.

FIGs. 4-5 are block diagrams that illustrates embodiments of methods, radiotelephones, and systems according to the present invention.

FIG. 6 is a schematic diagram that illustrates embodiments of Web pages according to the present invention.

FIGs. 7-8 are block diagrams that illustrate embodiments of methods, radiotelephones, and systems according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout.

As will be appreciated by one of skill in the art, the present invention may be embodied as methods, devices or computer displayable documents. Accordingly, the present invention may take the form of a hardware embodiment, a software embodiment or an embodiment combining software and hardware aspects.

The present invention is also described using flowchart illustrations and block diagrams. It will be understood that each block (of the flowchart illustrations and block diagrams), and combinations of blocks, can be implemented by computer program instructions. These program instructions may be provided to a processor circuit(s) within the mobile user terminal or system, such that the instructions which execute on the processor circuit(s) create means for implementing the functions specified in the block or blocks. The computer program instructions may be executed by the processor circuit(s) to cause a series of operational steps to be performed by the processor circuit(s) to produce a computer implemented process such that the instructions which execute on the processor circuit(s) provide steps for implementing the functions specified in the block or blocks.

Accordingly, the blocks support combinations of means for performing the specified functions, combinations of steps for performing the specified functions and program instruction means for performing the specified functions. It will also be understood that each block, and combinations of blocks, can be implemented by special purpose hardware-based systems which perform the specified functions or steps, or combinations of special purpose hardware and computer instructions.

Although the present invention is described herein by reference to a radiotelephone, it will be understood that the present invention can be embodied in other types of mobile user terminals such as a portable computer, a handheld computer, a personal digital assistant and the like. The present invention can be embodied in a type of radiotelephone commonly referred to as a Web phone or Web enabled radiotelephone. As used herein, the term "Web" refers to the World Wide Web which currently runs on the Internet. The Web is described further, for example, in U.S. Patent No. 5,937,160 to Davis *et al.* entitled *Systems, Methods, and Computer Program Products for Updating Hypertext Documents Via Electronic Mail* the entire disclosure of which is incorporated herein by reference. The present invention can also be utilized in other types of networks such as an intranet or private network.

FIG. 1 is a block diagram that illustrates embodiments of radiotelephones **101** according to the present invention. The radiotelephone **101** can be used to communicate within a wireless communications system. Wireless communications systems are commonly employed to provide voice and data communications to subscribers. For example, analog cellular radiotelephone systems, such as those designated AMPS, ETACS, NMT-450, and NMT-900, have long been deployed successfully throughout the world. Digital cellular radiotelephone systems, such as those conforming to the North American standard IS-54 and the European standard GSM, have been in service since the early 1990's. More recently, a wide variety of wireless digital services broadly labeled as PCS (Personal Communications Services) have been introduced, including advanced digital cellular systems conforming to standards such as IS-136 and IS-95, lower-power systems such as DECT (Digital Enhanced Cordless Telephone) and data communications services such as CDPD (Cellular Digital Packet Data).

As shown in **FIG. 1**, the radiotelephone **101** includes a keypad **110** which can be used to provide input to the radiotelephone **101**. The keypad **110** can include a plurality of keys that provide input to the radiotelephone **101** when pushed. For example, when the user wishes to initiate a call in the wireless communications system, the user pushes a series of keys that correspond to the number to be dialed. During the call, the user can speak into a microphone **145** which causes the radiotelephone **101** to generate communication signals which are transmitted from the radiotelephone **101**. The user may listen to a speaker **160** that produces audio signals generated by the radiotelephone **101** from communication signals received by the radiotelephone **101** during a call. The radiotelephone **101** transmits and receives the communication signals via a transceiver circuit **140** over an antenna **159**. The transceiver circuit **140** include separate transmitter and receiver circuits.

During operation, the user may refer to a display **156** of the radiotelephone **101** to observe information relevant to the operation of the radiotelephone **101**, such as characters or numbers. For example, the display **156** can be a black and white Liquid Crystal Display (LCD) that displays, for example, a telephone number entered by the user or a name stored in the radiotelephone **101**. The display **156** may also be used in conjunction with the keypad **110** such as when the user dials a number to place a call.

It will be understood that the functions of keypad **110** and the display **156** can be provided by a user interface to the radiotelephone **101**. For example, the user interface can be a touch screen through which the user can view computer displayable documents, provide input thereto, and control the radiotelephone **101**. It will be understood by those having skill in the art that Web pages and computer displayable documents can be, for example, hypertext documents which can include text, images, input fields, output fields, and a variety of other objects.

A processor circuit **103** provides the communications signals to the transceiver circuit **140** for transmission and receives the communications signals from the transceiver circuit **140** for reception. For example, the processor circuit **103** provides communications signals to the transceiver **140** when the user speaks into the microphone **145** and receives communications signals from the transceiver **140** for the reproduction of audio through the speaker **160**. The processor circuit **103** generates characters for display on the display **156**. For example, the processor circuit **103** generates numbers for display when the user enters a telephone number on the keypad **110**. The characters can also be generated by a character generator which is not shown. The microphone **145**, speaker **160**, keypad **110**, and display **156** are coupled to the processor circuit **103** which controls operations of the radiotelephone **101**.

The radiotelephone **101** of the present invention can include a receiver circuit **105** and an antenna **107**. The receiver circuit **105** and antenna **107** can receive signals used to determine location information associated with the radiotelephone **101**. In some embodiments, the receiver circuit **105** and antenna **107** are a GPS receiver and antenna which receive GPS signals used to provide latitude and longitude information to the processor circuit **103**. The processor circuit **103** can use the latitude and longitude information to determine the location information associated with the radiotelephone **101**. In other embodiments, the location information is determined by receiving signals from the wireless communications system as described, for example, in Watters et al. The radiotelephone **101** may use other methods and/or systems to determine the location information.

Alternatively, the location information can be determined external to the radiotelephone **101**. For example, in some embodiments the location information is determined by a cellular positioning system using a triangulation technique. Cellular positioning systems are described further, for example, in U.S. Patent No. 5,327,144 to Stilp *et al.* entitled *Cellular telephone location system*, the disclosure of which is incorporated herein by reference in its entirety.

In some embodiments the location information can be a cell or base station number in the wireless communications system, an address, or other information that can be used to indicate a location of the radiotelephone **101**. The location information can be updated periodically or in response to an event or a command. For example, location information may be determined in response to receiving a request for location information.

The location information can be stored in a location circuit **106**. The location circuit **106** can also store the a list of identifiers associated with authorized requestors. The location circuit **106** can operate as a location server which provides the location information associated with the radiotelephone **101** to a requestor that is determined to be authorized to receive the location information associated with the radiotelephone. In some embodiments, the location information is not stored in the radiotelephone **101**. For example, the location information may be stored on a server in a network.

It will be understood that the location circuit **106** can be implemented by software and/or firmware that is run by the processor circuit **103**. The processor circuit **103** may, for example, store the location information and list of authorized requestors in a memory (not shown). Alternatively, the location circuit **106** can be a separate circuit that executes software and/or firmware to carry out the operations of the location server.

