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Table with 5 columns: APPLICATION NO., ISSUE DATE, PATENT NO., ATTORNEY DOCKET NO., CONFIRMATION NO.
12/815,306 03/25/2014 8678321 034563-8003.US02 1105

25096 7590 03/05/2014
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

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 533 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):

Jeffrey P. Bezos, Greater Seattle, WA;
Gary Lai, Seattle, WA;
Sean R. Findlay, Seattle, WA;

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NOTICE OF ALLOWANCE AND FEE(S) DUE

25096 7590 02/04/2014
PERKINS COIE LLP - SEA General
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

EXAMINER

RODRIGUEZ, VICENTE M

ART UNIT PAPER NUMBER

3645

DATE MAILED: 02/04/2014

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.

12/815,306 06/14/2010 Jeffrey P. Bezos 034563-8003.US02 1105

TITLE OF INVENTION: SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

Table with 7 columns: 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 05/05/2014

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  
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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)

25096 7590 02/04/2014  
 PERKINS COIE LLP - SEA General  
 PATENT-SEA  
 P.O. BOX 1247  
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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.
12/815,306	06/14/2010	Jeffrey P. Bezos	034563-8003.US02	1105

TITLE OF INVENTION: SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

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	05/05/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
RODRIGUEZ, VICENTE M	3645	244-158900

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. <b>Use of a Customer Number is required.</b></p>	<p>2. For printing on the patent front page, list</p> <p>(1) The names of up to 3 registered patent attorneys or agents OR, alternatively, _____ 1 _____</p> <p>(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. _____ 2 _____</p> <p>_____ 3 _____</p>
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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

<p>4a. The following fee(s) are submitted:</p> <p><input type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (<b>Please first reapply any previously paid issue fee shown above</b>)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input type="checkbox"/> 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).</p>
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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 \_\_\_\_\_ Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_ Registration No. \_\_\_\_\_



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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
Row 1: 12/815,306, 06/14/2010, Jeffrey P. Bezos, 034563-8003.US02, 1105
Row 2: 25096, 7590, 02/04/2014, PERKINS COIE LLP - SEA General PATENT-SEA, P.O. BOX 1247, SEATTLE, WA 98111-1247, EXAMINER RODRIGUEZ, VICENTE M, ART UNIT 3645, PAPER NUMBER
DATE MAILED: 02/04/2014

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

The Patent Term Adjustment to date is 249 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 249 day(s).

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 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.

<b>Notice of Allowability</b>	<b>Application No.</b> 12/815,306	<b>Applicant(s)</b> BEZOS ET AL.	
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645	<b>AIA (First Inventor to File) Status</b> No

**-- 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 claims filed 12/30/2013; telephone interview of 1/17/2014.
  - 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 2-4, 7-10, 12-16, 18, 20, 21. 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](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto: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. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input checked="" type="checkbox"/> Examiner's Amendment/Comment       |
| 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date <u>12/30/2013, 1/16/2014</u> | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material                                   | 7. <input type="checkbox"/> Other _____.                                  |
| 4. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>1-15-14</u> .                               |   |

/V. R./ Examiner, Art Unit 3645	/Rob Swiatek/ Primary Examiner, Art Unit 3643
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The present application is being examined under the pre-AIA first to invent provisions.

#### **EXAMINER'S AMENDMENT**

An extension of time under 37 CFR 1.136(a) is required in order to make an examiner's amendment which places this application in condition for allowance. During a telephone conversation conducted on 1/17/2014 with MR STEVE ARNETT, agreed to an extension of time for ONE MONTH (thus extending the period for reply to a total of six months from the mailing date of the final rejection) and authorized the Director to charge Deposit Account No. 50-0665 the required fee of \$400.00 for this extension and authorized the following examiner's amendment. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with MR STEVE ARNETT on 1/17/2014.

**Claims 3, 4 have been amended to read as follows:**

3. The method of claim 4 wherein the landing structure is a floating platform.

4. A method for operating a space launch vehicle, the method comprising:  
launching the space launch vehicle from earth in a nose-first orientation, wherein  
launching the space launch vehicle includes igniting one or more rocket engines  
on the space launch vehicle;  
reorienting the space launch vehicle to a tail-first orientation after launch;  
positioning a landing structure in a body of water; and  
vertically landing the space launch vehicle on the landing structure in the body of water  
in the tail-first orientation while providing thrust from at least one of the one or  
more rocket engines.

**Claim 5 has been cancelled.**

**Claim 6 has been cancelled.**

**Claim 10 has been amended to read as follows:**

10. The method of claim 4 wherein the space launch vehicle includes a  
payload carried on an upper stage mounted to a booster stage, wherein igniting one or  
more rocket engines includes igniting one or more rocket engines on the booster stage  
to launch the space launch vehicle from a launch site on land, wherein reorienting the  
space launch vehicle includes reorienting the booster stage to a tail-first orientation, and  
wherein the method further comprises:



turning off the one or more rocket engines on the booster stage;  
separating the upper stage from the booster stage at a predetermined altitude;  
receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information; and

reigniting the one or more rocket engines on the booster stage prior to landing, wherein the landing structure is a mobile landing platform, and wherein vertically landing the space launch vehicle includes vertically landing the booster stage on the mobile landing platform.

**Claim 11 has been cancelled.**

**Claims 12, 13, 15, 16, 20 have been amended to read as follows:**

12. A method for transporting a payload to space, the method comprising:  
coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion and one or more rocket engines positioned toward the aft end portion;  
positioning a floating platform in a body of water;  
igniting at least one of the one or more rocket engines and launching the rocket toward space in a nose-first orientation;  
turning off at least one of the ignited one or more rocket engines;  
separating the payload from the booster stage;

after separating and turning off, reorienting the booster stage from the nose-first orientation to a tail-first orientation;  
after reorienting, igniting at least one of the one or more rocket engines to decelerate the booster stage; and  
landing the booster stage on the floating platform in the tail-first orientation, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

13. The method of claim 12, further comprising:  
after the booster stage has separated from the payload and followed a ballistic trajectory,  
deploying an aerodynamic control surface from the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

15. The method of claim 12, further comprising:  
operating one or more propulsive thrusters mounted to the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

16. The method of claim 12, further comprising:  
moving an aerodynamic control surface on the booster stage to at least partially control a flight path of the booster stage toward the platform based on platform positional information received from the platform.

20. A system for providing access to space, the system comprising:  
a space launch vehicle, wherein the space launch vehicle includes one or more rocket engines;  
a launch site;  
a sea going platform;  
means for launching the launch vehicle from the launch site a first time, wherein the means for launching include means for igniting the one or more rocket engines and launching the vehicle in a nose-first orientation;  
means for shutting off the one or more rocket engines;  
means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing;  
means for reigniting at least one of the one or more rocket engines when the launch vehicle is in the tail-first orientation to decelerate the vehicle;  
means for landing at least a portion of the launch vehicle on the sea going platform in a body of water, wherein the means for landing include means for landing in the tail-first orientation while the one or more rocket engines are thrusting; and  
means for launching at least a portion of the launch vehicle from the launch site a second time.

**The following new claim 21 has been added:**

21. The method of claim 12:  
wherein igniting at least one of the one or more rocket engines includes igniting a first  
rocket engine,  
wherein turning off at least one of the one or more rocket engines includes turning off  
the first rocket engine, and  
wherein, after reorienting, igniting at least one of the one or more rocket engines  
includes reigniting the first rocket engine.

***Allowable Subject Matter***

Claims 2-4, 7-10, 12-16, 18, 20-21 have been allowed.

The following is an examiner's statement of reasons for allowance:

**With regard to claim 4**, the cited prior art fails to teach or render obvious the limitations of claim 4. Specifically, "*positioning a landing structure in a body of water; and vertically landing the space launch vehicle on the landing structure in the body of water in the tail-first orientation while providing thrust from at least one of the one or more rocket engines.*"

The closest prior art is Webb and Brand. Webb does not teach or suggest *positioning a landing structure in a body of water; and vertically landing the space launch vehicle on the landing structure in the body of water in the tail-first orientation while providing thrust from at least one of the one or more rocket engines.*

The invention of Brand specifically teaches away from the use of rocket engines in the booster stage, and accordingly does not teach or suggest the above limitation.

**In regards to claim 12**, the cited prior art fails to teach or render obvious the limitations of claim 12. Specifically, Webb does not teach or render obvious the limitation *“positioning a floating platform in a body of water; landing the booster stage on the floating platform in the tail-first orientation, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.”*

Brand does not teach or render obvious the limitation of claim 12 whereby *“igniting at least one of the one or more rocket engines and launching the rocket toward space in a nose-first orientation; turning off at least one of the ignited one or more rocket engines; after reorienting, igniting at least one of the one or more rocket engines to decelerate the booster stage.”*

**In regards to claim 14**, the cited prior art fails to teach or render obvious the limitations of claim 14. Specifically, neither Webb nor Brand teach or render obvious the limitation *“positioning a floating platform in a body of water; after the booster stage has separated from the payload and followed a ballistic trajectory, deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation; and landing the booster stage on the floating platform in the tail-first orientation.”*

**In regards to claim 20**, the cited prior art fails to teach or render obvious the limitations of claim 20. Specifically, neither Webb nor Brand teach or render obvious the limitation *"landing at least a portion of the launch vehicle on the sea going platform in a body of water, wherein the means for landing include means for landing in the tail-first orientation while the one or more rocket engines are thrusting."*

However, neither Webb nor Brand, singularly or in combination, teach or render obvious the above limitations.

#### **Conclusion**

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VICENTE RODRIGUEZ whose telephone number is (571)272-4798. The examiner can normally be reached on Monday-Thursday 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Isam Alsomiri can be reached on 571-272-6970. 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.

/V. R./  
Examiner, Art Unit 3645

/Rob Swiatek/  
Primary Examiner, Art Unit 3643  
29 January 2014

<b>Examiner-Initiated Interview Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	12/815,306	BEZOS ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	VICENTE RODRIGUEZ	3645	

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

(1) VICENTE RODRIGUEZ. (3) \_\_\_\_\_.

(2) MR STEVE ARNETT. (4) \_\_\_\_\_.

Date of Interview: 17 January 2014.

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

Exhibit shown or demonstration conducted:  Yes  No.  
If Yes, brief description: \_\_\_\_\_.

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: 20.

Identification of prior art discussed: Webb.

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...)

Discussed an examiner's amendment to claim 20 regarding addition of a sea-going platform and a needed extension of time. See accompanying examiner's amendment.

**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

/N. R./  
Examiner, Art Unit 3645



<b>Notice of References Cited</b>	Application/Control No. 12/815,306	Applicant(s)/Patent Under Reexamination BEZOS ET AL.	
	Examiner VICENTE RODRIGUEZ	Art Unit 3645	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A US-3,295,790	01-1967	WEBB JAMES E	244/158.9
	B US-			
	C US-			
	D US-			
	E US-			
	F US-			
	G US-			
	H US-			
	I US-			
	J US-			
	K US-			
	L US-			
	M US-			

**FOREIGN PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	U	V	W	X
	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)			

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.




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 Alexandria, Virginia 22313-1450  
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BIB DATA SHEET

CONFIRMATION NO. 1105

<b>SERIAL NUMBER</b> 12/815,306	<b>FILING or 371(c) DATE</b> 06/14/2010 <b>RULE</b>	<b>CLASS</b> 244	<b>GROUP ART UNIT</b> 3645	<b>ATTORNEY DOCKET NO.</b> 034563-8003.US02		
<b>APPLICANTS</b>						
<b>INVENTORS</b> Jeffrey P. Bezos, Greater Seattle, WA; Gary Lai, Seattle, WA; Sean R. Findlay, Seattle, WA;						
<b>** CONTINUING DATA *****</b> This appln claims benefit of 61/218,029 06/17/2009 and claims benefit of 61/187,243 06/15/2009						
<b>** FOREIGN APPLICATIONS *****</b>						
<b>** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** ** SMALL ENTITY **</b> 06/22/2010						
Foreign Priority claimed <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	35 USC 119(a-d) conditions met <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Met after Allowance	<b>STATE OR COUNTRY</b> WA	<b>SHEETS DRAWINGS</b> 2	<b>TOTAL CLAIMS</b> 20	<b>INDEPENDENT CLAIMS</b> 3
Verified and Acknowledged /VICENTE M RODRIGUEZ/ Examiner's Signature	Initials					
<b>ADDRESS</b> PERKINS COIE LLP - SEA General PATENT-SEA P.O. BOX 1247 SEATTLE, WA 98111-1247 UNITED STATES						
<b>TITLE</b> SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS						
<b>FILING FEE RECEIVED</b> 737	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit			

<b>Search Notes</b>  	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

CPC- SEARCHED		
Symbol	Date	Examiner


CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
244	158.9, 158.1	09/18/2012	VR
244	3.1, 110D, 7B, 114R, 110E, 171.3, 171.6,	1/7/2014	VR
114	258, 261	1/8/2014	VR

SEARCH NOTES		
Search Notes	Date	Examiner
inventer name search	09/13/2012	VR
NPL search, NASA technical reports server	09/17/2012	VR
updated search in response to amended claims	7/8/2013	VR
consulted with T. Dien	6/25/2013	VR
updated search in response to AF arguments and interview with applicant's atty and Examiner Swiatek	1/8/2014	VR
consulted with Examiner Swiatek on allowability and newly found prior art	1/17/2014	VR
google patents, IP.com	1/8/2014	VR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
244	3.1, 110D, 7B, 114R, 110E, 171.3, 171.6, 158.9, 158.1 (text search)	1/22/2014	VR
114	258, 261 (text search)	1/22/2014	VR

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<b>Index of Claims</b> 	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA			<input type="checkbox"/> T.D.			<input type="checkbox"/> R.1.47		
CLAIM		DATE								
Final	Original	09/20/2012	07/10/2013	01/16/2014						
	1	✓	-	-						
	2	✓	✓	=						
	3	✓	✓	=						
	4	✓	✓	=						
	5	✓	✓	-						
	6	✓	✓	-						
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	19	✓	✓	-						
	20	✓	✓	=						
	21			=						

Receipt date: 12/30/2013

12815306 - GAU: 3645

PTO/SB/08b (07-09)  
Approved for use through 07/31/2012. OMB 0651-0031  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  <i>(Use as many sheets as necessary)</i>		<b>Complete if Known</b>			
		Application Number	12/815,306-Conf. #1105		
		Filing Date	June 14, 2010		
		First Named Inventor	Jeffrey P. Bezos		
		Art Unit	3645		
		Examiner Name	V. M. Rodriguez		
Sheet	1	of	1	Attorney Docket Number	0345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-4,896,847	01-30-1990	Gertsch	
		US-3,210,025	10-05-1965	Lubben et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
		JP-2003239698-A	08-27-2003	Sasaki Giken Kk		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>7</sup>

Examiner Signature	/Vicente Rodriguez/	Date Considered	01/15/2014
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with an asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

34563-8003 US02/LEGAL/2008447 1 1  
ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.R./

**EAST Search History**

**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S23	0	244/158.1.ccls	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/07 17:30
S24	405	244/158.1.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/07 17:30
S25	29	244/158.7.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/07 17:30
S26	943	244/3.1.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/07 17:31
S27	0	244/158r.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/07 17:32
S28	70	("1739193"   "1874423"   "1914573"   "2841107"   "2977080"   "3000593"   "3122098"   "3168266"   "3221656"   "3260204"   "3285175"   "3384016"   "3437285"   "3534686"   "3606212"   "3702688"   "3738597"   "3964698"   "4265416"   "4410151"   "4678141"   "4709883"   "4744529"   "4796839"   "4884770"   "5090642"   "5129602"   "5143327"   "5163640"   "5217188"   "5295642"   "5568901"   "5626310").PN. OR ("5927653").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/07 18:54
S29	32	("1324433"   "2840328"   "3065937"   "3098445"   "3118636"   "3181824"   "3210025"   "3246864"   "3776490"   "3903801"   "4007505"   "4832288"   "4896847"   "5031857"   "5322248"   "5398888").PN. OR ("5873549").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/07 18:57
S30	100	244/7b.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 11:10
S31	127	244/110e.ccls.	US- PGPUB;	OR	ON	2014/01/08 11:22