FIG. 2 is a block diagram that illustrates embodiments of methods, radiotelephones and systems according the present invention. As shown in **FIG. 2**, a location server **225** according to the present invention is included in a radiotelephone **201**. A requestor **205** transmits a request **215** for location information to the location server **225** via a network **209**, such as the Internet, coupled to a wireless communication system **210**. The requestor **205** can be, for example, a computer, a computer terminal, a telephone, a second radiotelephone, or other electronic communications device. Alternatively, the requestor **205** may communicate with the wireless communications system **210** directly, thereby avoiding communications with the network **209**.

The request **215** can include a requestor identifier associated with the requestor **205**. The requestor identifier can be, for example, a name, a telephone number associated with the requestor, or other information that allows the location server **225** to identifier the requestor **205**.

The location server **225** can transmit an authorization response **220** including the location information to the requestor **205** if the requestor is authorized to receive the location information. The request **215** and the authorization response **220** can be transmitted in the wireless communications system **210** using techniques known to those having skill in the art. For example, the request **215** and the authorization response **220** can be transmitted using a Short Message Service (SMS). SMS is described, for example, in U.S. Patent No. 5,915,222 to Olsson *et al*. entitled *Transporting Short Message Service (SMS) Messages Within A Telecommunications Network*, which is assigned to the assignee of the present invention, the entire disclosure of which is incorporated herein by reference. Other services and/or techniques may be used.

It will be understood that the requests and responses according to the present invention may be conducted when a call status of the radiotelephone is active, for example, during a call. Alternatively, communications according to the present invention may occur when the call status is inactive. The communications can be conducted over a channel of the wireless communications system, such as a traffic channel, a control channel, a packet data channel or the like. Other communications systems, such as a Public Switched Telephone Network or the Internet may be used.

FIG. 3 is a flowchart that illustrates methods of operating location servers according to the present invention. The location server receives a request for location information associated with the radiotelephone (block **301**). The location server determines whether the requestor is authorized to receive the location information based, for example, on a requestor identifier associated with the request (block **302**).

If the location server determines that the requestor is authorized to receive the location information (block **302**), the location server transmits an authorization that allows the requestor to receive the location information (block **303**). If the location server determines that the requestor is not authorized to receive the location information (block **302**), no authorization is sent to the requestor (block **304**). In some embodiments, the radiotelephone may prompt the user for input to indicate whether the requestor is authorized or not. Accordingly, the transmission of the authorization for the requestor to receive the location information may be provided by input via the keypad **110**.

FIG. 4 is a block diagram that illustrates embodiments of methods, radiotelephones, and systems according to the present invention. A location server **423** according to the present invention communicates with a Web page **410** or computer displayable document running on a server **440** via a network **409** to authorize a requestor **405** to receive the location information.

The requestor **405** submits a request **415** for location information to the Web page **410**. The Web page **410** transmits the request **415** to the location server **423** in the radiotelephone **401** via a wireless communications system **411**. If the location server **423** determines that the requestor **405** is authorized to receive the location information, the location server **423** transmits an authorization response **425** including the location information to the server **440** which provides the location information to the requestor **405** via the Web page **410**.

FIG. 5 is a block diagram that illustrates embodiments of methods, radiotelephones, and systems according to the present invention. As shown in **FIG. 5**, a requestor **505** transmits a first request **515** to a location server **523** in the radiotelephone **501** via a network **509** coupled to a wireless communications system **511**. In contrast to the embodiments illustrated in **FIG. 4**, the first request **515** may not be transmitted through a Web page **504** on a server **510**.

If the location server **523** determines that the requestor **505** is authorized to receive the location information, the location server **523** can transmit a response **520** that authorizes the requestor **505** to receive the location information. The authorization response **520** can include the location information and an authorization identifier, such as a Personal Identification Number (PIN) which is provided to the requestor **505**. The requestor **505** can access the Web page **504** to receive the PIN. The requestor **505** transmits a second request **530**, including the requestor identifier and the PIN, to the server **510**. The server **510** transmits a second response **527** to the requestor **505** that includes the location information.

In some embodiments, a PIN can be provided to the to the requestor **505** without the use of a Web page. For example, the PIN may be sent by the radiotelephone **501** directly to the requestor **505** using SMS or e-mail. Other types of communications can be used. In other embodiments, the PIN can be sent to the requestor **505** by a source other than the radiotelephone **501**.

It will be understood that the communications described herein may be encrypted or authenticated using, for example, digital certificates signed by a certifying authority, such as VeriSign®, so that the location server can verify that a request is from the identified requestor. Additional information on VeriSign® may be obtained on the Web at http://www.verisign.com. Other types of encryption or authentication may be used.

FIG. 6 is a schematic diagram that illustrates embodiments of Web pages and computer displayable documents according to the present invention. As shown in **FIG. 6**, a Web page **700** can include a requestor field **705** to which the requestor can input a requestor identifier that is recognizable by the location server as being associated with the requestor. The Web page also includes a radiotelephone identifier field **710**.

The Web page **700** can transmit the requestor identifier to the location server associated with the radiotelephone identified by the radiotelephone identifier. If the requestor is authorized to receive the location information, the Web page outputs the location information received from the location server via the location information field **715**. Alternatively, the location server may transmit an authorization code, such as a Personal Identification Number (PIN) to the requestor which can input the PIN to a authorization code field **720** to access the location information.

In some embodiments, the Web page **700** can be the user's home Web page or a third party Web page that provides the location information services according to the present invention to a group of subscribers.

FIG. 7 is a block diagram that illustrates embodiments of methods, radiotelephone, and systems according to the present invention. As shown in **FIG. 7**, a location server **640** can run on a server **610** external to a radiotelephone **601**. The radiotelephone **601** can provide location information and a list of authorized requestor identifiers to the location server **640** by communications **620** via a wireless communications system **611** coupled to a network **609**. In other embodiments, the authorized requestor identifiers are provided from a source other than that radiotelephone **601**, such as by sending electronic mail via the Internet. Other sources may be used.

The location information can be provided periodically or in response to a request from the location server **640** or other system or device. The location information can be provided prior to a request for location information. Accordingly, location information associated with the radiotelephone **601** may be provided when the radiotelephone is switched off or is otherwise in an inactive state.

The requestor **605** transmits a request **615**, including a requestor identifier and a radiotelephone identifier, to the location server **640** via the network **609**. If the location server **640** determines that the requestor **605** is authorized to receive the location information, the location server **640** can transmit an authorization response **630** that includes the location information.

In some embodiments, the authorization can be valid for a predetermined time. Accordingly, if an authorized requestor does not request the location information prior to expiration of the predetermined time, the requestor's authorization will expire. In other embodiments, the user may revoke authorization previously given to a requestor. In still other embodiments, the user can delete the location information associated with the radiotelephone **601** from the location server **640**.

FIG. 8 is a block diagram that illustrates embodiments of methods, radiotelephone, and systems according to the present invention. According to **FIG. 8**, the location information is determined using a cellular positioning system **802** such as those described in Stilp. In particular, the cellular positioning system **802** can provide location information using triangulation techniques applied to communications used for standard radiotelephone operations. Accordingly, a radiotelephone **801** may not need specialized location determination hardware and/or software to function in systems according to the present invention.

The cellular positioning system **802** can be part of a wireless communications system **811** that provides service to the radiotelephone **801**. In other embodiments, the cellular positioning system **802** can be separate from the wireless communications system **811**.

A location server **840** can run on a server **810** external to the radiotelephone **801**. The cellular positioning system **802** can provide location information to the location server **840** via a network **809** coupled to the wireless communications system **811**.