			USPAT; EPO; JPO; DERWENT			
S32	554	244/114r.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 11:25
S33	37	("1637769"   "1739193"   "1874423"   "1914573"   "2841107"   "3000593"   "3285175"   "3486718"   "3817479"   "4265416"   "4678141"   "4709883"   "4744529"   "4802639"   "5000398"   "5090642"   "5129602"   "5295642").PN. OR ("5667167").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 11:35
S34	106	244/158.9.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 11:52
S35	89	244/171.3.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 12:01
S36	17	244/171.6.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 12:08
S37	230	114/258.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 12:09
S38	232	114/261.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 12:22
S39	8	114/261.ccls. and (rocket spacecraft booster)	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 12:32
S40	26	("1681434"   "1801039"   "1833033"   "2401853"   "2421699"   "2444332"   "2591913"   "2780422"   "2951664"   "3011738"   "3295789").PN. OR ("3572611").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 12:35
S41	943	244/3.1.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/08 12:36
S42	12	("3063240"   "3066480"   "3215372"   "5593110"   "5740985"   "6450452"   "6612522"   "6616092"   "6817580").PN. OR ("8047472").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 13:41
S43	355	(( B64G1/002).CPC. )	US-	OR	ON	2014/01/08;

			PGPUB; USPAT; USOCR			13:44
S44	135968	rocket booster spaceship spacecapsule	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:02
S45	4760	S44 and (landing recovery descent) same (ocean water bay)	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:03
S46	1509	S44 and (landing recovery descent) same (platform barge ship transport)	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:04
S47	1509	S44 and (platform barge ship transport) same (recovery landing descent)	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:05
S48	420	S47 and (recovery landing descent) same (booster stage)	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:06
S49	108	S48 and (recovery landing descent) same (powered)	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:06
S50	12	S48 and (recovery landing descent) near (powered)	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:07
S51	48	("2921756"   "3369771"   "3576300"   "3702688"   "3830666"   "3955784"   "D220983").PN. OR ("4265416").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/08 14:07
S52	4	"8047472"	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/22 11:52
S53	368	(B64G1/002).CPC.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/22 11:53
S54	46	("2977080"   "3000593"   "3262655"   "3285175"   "3286629"   "3702688"   "4265416"   "4709883"   "4796839"   "4844380"   "5090642"   "5129602"   "5143327"   "5172875"   "5295642").PN. OR ("5568901").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2014/01/22 12:20
S55	256	(B64G1/62).CPC.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/22 12:30
S56	428	(B64G1/242).CPC.	US- PGPUB; USPAT;	OR	ON	2014/01/22 12:45



**EAST Search History (Interference)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S57	1979949	(booster stage rocket space\$vehicle)	US-PGPUB; USPAT; UPAD	OR	ON	2014/01/22 12:55
S58	296937	S57 and (recovery landing reuse)	US-PGPUB; USPAT; UPAD	OR	ON	2014/01/22 12:58
S59	14	S58 and (rocket adj engines) near booster	US-PGPUB; USPAT; UPAD	OR	ON	2014/01/22 12:58
S60	44906	S57 and (recovery landing) same (water platform near (water ocean sea))	US-PGPUB; USPAT; UPAD	OR	ON	2014/01/22 13:00
S61	2008	S57 and (recovery landing) same ((water platform) near (water ocean sea))	US-PGPUB; USPAT; UPAD	OR	ON	2014/01/22 13:00
S62	3	S61 and (tail adj (first orientation landing))	US-PGPUB; USPAT; UPAD	OR	ON	2014/01/22 13:01

1/ 22/ 2014 1:41:31 PM

C:\Users\vrodriguez\Documents\EAST\Workspaces\12-815-306.wsp

Receipt date: 01/16/2014

12815306 - GAU: 3645

PTO/SB/08b (07-09)  
Approved for use through 07/31/2012. OMB 0651-0031  
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  <i>(Use as many sheets as necessary)</i>		<b>Complete if Known</b>			
		Application Number	12/815,306-Conf. #1105		
		Filing Date	June 14, 2010		
		First Named Inventor	Jeffrey P. Bezos		
		Art Unit	3645		
		Examiner Name	V. M. Rodriguez		
Sheet	1	of	1	Attorney Docket Number	0345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-13/968,326	08-15-2013	Featherstone	
		US-14/103,742	12-11-2013	Featherstone	
		US-20060113425-A1	06-01-2006	Radar	
		US-20080078884-A1	04-03-2008	Trabandt et al.	
		US-20090206204-A1	08-20-2009	Rosen	
		US-2,464,827	03-22-1949	Noyes et al.	
		US-2,870,599	09-24-1957	Hawkins et al.	
		US-3,295,790	01-03-1967	Bono et al.	
		US-3,966,142	06-29-1976	Corbett et al.	
		US-5,318,256	06-07-1994	Appleberry et al.	
		US-5,871,173	02-16-1999	Frank et al.	
		US-5,873,549	02-23-1999	Lane et al.	
		US-6,193,187	02-27-2001	Scott et al.	
		US-6,666,402	12-23-2003	Rupert et al.	
		US-6,929,576	08-16-2005	Armstrong et al.	
		US-7,344,111	03-18-2008	Janeke	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
		JP-2000508601-A	07-11-2000	Mueller et al.		
		JP-2002535193-A	10-22-2002	Scott et al.		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>

Examiner Signature	/Vicente Rodriguez/	Date Considered	01/23/2014
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with a single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

34563-8003.US02/LEGAL29048078.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.R./

**EAST Search History****EAST Search History (Prior Art)**


Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	0	(13/968326).APP.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:39
L3	0	"13968326"	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2014/01/23 12:40
L4	0	(14/103742).APP.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:40
L5	2	("20060113425").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:44
L6	2	("20080078864").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:44
L7	2	("20080078884").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:45
L8	2	("20090206204").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:45
L9	7	("2464827").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:46
L10	3	("2870599").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:46
L11	2	("3295790").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:46
L12	3	("3966142").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:47
L13	3	("5318256").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:47
L14	2	("5871173").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:48
L15	2	("5873549").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:48
L16	2	("6193187").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:48
L17	2	("6666402").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:49
L18	2	("6929576").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:50
L19	2	("7344111").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:50
L20	3	("200508601").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2014/01/23 12:51

**EAST Search History (Interference)**

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**1/ 23/ 2014 12:55:07 PM****C:\Users\vrodriquez\Documents\EAST\Workspaces\12-815-306.wsp**



<b>Issue Classification</b> 	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.	
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645	

US ORIGINAL CLASSIFICATION					INTERNATIONAL CLASSIFICATION														
CLASS		SUBCLASS			CLAIMED					NON-CLAIMED									
244		158.9			B	6	4	G	1 / 00 (2006.0)										
<b>CROSS REFERENCE(S)</b>																			
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)																		
244	114R	158.1																	
114	261																		

/VICENTE RODRIGUEZ/ Examiner.Art Unit 3645  (Assistant Examiner)	01/22/2014  (Date)	<b>Total Claims Allowed:</b> 15	
/ROB SWIATEK/ Primary Examiner.Art Unit 3643  (Primary Examiner)	01/27/2014  (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

<b>Issue Classification</b> 	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

<input type="checkbox"/> <b>Claims renumbered in the same order as presented by applicant</b>																<input type="checkbox"/> <b>CPA</b>		<input type="checkbox"/> <b>T.D.</b>		<input type="checkbox"/> <b>R.1.47</b>	
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original						
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/VICENTE RODRIGUEZ/ Examiner.Art Unit 3645  (Assistant Examiner)	01/22/2014  (Date)	<b>Total Claims Allowed:</b>  15	
/ROB SWIATEK/ Primary Examiner.Art Unit 3643  (Primary Examiner)	01/27/2014  (Date)	O.G. Print Claim(s)  1	O.G. Print Figure  1

OK TO ENTER: /V.R./

**AMENDMENTS TO THE CLAIMS**

Please amend claims 14 and 20, and cancel claim 19 as set forth below.

/V.R./ 01/15/2014

1. (Canceled)
  
2. (Previously Presented) The method of claim 4 wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land.
  
3. (Previously Presented) The method of claim 4 wherein landing the space launch vehicle includes vertically landing the space launch vehicle on a floating platform in the body of water.
  
4. (Previously Presented) A method for operating a space launch vehicle, the method comprising:  
launching the space launch vehicle from earth, wherein launching the space launch vehicle includes igniting one or more rocket engines on a booster stage;  
positioning a landing structure in a body of water; and  
landing the space launch vehicle on the landing structure in the body of water, wherein landing the space launch vehicle includes vertically landing the booster stage on the landing structure in the body of water.
  
5. (Previously Presented) The method of claim 4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation.

Application No. 12/815,306  
After Final Office Action of July 29, 2013

Docket No.: 0345638003US2

6. (Previously Presented) The method of claim 4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation while providing thrust from one or more vehicle engines in a tail-first direction.

7. (Previously Presented) The method of claim 4, further comprising reusing at least a portion of the space launch vehicle.

8. (Previously Presented) The method of claim 4, further comprising:  
transporting the space launch vehicle on the landing structure to a refurbishment facility;  
refurbishing at least a portion of the space launch vehicle at the refurbishment facility; and  
reusing at least a portion of the space launch vehicle after refurbishment.

9. (Previously Presented) The method of claim 4, further comprising transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle.

10. (Previously Presented) The method of claim 4 wherein the space launch vehicle includes a payload carried on an upper stage mounted to a booster stage, wherein launching the space launch vehicle from earth includes igniting one or more rocket engines on the booster stage to launch the space launch vehicle from a launch site on land in a nose-first orientation, wherein landing the space launch vehicle includes landing the space launch vehicle on a mobile landing platform in the body of water, and wherein the method further comprises:

turning off the one or more rocket engines on the booster stage;



separating the upper stage from the booster stage at a predetermined altitude;  
reorienting the booster stage to a tail-first orientation;  
receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information; and  
reigniting the one or more rocket engines on the booster stage prior to landing, wherein landing the space launch vehicle includes vertically landing the booster stage on the platform in the tail-first orientation while providing thrust from the reignited one or more rocket engines.

11. (Original) A method for transporting a payload to space, the method comprising:

coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion;  
positioning a floating platform in a body of water;  
igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;  
separating the payload from the booster stage;  
after separating, reorienting the booster stage from the nose-first orientation to a tail-first orientation; and  
landing the booster stage on the floating platform in the tail-first orientation.

12. (Original) The method of claim 11, further comprising:

turning off the one or more rocket engines positioned toward the aft end portion of the booster stage before reorienting the booster stage from the nose-first orientation to the tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage to decelerate

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Docket No.: 0345638003US2

the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

13. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines and following a ballistic trajectory; and  
deploying an aerodynamic control surface from the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

14. (Currently Amended) A method for transporting a payload to space, the method comprising:

coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion;  
positioning a floating platform in a body of water;  
igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;  
turning off the one or more rocket engines;  
separating the payload from the booster stage;  
after the booster stage has separated from the payload and followed ~~separating and following a~~ ballistic trajectory; ~~and~~ deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation; and  
landing the booster stage on the floating platform in the tail-first orientation.

15. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines; and

operating one or more propulsive thrusters mounted to the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

16. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines after separating the payload from the booster stage;  
moving an aerodynamic control surface on the booster stage to at least partially control a flight path of the booster stage toward the platform based on platform positional information received from the platform;  
moving the aerodynamic control surface on the booster stage to at least partially reorient the booster stage from the nose-first orientation to a tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

17. (Canceled)

18. (Previously Presented) The system of claim 20 wherein the means for landing include means for vertically landing at least a portion of the space launch vehicle on a floating platform.

19. (Cancelled)

20. (Currently Amended) A system for providing access to space, the system comprising:  
a space launch vehicle, wherein the space launch vehicle includes one or more rocket engines;

Application No. 12/815,306  
After Final Office Action of July 29, 2013

Docket No.: 0345638003US2

a launch site;  
means for launching the launch vehicle from the launch site a first time, wherein  
the means for launching include means for igniting the one or more rocket  
engines and launching the vehicle in a nose-first orientation;  
means for shutting off the one or more rocket engines;  
means for reorienting the launch vehicle from the nose-first orientation to a tail-  
first orientation before landing;  
means for reigniting at least one of the ~~one or more of the~~ rocket engines when  
the launch vehicle is in the tail-first orientation to decelerate the vehicle;  
means for landing at least a portion of the launch vehicle on a structure in a body  
of water, wherein the means for landing include means for landing in the  
tail-first orientation while the one or more rocket engines are thrusting; and  
means for launching at least a portion of the launch vehicle from the launch site a  
second time.

**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)

25096  
 PERKINS COIE LLP - SEA General  
 PATENT - SEA  
 P.O. Box 1247  
 Seattle, Washington 98111-1247

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 eFiled, on the date indicated below.

Paula Quinano	(Depositor's name)
	(Signature)
February 4, 2014	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/815,306	06/14/2010	Jeffrey P. Bezos	0345638003US2	1105

TITLE OF INVENTION: SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480.00	\$0	\$0	\$480.00	05/05/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
V. M. Rodriguez	3645	244-158900

- |   |   |   |
|---|---|---|
| 1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).<br><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.<br><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached.<br><b>Use of a Customer Number is required.</b> | 2. For printing on the patent front page, list<br>(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,<br>(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 <u>Perkins Coie LLP</u><br>2 _____<br>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: Blue Origin, LLC (B) RESIDENCE: (CITY and STATE OR COUNTRY) Kent, Washington

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:<br><input checked="" type="checkbox"/> Issue Fee<br><input type="checkbox"/> Publication Fee (No small entity discount permitted)<br><input type="checkbox"/> Advance Order - # of Copies _____ | 4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)<br><input type="checkbox"/> A check is enclosed.<br><input checked="" type="checkbox"/> Payment by credit card.<br><input checked="" type="checkbox"/> The Director is hereby authorized to charge any deficiency, or credit any overpayment, to Deposit Account Number <u>50-0665</u> |
|---|--|

5. Change in Entity Status (from status indicated above)
- |   |   |
|---|---|
| <input type="checkbox"/> Applicant certifying micro entity status. See 37 CFR 1.29. | <b>NOTE:</b> Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. |
| <input type="checkbox"/> Applicant asserts small entity status. See 37 CFR 1.27.    | <b>NOTE:</b> 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.                             |
| <input type="checkbox"/> Applicant changing to regular undiscounted fee status.     | <b>NOTE:</b> Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.  |

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ /Stephen E. Arnett/	Date <u>February 4, 2014</u>
Typed or printed name <u>Stephen E. Arnett</u>	Registration No. <u>47,392</u>

Docket No.: 0345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3645

For: SEA LANDING OF SPACE LAUNCH VEHICLES  
AND ASSOCIATED SYSTEMS AND METHODS

Examiner: V. M. Rodriguez

**COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE**

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

Madam:

In the Notice of Allowance mailed February 4, 2014, the Examiner allowed claims 2-4, 7-10, 12-16, 18, 20 and 21. Although applicant agrees with the Examiner's conclusion that these claims are allowable, applicant notes that the claims may be allowable for reasons other than those identified by the Examiner.

Dated: February 4, 2014

Respectfully submitted,

By           /Stephen E. Arnett/  
Stephen E. Arnett  
Registration No.: 47,392  
PERKINS COIE LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
(206) 359-8000  
(206) 359-7198 (Fax)  
Attorney for Applicant

34563-8003.US02/LEGAL29242712.1

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	12815306			
<b>Filing Date:</b>	14-Jun-2010			
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS			
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos			
<b>Filer:</b>	John M. Wechkin/paula quinanola			
<b>Attorney Docket Number:</b>	034563-8003.US02			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
Utility Appl Issue Fee	2501	1	480	480
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
<b>Total in USD (\$)</b>				<b>480</b>



<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	18115886
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/paula quinanola
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	034563-8003.US02
<b>Receipt Date:</b>	04-FEB-2014
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	21:59:18
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

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Payment was successfully received in RAM	\$ 480
RAM confirmation Number	6626
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		SEAD402528_EXCHANGE_0204 2014-180910.PDF	123139 <small>5b05b93d4f1b675e5fd4e00da7a9a526cd301d7b</small>	yes	2
<b>Multipart Description/PDF files in .zip description</b>					
		<b>Document Description</b>	<b>Start</b>	<b>End</b>	
		Issue Fee Payment (PTO-85B)	1	1	
		Miscellaneous Incoming Letter	2	2	
<b>Warnings:</b>					
<b>Information:</b>					
2	Fee Worksheet (SB06)	fee-info.pdf	30570 <small>595b5ac0fb6089b71aeb4f0bf5ae4955cc7b63</small>	no	2
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			153709		
<p>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.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b> 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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b> 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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b> 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.</p>					



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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO. Includes details for application 12/815,306 filed 06/14/2010 by Jeffrey P. Bezos, attorney 034563-8003.US02, examiner RODRIGUEZ, VICENTE M, art unit 3645, notification date 01/16/2014, delivery mode 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):

patentprocurement@perkinscoie.com

<b>Examiner-Initiated Interview Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
		12/815,306	BEZOS ET AL.
	<b>Examiner</b>	<b>Art Unit</b>	
	VICENTE RODRIGUEZ	3645	

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

(1) VICENTE RODRIGUEZ. (3) \_\_\_\_\_.