A requestor **805** transmits a request **815**, including a requestor identifier and a radiotelephone identifier, to the location server **840** via the network **809**. The location server **840** forwards a request **820** to the radiotelephone **801** via the wireless communications system **811**. Other communications can be used to provide the request **820** to the radiotelephone **801**.

Upon receiving the request **820**, the radiotelephone **801** can be used to determine whether the requestor **805** is authorized to receive the location information. For example, in some embodiments the radiotelephone **801** can store a list of authorized users so that the radiotelephone **801** may respond to the request **820** without user intervention. In other embodiments, the radiotelephone **801** may request input from the user as to whether the requestor **805** is authorized to receive the location information.

If the requestor **805** is authorized, the radiotelephone **801** can transmit an authorization response **830** to the location server **840**. Upon receiving the authorization response **830**, the location server **840** can provide the location information to the requestor **805**. If the requestor **805** is not authorized, the radiotelephone **801** does not transmit the authorization. Accordingly, the location information can be provided to the authorized requestor **805** under the control of the user without requiring the radiotelephone **801** to include special hardware and/or software to determine the location of the radiotelephone **801**.

According to the present invention, access to location information associated with a radiotelephone can be controlled by determining whether a requestor is authorized to receive the location information prior to allowing the requestor to access or receive the location information.

Embodiments according to the present invention can provide location information associated with a mobile user terminal by receiving a request from a requestor for location information associated with a location of the mobile user terminal at a location server that maintains the location information. A determination is made as to whether the requestor is authorized to receive the location information from the location server. If the requestor is determined to be an authorized requestor, an authorization is transmitted that allows the requestor to receive the location information from the location server. Accordingly, access to location information associated with the radiotelephone can be controlled by the user by determining whether a requestor is authorized to receive information prior to transmission of the location information.

In some embodiments, the location server is external to the mobile user terminal. In other embodiments, the location server is included in the mobile user terminal. In still other embodiments, the location server comprises a web page.

In other embodiments, the request is received when a call status associated with the mobile user terminal is inactive indicating that no call is in progress at the mobile user terminal.

According to some embodiments of the present invention, a computer-displayable document according to the present invention includes a first field for input of a requestor identifier associated with a requestor of location information associated with the mobile user terminal and a second field for input of a mobile user terminal identifier associated with the mobile user terminal for which location information is requested. A third field is configured to provide output of the location information based on whether the requestor is authorized to receive the location information.

In further embodiments according to the present invention, the computer-displayable document further includes a fourth field that provides for output of an authorization code that authorizes the requestor to receive the location information and a fifth field that provides for input of the authorization code that is transmitted to a location server that maintains the location information. In some embodiments, the second field provides for input of a telephone number.

In other embodiments, the mobile user terminal can include a receiver circuit that receives requests from a requestor for location information associated with a location of the mobile user terminal and a processor circuit that determines whether the requestor is authorized to receive the location information. A transmitter circuit transmits an authorization in response to the processor circuit determining that the requestor is authorized to receive the location information. Accordingly, location information can be determined external to the mobile user terminal. For example, the location information can be provided by a cellular positioning system that determines the location information based on communications used, for example, during standard mobile user terminal operations. Therefore, the mobile user terminal may not need specialized location determination hardware and/or software to function in a system according to the present invention.

In the drawings and specification, there have been disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

WHAT IS CLAIMED:

1. A method for providing location information associated with a mobile user terminal, the method comprising the steps of:

receiving a request from a requestor for location information associated with a location of the mobile user terminal at a location server that maintains the location information;

determining whether the requestor is authorized to receive the location information from the location server; and

transmitting an authorization that allows the requestor to receive the location information from the location server in response to determining that the requestor is authorized to receive the location information from the location server.

2. A method according to Claim 1, wherein the location server is external to the mobile user terminal.

3. A method according to Claim 2, wherein the step of receiving comprises the step of receiving the request when a call status associated with the mobile user terminal is inactive indicating that no call is in progress at the mobile user terminal.

4. A method according to Claim 1, wherein the location server is included in the mobile user terminal.

5. A method according to Claim 1, wherein the location server comprises a web page that is configured to display the location information to the requestor.

6. A method according to Claim 1, wherein the step of determining comprises the step of comparing a requestor identifier associated with the requestor to a list of authorized requestor identifiers associated with respective requestors authorized to receive the location information.

7. A method according to Claim 1, wherein the step of determining comprises the steps of:

outputting a received requestor identifier associated with the requestor via an interface of the mobile user terminal; and

receiving input via the interface that indicates whether the requestor is authorized to receive the location information from the location server.

8. A method according to Claim 7, wherein the step of transmitting comprises the step of transmitting a signal that authorizes the transmission of the location information from the mobile user terminal.

9. A method according to Claim 2, wherein the step of determining is preceded by the step of receiving an authorization identifier associated with an authorized requestor that is authorized to receive the location information.

10. A method according to Claim 9, wherein the authorization identifier authorizes the associated requestor to receive the location information from the location server for a predetermined time.

11. A method according to Claim 2 further comprising the step of receiving an unauthorized identifier associated with an unauthorized requestor that indicates that the unauthorized requestor is not authorized to receive the location information from the location server.

12. A method according to Claim 1, wherein the step of transmitting comprises the step of transmitting the location information from the location server to the requestor.

13. A method according to Claim 2 further comprising the steps of:

receiving a second request for the location information at the location server from the requestor; and

transmitting the location information from the location server to the requestor in response to the second request.

14. A method according to Claim 1, wherein the requestor comprises a second mobile user terminal.

15. A method for providing location information associated with a mobile user terminal, the method comprising the steps of:

receiving a requestor identifier associated with a requestor of location information associated with the mobile user terminal;

receiving a mobile user terminal identifier associated with the mobile user terminal for which location information is requested; and

transmitting the location information based on whether the requestor is authorized to receive the location information.

16. A method according to Claim 15, wherein the mobile user terminal identifier comprises a telephone number.

17. A method according to Claim 15 further comprising the steps of:

receiving an authorization code from the mobile user terminal that authorizes the requestor to receive the location information;

transmitting the authorization code to a location server that maintains the location information; and

transmitting the location information from the location server to the requestor.

18. A mobile user terminal comprising:

a receiver circuit that receives requests from a requestor for location information associated with a location of the mobile user terminal;

a location circuit, coupled to the receiver, that determines the location information and stores the location information;

a processor circuit, coupled to the receiver circuit and the location circuit, that determines whether the requestor is authorized to receive the location information from the location circuit; and

a transmitter, coupled to the processor circuit, that transmits the location information stored in the location circuit in response to the processor circuit determining that the requestor is authorized to receive the location information from the location circuit.

19. A mobile user terminal according to Claim 18 further comprising:

an interface, wherein the interface provides a received requestor identifier associated with the requestor and receives input via the interface that indicates whether the requestor is authorized to receive the location information from the location circuit.

20. A mobile user terminal according to Claim 19, wherein the transmitter circuit transmits a signal that authorizes the transmission of the location information from the mobile user terminal.

21. A mobile user terminal comprising:

a receiver circuit that receives requests from a requestor for location information associated with a location of the mobile user terminal;

a processor circuit, coupled to the receiver circuit, that determines whether the requestor is authorized to receive the location information; and

a transmitter circuit, coupled to the processor circuit, that transmits an authorization in response to the processor circuit determining that the requestor is authorized to receive the location information.