(2) MR STEVE ARNETT. (4) \_\_\_\_\_.

Date of Interview: 10 January 2014.

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

Exhibit shown or demonstration conducted:  Yes  No.  
If Yes, brief description: \_\_\_\_\_.

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: \_\_\_\_\_.

Identification of prior art discussed: Webb (3295790).

**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...)

Discussed newly found Webb reference, and its reading on presented claims 4, 11, 14, 20. Discussed the booster landing of Webb. No agreement reached.

**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

/N. R./ Examiner, Art Unit 3645	/Rob Swiatek/ Primary Examiner, Art Unit 3643
------------------------------------	--

Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  <i>(Use as many sheets as necessary)</i>		<b>Complete if Known</b>			
		Application Number	12/815,306-Conf. #1105		
		Filing Date	June 14, 2010		
		First Named Inventor	Jeffrey P. Bezos		
		Art Unit	3645		
		Examiner Name	V. M. Rodriguez		
Sheet	1	of	1	Attorney Docket Number	0345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
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		JP-2000508601-A	07-11-2000	Mueller et al.		
		JP-2002535193-A	10-22-2002	Scott et al.		

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Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>

Examiner Signature	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with a single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

34563-8003.US02/LEGAL29048078.1



Espacenet

Bibliographic data: JP2000508601 (A) — 2000-07-11

**TWO-STAGE REUSABLE EARTH-TO-ORBIT AEROSPACE VEHICLE AND TRANSPORT SYSTEM**

No documents available for this priority number.

**Inventor(s):**

**Applicant(s):**

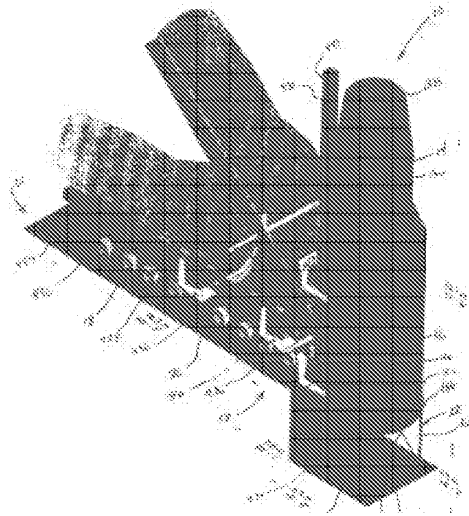
**Classification:** - international: **B64G1/00; B64G1/14; B64G1/40; B64G1/62; B64G1/64; B64G5/00;** (IPC1-7): B64G1/00; B64G1/64; B64G5/00  
 - cooperative: **B64G1/14; B64G1/401; B64G1/402; B64G1/62; B64G1/641; B64G5/00**

**Application number:** JP19970537397 19970417

**Priority number (s):** WO1997US06501 19970417 ; US19960632786 19960417

**Also published as:** WO9738903 (A2) WO9738903 (A3) US5927653 (A) AU2991297 (A)

Abstract not available for JP2000508601 (A)  
 Abstract of corresponding document: WO9738903 (A2)



<http://worldwide.espacenet.com/publicationDetails/biblio?DB=worldwide.espacenet.com&...> 1/16/2014

A two-stage wingless reusable aerospace vehicle (10) having upper and lower stages (14, 16) that take off from a take-off area (30) and separate at a separation point (26) along a first trajectory (24). The separation forces are generated by air retained between the upper and lower stages (14, 16), which is at a pressure higher than ambient pressure at the separation point (26). The lower stage (16) is then propelled along a return trajectory (28) to a landing area (30). After separation from the lower stage (16), the upper stage (14) continues to an Earth orbit (32) for deployment of a payload (71). After deploying the payload, the upper stage (14) moves out of the Earth orbit, re-enters the Earth's atmosphere, and returns to the take-off and landing area (30). The upper and lower stages (14, 16) are powered by liquid oxygen and kerosene engines (56, 152).; The aerospace vehicle (10) is transported to a take-off area (20) by a transport vehicle (18) having a first fixed carriage (436) and a second translatable carriage (437) that is adapted to move the upper stage (14) relative to the lower stage (16) for assembly of the aerospace vehicle while in the horizontal position. The transport vehicle then pivots the aerospace vehicle (10) from the horizontal to the vertical position for launching.

Last updated: 11.12.2013 Worldwide Database 5.8.15; 93p

【公報種別】特許法第17条の2の規定による補正の掲載  
【部門区分】第2部門第5区分  
【発行日】平成16年12月9日(2004.12.9)

【公表番号】特表2000-508601(P2000-508601A)

【公表日】平成12年7月11日(2000.7.11)

【出願番号】特願平9-537397

【国際特許分類第7版】

B64G 1/00

B64G 1/64

B64G 5/00

【F I】

B64G 1/00 A

B64G 1/64 B

B64G 5/00



(2)

(3)

60. 前記並進可能な台車ならびに前記第1および第2の安定化部材に動作可能に接続される空気圧式システムをさらに備えた、請求項57に記載の運搬打上用車両。



Espacenet

Bibliographic data: JP2002535193 (A) — 2002-10-22

## PAYLOAD CARRY AND LAUNCH SYSTEM

No documents available for this priority number.

## Inventor(s):

## Applicant(s):

**Classification:** - **international:** **B64C30/00; B64G1/00; B64G1/14; B64G1/40; F02K7/10; F02K7/12; F02K9/50; F02K9/80;** (IPC1-7): B64C30/00; B64G1/00; F02K7/10; F02K9/50; F02K9/80

- **cooperative:** **B64G1/14; B64G1/401; F02K7/10; F02K7/12; B64G1/005; B64G1/007; B64G1/402; Y02T50/672**

**Application number:** JP20000594698 19991229

**Priority number (s):** US19980224190 19981231 ; WO1999US31168 19991229

**Also published as:** WO0043267 (A2) WO0043267 (A3) US6193187 (B1) UA72491 (C2) RU2233772 (C2) more

Abstract not available for JP2002535193 (A)

Abstract of corresponding document: WO0043267 (A2)

The reusable space launch system (1) embodiment has a first stage vehicle or aerospacecraft (50), a second stage vehicle or reusable spacecraft (51) and a third stage vehicle or reusable orbit transfercraft (52). All the stages have the basic aerodynamic vehicle elements of a fuselage, wings, and tail, with the incorporation of control surfaces to supply lift, stability and control. The aerospacecraft (50) is configured to use ejector ramjet engines (18) for powered flight and includes equipment to capture air to supplement oxidizer for the ejector ramjet engine (18) during take-off and extreme high altitude. In order to optimize aerospacecraft (50) performance in a pull up movement to exit the sensible atmosphere, the aerospacecraft (50) may include auxiliary ascent rocket engines (116).