22. A mobile user terminal according to Claim 21 further comprising:

an interface, wherein the interface provides a received requestor identifier associated with the requestor and receives input via the interface that indicates whether the requestor is authorized to receive the location information.

23. A mobile user terminal according to Claim 21, wherein the location information is determined via a cellular positioning system.

24. A mobile user terminal according to Claim 21, wherein the processor circuit determines whether the requestor is authorized without requesting input from a user.

25. A mobile user terminal according to Claim 24, wherein the processor circuit determines whether the requestor is authorized by comparing a requestor

identifier associated with the requestor to an authorized identifier associated with an authorized requestor.

26. A computer-displayable document for providing location information associated with a mobile user terminal, the computer-displayable document comprising:

a first field configured to receive a requestor identifier associated with a requestor of location information associated with the mobile user terminal;

a second field configured to receive a mobile user terminal identifier associated with the mobile user terminal for which location information is requested; and

a third field that provides the location information based on whether the requestor is authorized to receive the location information.

27. A computer-displayable document according to Claim 26 further comprising:

a fourth field that provides an authorization code that authorizes the requestor to receive the location information; and

a fifth field configured to receive the authorization code that is transmitted to a location server that maintains the location information.

28. A computer-displayable document according to Claim 26, wherein the second field is configured to receive a telephone number.

29. A system for providing location information associated with a mobile user terminal, the system comprising:

means for receiving a request from a requestor for location information associated with a location of the mobile user terminal at a location server that maintains the location information;

means for determining whether the requestor is authorized to receive the location information from the location server; and

means for transmitting an authorization that allows the requestor to receive the location information from the location server in response to determining that the requestor is authorized to receive the location information from the location server.

30. A system according to Claim 29, wherein the location server is external to the mobile user terminal.

31. A system according to Claim 30, wherein the means for receiving comprises means for receiving the request when a call status associated with the mobile user terminal is inactive indicating that no call is in progress at the mobile user terminal.

32. A system according to Claim 29, wherein the location server is included in the mobile user terminal.

33. A system according to Claim 29, wherein the location server comprises a web page that is configured to display the location information to the requestor.

34. A system according to Claim 29, wherein the means for determining comprises means for comparing a requestor identifier associated with the requestor to a list of authorized requestor identifiers associated with respective requestors authorized to receive the location information.

35. A system according to Claim 29, wherein the means for determining comprises:

means for outputting a received requestor identifier associated with the requestor via an interface of the mobile user terminal; and

means for receiving input via the interface that indicates whether the requestor is authorized to receive the location information from the location server.

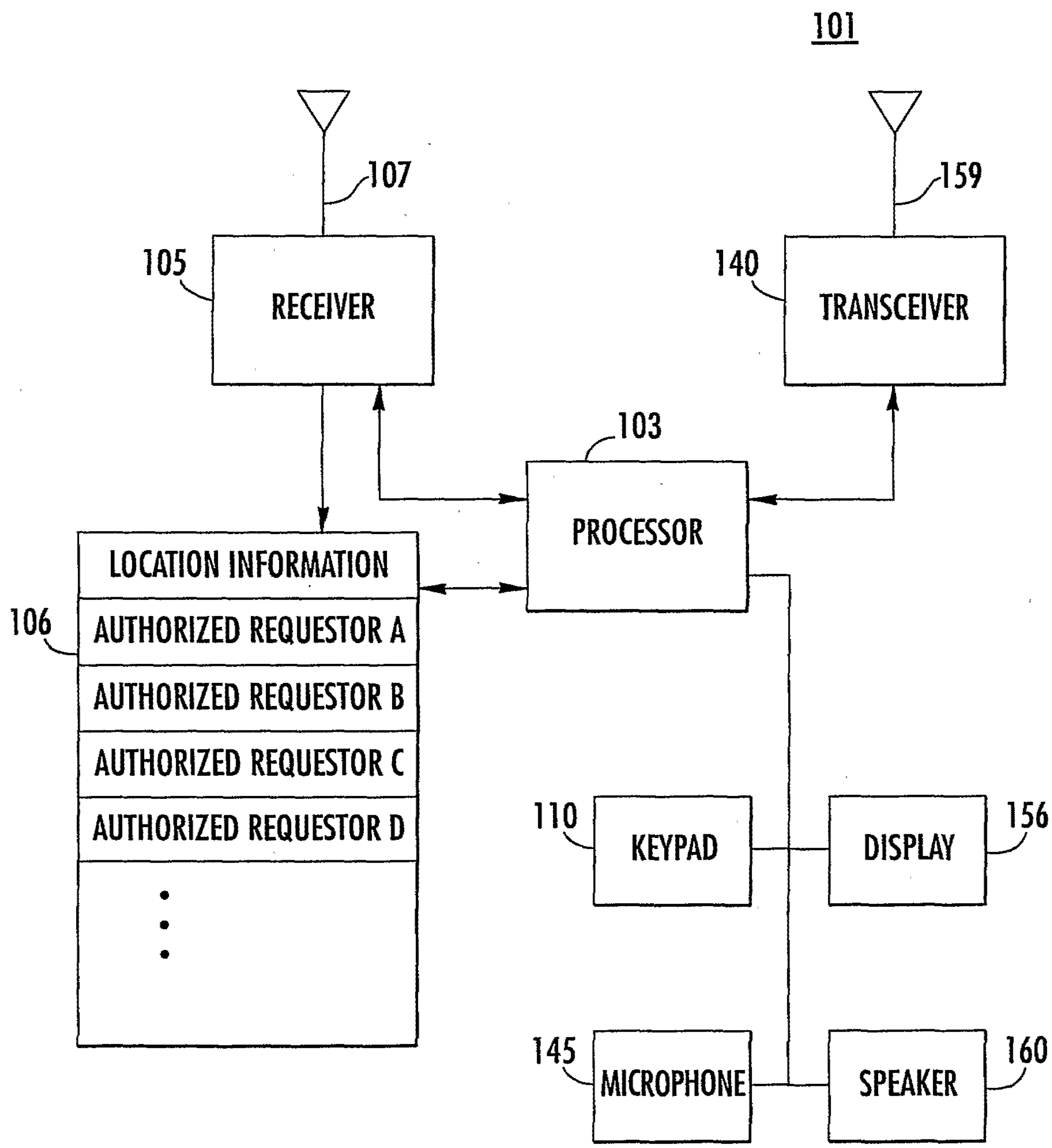
101
107
159
105
RECEIVER
140
TRANSCEIVER
103
PROCESSOR
LOCATION INFORMATION
106
AUTHORIZED REQUESTOR A
AUTHORIZED REQUESTOR B
AUTHORIZED REQUESTOR C
AUTHORIZED REQUESTOR D
110
KEYPAD
DISPLAY
156
145
MICROPHONE
SPEAKER
160

FIG. 1.

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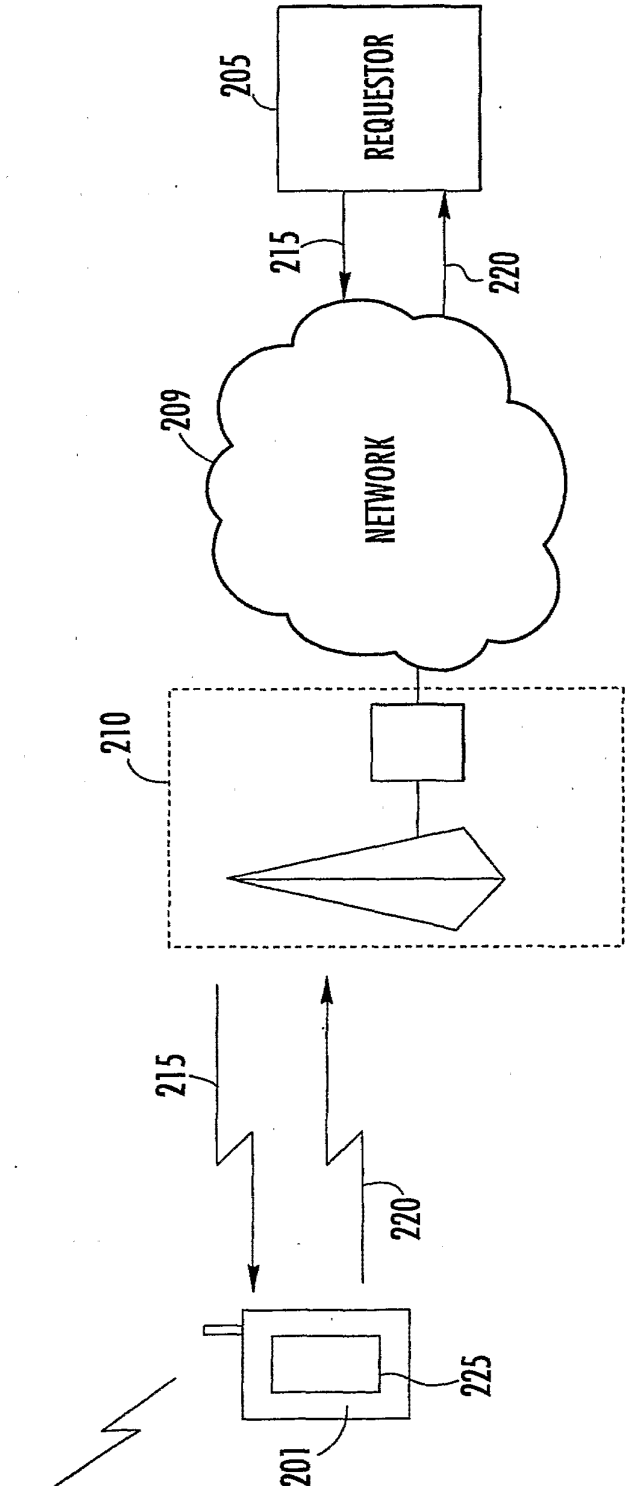

FIG. 2.

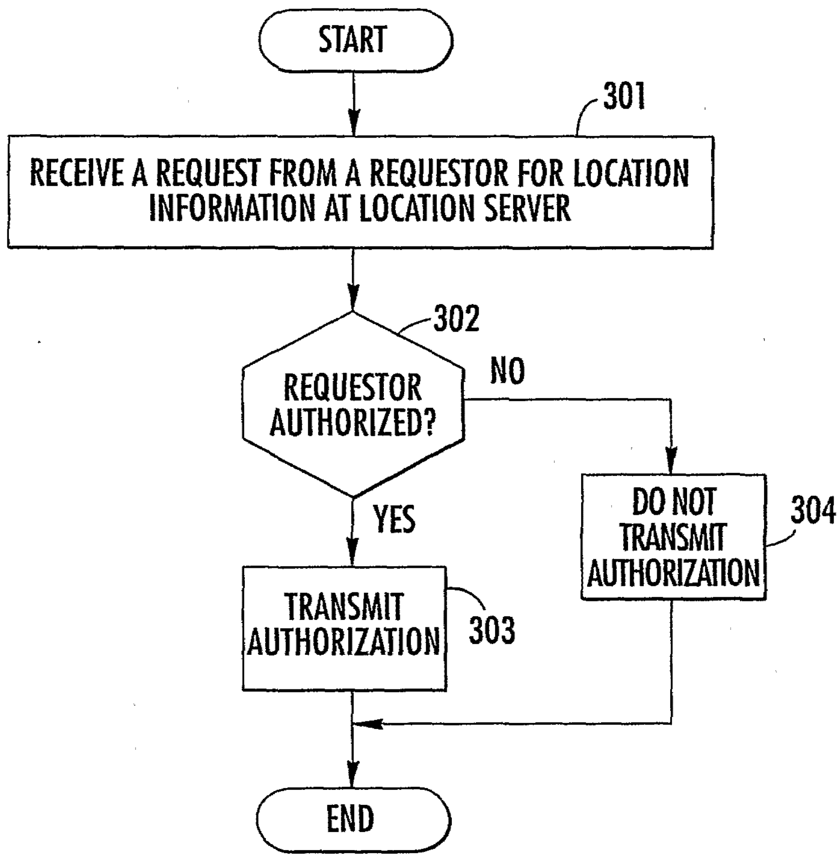
START
301
RECEIVE A REQUEST FROM A REQUESTOR FOR LOCATION INFORMATION AT LOCATION SERVER
302
REQUESTOR AUTHORIZED?
NO
YES
DO NOT TRANSMIT AUTHORIZATION
304
TRANSMIT AUTHORIZATION
303
END

FIG. 3.