Last updated: 11.12.2013 Worldwide Database 5.8.15; 63p

<http://worldwide.espacenet.com/publicationDetails/biblio?DB=worldwide.espacenet.com&...> 1/16/2014

<http://worldwide.espacenet.com/publicationDetails/biblio?DB=worldwide.espacenet.com&...> 1/16/2014

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( P2002-535193A )

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B 6 4 C	30/00	B 6 4 C	30/00
F 0 2 K	7/10	F 0 2 K	7/10
	9/50		9/50
	9/80		9/80
		審査請求	未請求 予備審査請求 有 (全 42 頁)

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 (86) (22) 出願日 平成11年12月29日 (1999. 12. 29)  
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 (87) 国際公開番号 W O O 0 / 4 3 2 6 7  
 (87) 国際公開日 平成12年7月27日 (2000. 7. 27)  
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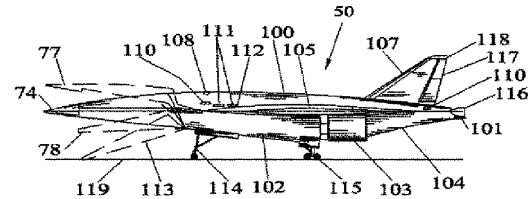
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最終頁に続く

(54) 【発明の名称】 バイロード輸送打ち上げシステム

(57) 【要約】

再利用型宇宙打ち上げシステム ( 1 ) の実施形態は、第1段輸送手段または航空宇宙機 ( 5 0 ) と、第2段輸送手段または再利用型宇宙機 ( 5 1 ) と、第3段輸送手段または再利用型軌道遷移機 ( 5 2 ) とを有する。全段には、揚力、安定性を与え制御を行う制御面を取り込んだ機体、翼および尾翼の基本的な空力輸送手段要素がある。航空宇宙機 ( 5 0 ) は、動力飛行用にイジェクタラムジェットエンジン ( 1 8 ) を使用するよう構成され、離陸中と極端に高い高度にいる間、イジェクタラムジェットエンジン ( 1 8 ) に酸化剤を補充するために空気を捕獲する装置を含む。感知しうる大気を出すために上昇運動時の航空宇宙機 ( 5 0 ) の性能を最適にするために、航空宇宙機 ( 5 0 ) は、補助上昇ロケットエンジン ( 1 1 6 ) を含んでよい。



【特許請求の範囲】

- 【請求項1】 a) 機体と、複数の制御面をもつ一对の翼と、方向舵をもつ尾翼と、
- b) 前記機体が、
- i) ノーズ端部から尾翼までの上部機体の円錐湾曲形状と、
  - ii) ノーズ端部からエンジンナセルまでの下部機体の直線円錐形状と、複数のエンジン排気ノズルまで一定の半円断面をもつ複数の入口のエンジンナセル後部と、尾翼端部まで減少する凹形の円錐形状をもつ下部後部機体と、
  - iii) 翼付け根後縁にあり、パイロード搭載室を囲むような機体の最大断面寸法と、パイロードを受けるために開かれ、フライトオペレーション用に閉じられ、パイロードを除去するために開かれるパイロード搭載室フードとパイロード搭載室ランプであるノーズ端部の後部からの2つのコラムシェルドアの手段によるパイロード搭載室へのアクセスとを備え、
- c) 前記翼が、
- i) 翼を取容するために中央線で機体に追加された一对の翼ストレークと、
  - ii) 各翼の外側部分を翼の先端へと後方に湾曲させてストレーク接合部から後方に流された各翼後縁とを備え、
- d) 前記尾翼が、
- i) 尾翼端部のわずか前方に取り付けられた尾翼と、尾翼付け根から後方に流された尾翼後縁と、
  - ii) 尾翼の先端へと後方に湾曲された尾翼の外側部分とを備え、
- e) 複数の位置燃料タンクを支持すると共に、パイロード搭載室のフードと翼の先端に取り付けられた複数の制御ロケットをもつ姿勢制御システムと、
- f) 前輪と、一对の中間部分の着陸装置と、
- g) パイロード搭載室の機体後部に含まれた一体の上昇タンクと、複数の補助上昇タンクと、クレードルタンクと、
- h) エンジンナセルに含まれる管路により接続された空気液化入口から空気を受け、複数の液化空気タンクに貯蔵するために空気を液化する空気液化ユニットと、

i) アビオニクスシステムと、複数のヘリウムタンクと、複数の主動力推進剤ユニットと、

j) エンジン入口管路により接続されたエンジンナセル入口から周囲空気を受けるエンジンナセルに取り付けられた複数のイジェクタラムジェットエンジンとを具備する航空宇宙機。

【請求項2】 a) ブースト液化水素タンクとブースト液化酸素タンクにより燃料供給される尾翼端部に取り付けられた一つのブースト上昇ロケットエンジンと、

b) カタパルトと、ペイロード搭載室に取り付けられた一対のペイロードレールと、

c) ペイロードレール上にペイロード搭載室に配置可能な再利用型宇宙機(RSC)であって、

i) 液化水素タンクと、液化酸素タンクを取り付け、複数の推進剤圧力ヘリウムタンクをもつロケットエンジンと、

ii) 設備部分と、主本体と、後部設備部分と、エンジンカウルをもつRSC尾翼端部と、回転可能なノーズと、

iii) 主本体のほぼ中間点からRSC尾翼端部のエンジンノズル再突入シールドまでフェアリングをもつ下部裏面にある主本体と、

iv) フェアリングに回転可能に取り付けられ、各テーパー状の後縁をもつ各翼に取り付けられた傾斜された尾翼をもつ一対のRSC翼であって、各RSC翼が制御補助翼をもち、各尾部がRSC方向舵をもち、

v) RSCノーズ着陸装置、一対のRSC主着陸装置および複数の機軸ローラであって、機軸ローラがペイロードレール上にあるようにRSC翼が折り畳まれているとき露出され、

vi) 複数のRSC姿勢制御スラスタと、誘導、航行および制御設備と、複数の主動力ユニットとを含む姿勢制御設備システムと、

vii) 回転可能なノーズとペイロードインタフェース設備に取り付けられたペイロードアダプタをもつペイロードマウントとを備える再利用型宇宙機とを具備する請求項1に記載の航空宇宙機。

【請求項3】 再利用型軌道遷移機（ROC）が再利用型宇宙機にペイロードとして取り付けられる航空宇宙機であって、前記再利用型軌道遷移機が、

a) ROC 液化水素タンクと、ROC 液化酸素タンクを取り付け、複数の ROC 推進剤圧力ヘリウムタンクをもつ軌道ロケットエンジンと、

ii) ROC 設備部分と、ROC 主本体と、ROC 後部設備部分と、ROC エンジンカウルフェアリングをもつ ROC 尾翼端部と、管状トラスと、開閉可能なクラムシェルノーズをもつ ROS ノーズインタフェースフェアリングと、

iii) ROC 主本体のほぼ中間点から ROC 尾翼端部の ROC エンジンノズル再突入シールドまで ROC フェアリングをもつ ROC 下部裏面にある ROC 主本体と、

iv) ROC フェアリングに回転可能に取り付けられ、テーパー状の各 ROC 翼と ROC 尾翼後縁をもつ各 ROC 翼に取り付けられた ROC の傾斜された尾翼をもつ一対の ROC 翼であって、各 ROC 翼が ROC 制御補助翼をもち、各 ROC 尾部が ROC 方向舵をもち、

v) ROC ノーズ着陸装置と、一対の ROC 主着陸装置と、

vi) 複数の ROC 姿勢制御スラスタと、ROC 誘導、航行および制御設備と、複数の ROC 主動力ユニットとを含む ROC 姿勢制御設備システムと、

vii) ノーズインタフェースフェアリングとクラムシェルノーズ要素開口をもつクラムシェルノーズに ROC ペイロード取付設備をもつ ROC ペイロードインタフェース設備とを備える請求項1に記載の航空宇宙機。

【請求項4】 第3段要素が、人ペイロード段である請求項2に記載の航空宇宙機。

【請求項5】 ペイロードを増やすために使い捨て型の第4段がある請求項3に記載の航空宇宙機。

【請求項6】 ペイロードを増やすために使い捨て型の第3段がある請求項2に記載の航空宇宙機。

【請求項7】 ペイロードを搬送するために、内部に取り付けられた使い捨て型の第2段と使い捨て型の第3段がある請求項1に記載の航空宇宙機。

【請求項8】 パイロット用の設備がある請求項1に記載の航空宇宙機。



【発明の詳細な説明】

【0001】

本発明は、地球の軌道に衛星などのペイロードを載せるのに使用される輸送手段に関する。新規の輸送手段は、通常、イジェクタラムジェット動力付きの航空宇宙機と、低地球軌道と中間地球軌道にペイロードを載せるための第2段ロケット動力付き再利用型宇宙機と、必要であれば、静止遷移軌道にペイロードを載せるための第3段ロケット動力付き再利用型軌道遷移機とからなる2～3段のものを使用する。また、航空宇宙機は、再利用型と使い捨て型の上段を組み合わせたものか、または静止軌道または惑星軌道にペイロードを載せるための第4段を含むすべてが使い捨て型の上段を用いて使用されてもよい。また、航空宇宙機は、極超音速機としてペイロードを輸送するために使用されてもよい。