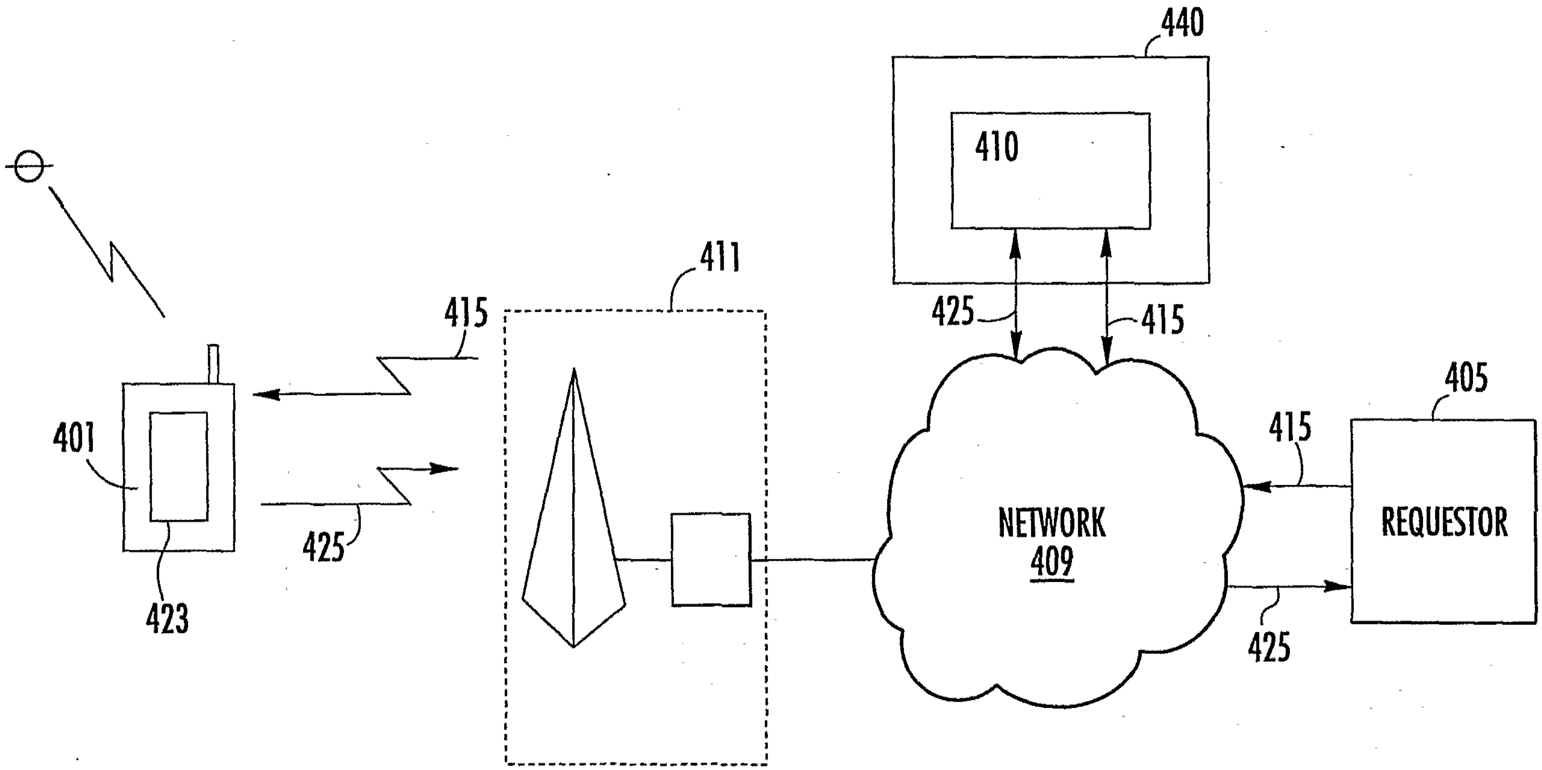
440
410
411
415
425
415
401
423
425
NETWORK
409
405
415
REQUESTOR
425

FIG. 4.

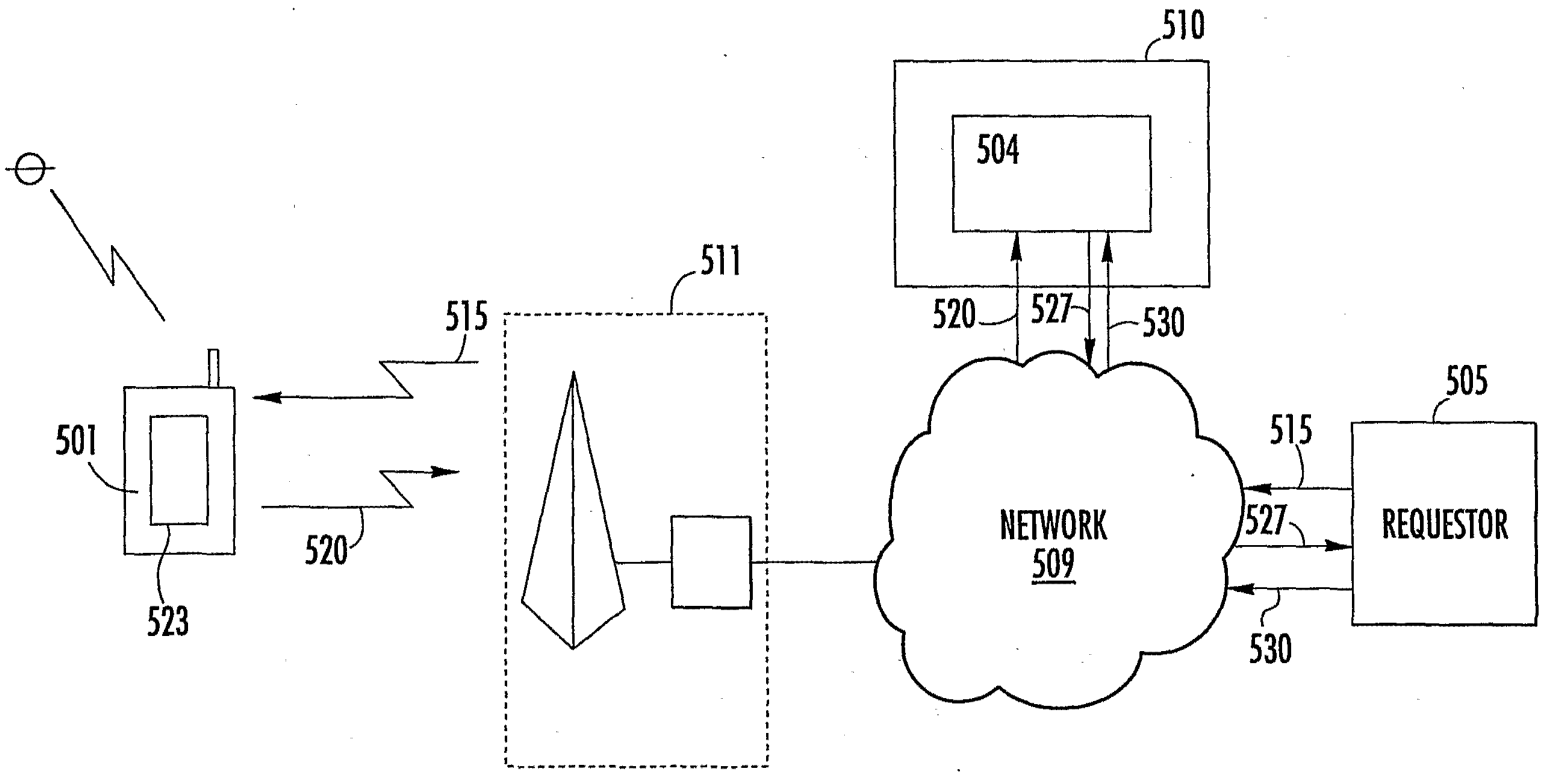
510
504
511
515
520
527
530
501
523
505
515
527
530
NETWORK
509
REQUESTOR

FIG. 5.

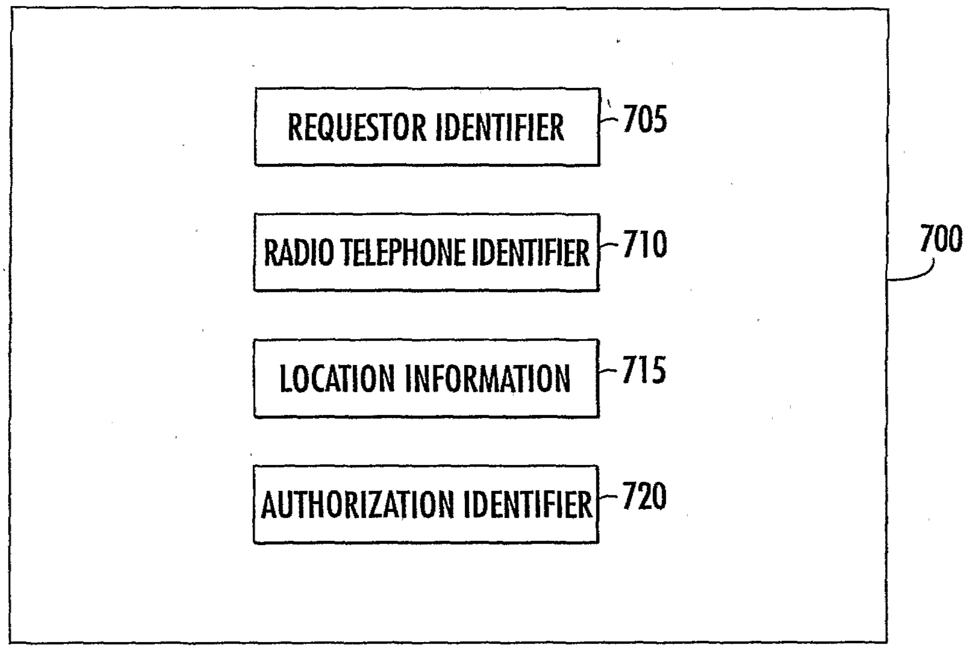
REQUESTOR IDENTIFIER
705
RADIO TELEPHONE IDENTIFIER
710
LOCATION INFORMATION
715
AUTHORIZATION IDENTIFIER
720
700