【0002】

現在、地球の軌道に衛星を載せるための輸送手段としてさまざまなものが使用されている。これらの輸送手段は、通常、ロケットやミサイルまたは航空機とロケットの組み合わせを含む。このような輸送手段は公知のものであり、米国ならびにその他の国でも製造されている。多数の例の中には、米国のスペースシャトル、フランスのアリアン、ロシアのプロトンなどがある。航空機からの発射用にロケットやミサイルを用いる既存の高高度航空機を使用する概念はこれまで開示されており、プロトタイプテストが行われてきた。また、米国特許第4,802,639号および同第5,402,965号に例示されているように、大型の水平離陸型初期上昇輸送手段用のさまざまなデザインが提案されている。

【0003】

しかしながら、水平離陸用または大型航空機からの発射用にデザインされた飛行特性をもつイジェクタラムジェット動力付き空力輸送手段の使用は、軌道ペイロードの宇宙打ち上げ用にはこれまで利用されていない。このようなシステムの1つが、米国特許第5,740,985号に開示されている。

【0004】

本発明によれば、補助上昇ロケットエンジンで感知しうる大気から上昇する能力を備えたゼロから極超音速までの飛行を最適化する航空力学輸送手段が提供さ

れる。航空力学輸送手段、すなわち航空宇宙機は、1段以上のロケット段を使用してペイロードを軌道に載せることが可能な高度まで飛行する。その後、航空宇宙機とロケット段はそれぞれ、再使用されるために戻り着陸する。また、航空宇宙機は、貨物室にあるペイロードを輸送するために使用されてもよく、この場合、航空宇宙機は離陸して目的の場所や陸地まで飛行する。

【0005】

本発明の目的は、地球軌道ペイロードの打ち上げ用の航空力学を提供することである。本発明の別の目的は、地球の軌道にペイロードを載せるための完全再利用型多段式打ち上げシステムを提供することである。多段式打ち上げシステムは、全ミッション用のイジェクタラムジェット動力付き航空宇宙機の第1段と、中間地球軌道および低地球軌道のミッション用のロケット動力付き再利用型宇宙機の第2段と、静止遷移軌道ミッション用のロケット動力付き再利用型軌道遷移機とからなる。別の目的は、有人航空宇宙機および再利用型宇宙機を用いて、人または人に関連するペイロードを低地球軌道や中間地球軌道に運ぶことである。さらなる目的は、地球軌道または惑星軌道にペイロードを載せるために、航空宇宙機、再利用型宇宙機、再利用型軌道遷移機、使い捨て型の第2段、使い捨て型の第3段、および使い捨て型の第4段をさまざまに組み合わせて用いて特別なミッションをサポートすることである。さらなる目的は、目的地間でペイロードを搬送するための極超音速航空機として、航空宇宙機的能力を用いることである。

【0006】

本願明細書に開示する記載により、記載および図面を検討しながら本発明の他の目的が明らかになるであろう。

【0007】

再利用型宇宙打ち上げシステムの実施形態は、第1段輸送手段または航空宇宙機と、第2段輸送手段または再利用型宇宙機と、第3段輸送手段または再利用型軌道遷移機とを備える。全段には、揚力、安定性および制御を行う制御面を取り込んだ機体、翼および尾翼の基本的な空力輸送手段要素がある。航空宇宙機は、動力飛行用にイジェクタラムジェットエンジンを使用するように構成され、離陸中と極端に高い高度にいる間、イジェクタラムジェットエンジンに酸化剤を補充す

るために空気を捕獲する装置を含む。感知しうる大気を出るために上昇運動時の航空宇宙機の性能を最適にするために、航空宇宙機は、補助上昇ロケットエンジンを含んでよい。航空宇宙機には、選択した軌道に衛星を載せるために1段以上の輸送手段が補充される。全段の外気圏制御は、全飛行軸の周りに必要に応じて小型ロケットを配設して用いることにより行われる。全輸送手段は、リモートパイロットバックアップを備えた無人自立誘導航法制御を用いて飛ばされてよい。ペイロード搭載室は、ノーズロード再閉鎖可能なペイロードフェアリングによりアクセスされる。再利用型宇宙機は、航空宇宙機のペイロード搭載室の各下側のトラックに取り付けられる。再閉鎖可能なフェアリングのランプ部分上にある固定振れ止めは、搬送中、再利用型宇宙機と再利用型軌道遷移機を支持する。段を切り離すために、カタパルトが再利用型宇宙機とそのペイロードを開いたペイロードフェアリングを介して射出する。航空宇宙機は、ペイロードフェアリングを閉じ、大気に再突入し、作業基地まで飛行して戻り、着陸して再利用される。航空宇宙機から射出された後、再利用型宇宙機と再利用型軌道遷移機は、それらの機体を広げてよい。

【0008】

再利用型宇宙機は、そのペイロードを低地球軌道または中間地球軌道に載せる。再利用型宇宙機の動力は、飛行用ロケットエンジンにより供給される。ペイロードは、再利用型宇宙機のフロント部に取り付けられる。ペイロードが分離された後、ペイロード取付部は、前部機体の内部に180度回転され、反対側にある球状部分が今度は回収飛行用の空力フェアリングとなる。再利用型宇宙機は、大気に再突入し、作業基地に着陸場所に滑走して再利用される。静止遷移軌道に衛星を載せる主要なミッションを行うために、再利用型軌道遷移機が使用される。再利用型軌道遷移機の動力は、飛行用のロケットエンジンにより供給される。衛星は、4つの開いたドア内にある再利用型軌道遷移機のフロント部の構造体上に取り付けられる。分離後、ドアは閉じられて、回収飛行用の空力フェアリングを与える。再利用型軌道遷移機は、再利用するために作業基地の着陸場所に滑走するための空力加熱および獲得交差レンジを最小限に抑えるように、軌道複数再突入を用いる。

## 【0009】

図1を参照すると、静止遷移軌道に衛星を載せるミッションの好適な実施形態のフライトオペレーションが略図的に示されている。このミッションは、打ち上げシステムのサイズを決定する。再利用型宇宙機(51)と、再利用型軌道遷移機(52)と、静止軌道衛星(53)とを含む航空宇宙機は、イジェクタラムジェットの推進力を用いて作業基地にある従来の滑走路(54)から離陸し、中間超音速まで加速しながら舞い上がる。このフライトセグメント中、イジェクタラムジェットエンジンのイジェクタは、離陸時に貯蔵され捕獲された空気酸化剤を用い、加速用に捕獲された空気酸化剤を用い、後で使用するための空気酸化剤を貯蔵する。イジェクタが停止した後、航空宇宙機(50)は、極超音速(55)まで加速し続ける。航空宇宙機(50)は、イジェクタを再点火することと、感知しうる大気(56)を脱出するためにブースト上昇ロケット推進力を用いることとを含む高高度引き上げを実行する。再利用型宇宙機(51)と、再利用型軌道遷移機(52)と、衛星(53)は、段の切り離し(57)用に航空宇宙機(50)からカタパルトにより射出される。航空宇宙機(50)は、大気圏に再突入し、高速の超音速(58)でラムジェット推進力により作業基地に飛行して戻る。航空宇宙機(50)は、水平着陸(59)で作業基地(54)で回収される。再利用型宇宙機(51)は、衛星(53)とともに再利用型軌道遷移機(52)を低地球軌道(60)に引き上げる。輸送と分離後、再利用型宇宙機は、大気圏(61)に再突入し、軌道を逸脱して(62)、水平着陸回収(63)用に作業基地の滑走路(54)へと滑走して戻る。再利用型軌道遷移機(52)は、衛星(53)を静止軌道(64)に送り、分離する(65)。再利用型軌道遷移機(52)は、空力加熱(66)を最小限に抑える空力ブレーキング用の1つを超える航路を用いて軌道を逸脱しながら、ポイント(67)で作業基地に滑走接近して到着するように、再利用型軌道遷移機(52)の空力特性をもつこのエネルギーを同時に用いてよい。再利用型軌道遷移機(52)は、作業基地の滑走路(54)で回収(68)用に水平着陸する。