FIG. 6.

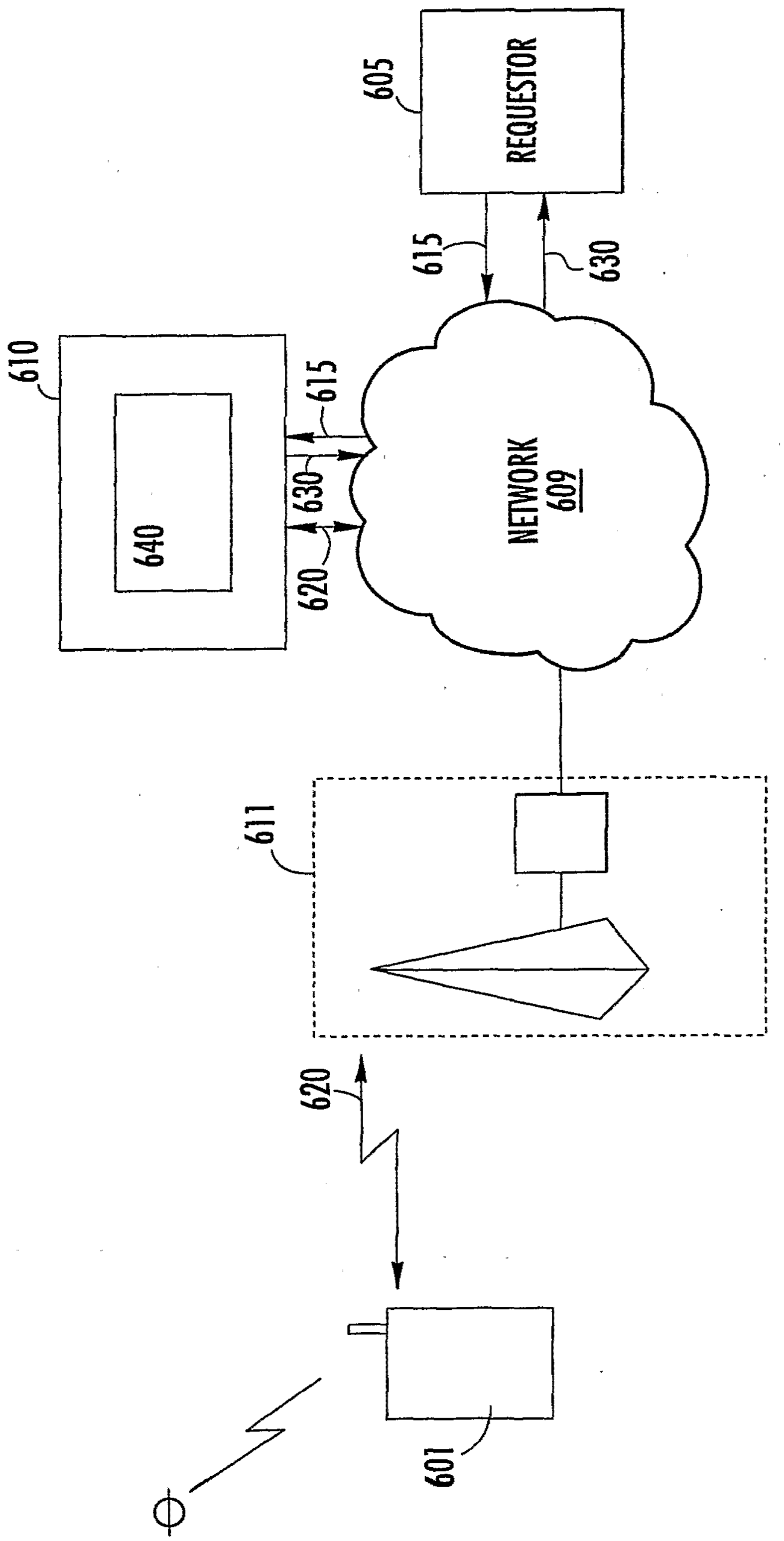
605
REQUESTOR
615
630
610
640
615
630
620
NETWORK
609
611
620
601

FIG. 7.

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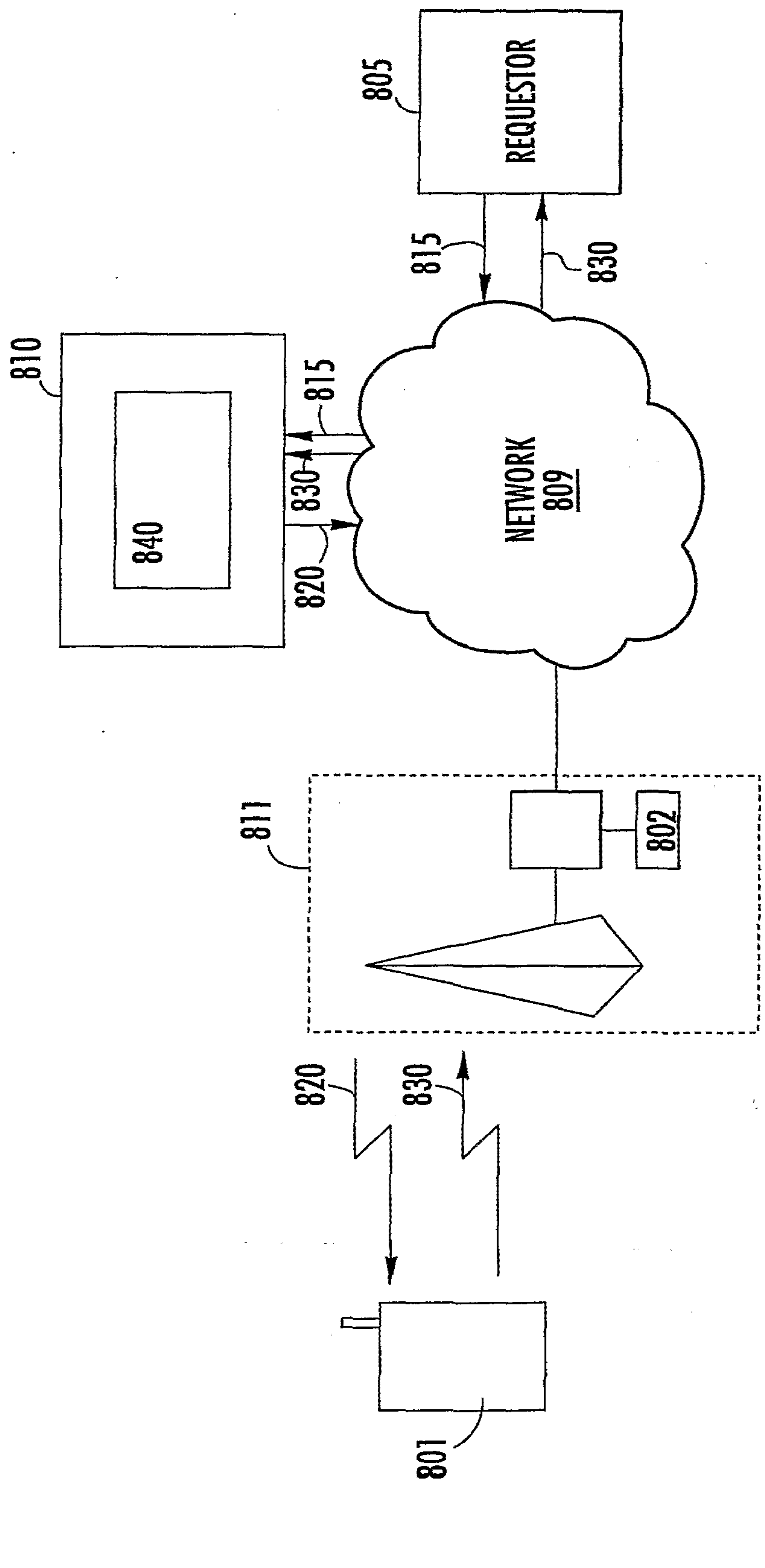
805
REQUESTOR
815
830
810
840
815
830
820
NETWORK
809
811
802
820
830
801

FIG. 8.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls
First Named Inventor/Applicant Name:	Darrell Diem
Filer:	Robert S. Babayi
Attorney Docket Number:	GDAC-7

Filed as Small Entity

Filing Fees for **Utility under 35 USC 111(a)**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	70	70
Utility Search Fee	2111	1	300	300
Utility Examination Fee	2311	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**730**

Electronic Acknowledgement Receipt

EFS ID:	21485637
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	12-FEB-2015
Filing Date:	
Time Stamp:	16:35:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$730
RAM confirmation Number	3307
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	Utility_Trasmittal.pdf	276749 2ca12862c837fcd15ba5e263c13b913e1037c7fc	no	2
Warnings:					
Information:					
2	Application Data Sheet	ADS.pdf	1895293 a2ff3dc795a807a2bf85724f9ba30370cf2a4f5f	no	7
Warnings:					
Information:					
3	Specification	Specification.pdf	250760 fa7fb68d0bc68576110ee584fba0eecaf52c1b61	no	37
Warnings:					
Information:					
4	Drawings-only black and white line drawings	Drawings.pdf	2212845 5ebb82dc4afd9cbea083ed48b1244356734738f8	no	21
Warnings:					
Information:					
5	Oath or Declaration filed	Inventor_Declaration.pdf	97262 679f7f5d5695946d292317656edcf5b365c18b3a	no	1
Warnings:					
Information:					
6	Power of Attorney	POA.pdf	82099 ea11534ae0a428d46f6341343e13740028520143	no	1
Warnings:					
Information:					
7	Information Disclosure Statement (IDS) Form (SB08)	GDAC_Master_IDS.pdf	614608 28f00acef3d70a1da19be0450ceaf99b8ac77fbd	no	11
Warnings:					
Information:					

8	Non Patent Literature	NPL1_Barkhuus.pdf	323754 f4be3861139f8b616baf35d7c97620965bbef67e	no	4
Warnings:					
Information:					
9	Non Patent Literature	NPL2_HP.pdf	1662025 48ac7afad31adeafbd282b5b28a0da11f7457325	no	8
Warnings:					
Information:					
10	Non Patent Literature	NPL3_Maly.pdf	983598 1df2c2310653652a1c5e11bdd8c11c4a5c806f6d	no	6
Warnings:					
Information:					
11	Foreign Reference	Foreign_Patent1.pdf	1110953 d76ea917bb70328ca7e017c222ee823dd99a4f11	no	27
Warnings:					
Information:					
12	Fee Worksheet (SB06)	fee-info.pdf	34979 d6e32e4b272eee1c7bbcf6df39dee133aaf308ec	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	9544925	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code : PET.OP.AGE
Description : Petition to make special based on Age/Health

PTO/SB/130 (07-09)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number

PETITION TO MAKE SPECIAL BASED ON AGE FOR ADVANCEMENT OF EXAMINATION UNDER 37 CFR 1.102(c)(1)

Application Information

Application Number	14620913	Confirmation Number	7589	Filing Date	2015-02-12
Attorney Docket Number (optional)	GDAC-7	Art Unit		Examiner	
First Named Inventor	Darrell Diem				
Title of Invention	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privileges under Multiple Levels of Access Controls				

Attention: Office of Petitions
An application may be made special for advancement of examination upon filing of a petition showing that the applicant is 65 years of age, or more. No fee is required with such a petition. See 37 CFR 1.102(c)(1) and MPEP 708.02 (IV).

APPLICANT HEREBY PETITIONS TO MAKE SPECIAL FOR ADVANCEMENT OF EXAMINATION IN THIS APPLICATION UNDER 37 CFR 1.102(c)(1) and MPEP 708.02 (IV) ON THE BASIS OF THE APPLICANT'S AGE.

A grantable petition requires one of the following items:
(1) Statement by one named inventor in the application that he/she is 65 years of age, or more; or
(2) Certification by a registered attorney/agent having evidence such as a birth certificate, passport, driver's license, etc. showing one named inventor in the application is 65 years of age, or more.

Name of Inventor who is 65 years of age, or older

Given Name	Middle Name	Family Name	Suffix
Darrell		Diem	

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18.
Please see 37 CFR 1.4(d) for the format of the signature.

Select (1) or (2) :

○ (1) I am an inventor in this application and I am 65 years of age, or more.

◉ (2) I am an attorney or agent registered to practice before the Patent and Trademark Office, and I certify that I am in possession of evidence, and will retain such in the application file record, showing that the inventor listed above is 65 years of age, or more.

Signature	/Robert S. Babayi/	Date (YYYY-MM-DD)	2015-02-12
Name	Robert S. Babayi	Registration Number	33471

Electronic Acknowledgement Receipt	
EFS ID:	21488044
Application Number:	14620913
International Application Number:	
Confirmation Number:	7589
Title of Invention:	System and Method for Conveying Event Information Based on Varying Levels of Administrative Privilege under Multiple Levels of Access Controls
First Named Inventor/Applicant Name:	Darrell Diem
Customer Number:	98699
Filer:	Robert S. Babayi
Filer Authorized By:	
Attorney Docket Number:	GDAC-7
Receipt Date:	12-FEB-2015
Filing Date:	
Time Stamp:	16:55:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition to make special based on Age/ Health	Petition_special_Age.pdf	78647 4c077eb7cd1ea8ba4cc8d4b0855c55a2385b1847	no	1

Warnings:

Information:

Total Files Size (in bytes):	78647

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.