## 【0010】

図2を参照すると、中間地球軌道または低地球軌道に衛星を載せるためのほか

の実施形態のフライトオペレーションミッションが略図的に示されている。これらのミッションは、2段システムとして航空宇宙機(50)と再利用型宇宙機(51)を用いる固有の能力に基づいたものである。再利用型宇宙機(51)および1以上の衛星(69)を含む航空宇宙機(50)は、イジェクタラムジェットの推進力を用いて作業基地にある従来の滑走路(54)から離陸し、中間超音速まで加速しながら舞い上がる。このフライトセグメント中、イジェクタは、離陸時に貯蔵され捕獲された空気酸化剤を用い、加速用に捕獲された空気酸化剤を用い、後で使用するための空気酸化剤を貯蔵する。イジェクタが停止した後、航空宇宙機(50)は、極超音速(55)まで加速し続ける。航空宇宙機(50)は、イジェクタを再点火することと、感知しうる大気(56)を脱出するためにブースト上昇ロケット推進力を用いることとを含む高高度引き上げを実行する。再利用型宇宙機(51)および衛星(69)は、段の切り離し(70)用に航空宇宙機(50)からカタパルトにより射出される。航空宇宙機(50)は、大気圏に再突入し、高速の超音速(58)でラムジェット推進力により作業基地に飛行して戻る。航空宇宙機(50)は、水平着陸(59)で作業基地(54)で回収される。

【0011】

再利用型宇宙機(51)は、衛星(69)を所望の高度(71)まで引き上げ、軌道(72)を周り、衛星(73)を投出する。再利用型宇宙機(51)は軌道を逸脱し(62)、水平着陸回収(63)用に作業基地の滑走路(54)へと滑走して戻る。

【0012】

図3を参照すると、好適な実施形態のミッション輸送手段の航空宇宙機(50)による搬送が示され、再利用型宇宙機(51)と、再利用型軌道遷移機(52)と、静止軌道衛星(53)の仮想線で描かれた外圍部とが部分的透視図に示されている。再利用型宇宙機(51)および再利用型軌道遷移機(52)は、機体付近にたたんであるエアフォイルを備える。再利用型宇宙機(51)は、そのノーズ上に取り付けた再利用型軌道遷移機(52)を備え、再利用型軌道遷移機(52)は、その開かれた前方ドア内に取り付けられた衛星(53)を備える。

これらの輸送手段は、上部フード（75）と下部ランプ（76）からなる再閉鎖可能なノーズフェアリング（74）を介してアクセスされる。仮想線において、フード（75）の開いた状態（77）が示されており、ランプ（76）の開いた状態（78）が示されている。

#### 【0013】

図4から図7を参照すると、航空宇宙機（50）は再利用型と使い捨て型の上段をさまざまに組み合わせて用いて、多数のペイロードを打ち上げることができる。低地球軌道または中間地球軌道に人または人に関連するペイロード（79）を運ぶようにデザインされた輸送手段が、図4の再利用型宇宙機（51）上に取り付けられて示されている。図5に示す航空宇宙機（50）の再利用型軌道遷移機（52）と再利用型宇宙機（51）に使い捨て型の第4段（81）を追加して、惑星間探査輸送手段（80）が打ち上げられてよい。図6は、航空宇宙機（50）と、再利用型宇宙機（51）と、使い捨て型の第3段（82）とを用いて地球軌道に載せられてよい大重量の衛星（84）の特別なケースを示す。使い捨て型の第3段（82）は、再利用型軌道遷移機（52）の再利用可能な特徴を、ブースト力を追加するための同等の質量の推進剤およびタンクと取り替えている。図7は、航空宇宙機（50）と、使い捨て型の第2段（83）と、使い捨て型の第3段（82）とを用いて地球軌道に直接載せられてよい大重量の衛星（85）の特別なケースを示す。使い捨て型の第2段（83）もまた、再利用型宇宙機（51）の再利用可能な特徴を、ブースト力を追加するための同等の質量の推進剤およびタンクと取り替えている。

#### 【0014】

図8および図9を参照すると、再利用型宇宙打ち上げシステムの施設が図示されている。図8は、一連のクリーンルームと航空宇宙機（50）用のメンテナンス・サービスルーム（87）とを含むペイロード処理施設（86）の側面図である。クリーンルームは、上段（89）に取り付け、航空宇宙機（90）に設置するための衛星準備（88）用のものである。各クリーンルームは、密封ドア（91）により隔離される。1つまたは複数の衛星が準備を介して上段に取り付けて処理され、そのアセンブリが航空宇宙機（50）に設置された後、再閉鎖可能

なノーズフェアリングの上部フード(75)と下部ランプ(76)は、閉じられて密閉される。その後、ペイロードを積んだ航空宇宙機(50)は、ペイロード処理施設(86)から、図9の作業基地(92)に含まれる推進剤供給施設(96)に引き出される。また、ペイロード処理施設(86)は、航空宇宙機のメンテナンスハンガとしての役割をもつ。作業基地の他の要素は、フライトオペレーションの管理・運営・技術支援ビル(93)と、再利用型軌道遷移機のメンテナンスハンガ(94)と、再利用型宇宙機のメンテナンスハンガ(95)と、推進剤供給施設(96)と、推進剤再供給輸送アクセス(97)、エンジンテスト施設(98)、輸送ランナップ施設(99)と、航空宇宙機(50)の離陸用と回収する全輸送手段の着陸用の滑走路(54)とを含む。

【0015】

図10を参照すると、前部機体をなす再閉鎖可能なペイロードノーズフェアリング(74)を備えた航空宇宙機(50)の平面図が示されている。頭部が湾曲状の上部機体(100)は、補助上昇ロケットエンジンカウル(101)に後方で混ざり合う。下部前方機体(102)は、ノーズからイジェクタラムジェットナセル(103)へと後方に広がる。下部後方機体(104)は、イジェクタラムジェットエンジンの延長されたノズルになるような形状をもつ。翼(105)は後方に流れ、イジェクタラムジェットノズル用の底部切欠きと、空力ピットおよびロール制御用の後縁補助翼(106)とを備えたテーパ状のものである。垂直尾翼(107)は、方向安定性を与える。外気圏姿勢は、ピッチ(108)、ロール(109)およびヨー(110)のスラストにより制御される。推進剤システムを除く機体の内圧は、通気孔(111)により制御される。ペイロード射出用カタパルトガスは、対称的な排気ポート(112)である。

【0016】

図11を参照すると、再閉鎖可能なペイロードノーズフェアリング(74)が実線で閉じられて示され、ペイロード射出位置において、フード開口(77)とランプ開口(78)が仮想線で示され、接地ペイロード設置において、ランプ開口(113)がさらに下げられた航空宇宙機(50)の側面図が示されている。地上操縦、離着陸用の伸張された位置にある補助着陸装置(114)および主着

陸装置(115)が示されている。翼(105)の下には、イジェクタラムジェットエンジンと酸化剤補充装置、空気液化ユニットの空気誘導システムを含むイジェクタラムジェットナセル(103)がある。下部前方機体(102)または前部機体拡大断面は、高速で空気誘導システムに入る空気を予め圧縮する。下部後方機体(104)は、イジェクタラムジェットエンジンの延長されたノズルになるような形状をもつ。補助上昇ロケットエンジンカウル(101)の下部は、再突入熱シールドである。ブースト上昇ロケットエンジン(116)のノズルは、動作中に熱を放射するように露出された状態にされる。垂直尾翼(107)の後縁の方向舵(117)は、空力方向制御を与える。燃料ベント(118)は、垂直尾翼(107)の後縁先端部にある。上部機体(100)のさまざまな部品の上には、ピッチ(108)およびヨー(110)の姿勢制御スラスト、機体ベント(111)および射出用カタパルト排気ポート(112)が示されている。航空宇宙機(50)は、静止地線(119)上に立った状態で示されている。

【0017】

図12を参照すると、外部形態は、頭部が湾曲状の高細長比低抗力上部機体(100)を特徴とする。翼(105)の上方にある後方部分機体(120)は、補助上昇ロケットエンジンカウル(101)と混ざるように狭くなり、下部前方機体(102)は、ノーズから翼(105)の下方にあるイジェクタラムジェットナセル(103)に広がり、高速で圧縮揚力を発生する。イジェクタラムジェットの動作中、ノズルを満たすためにターボポンプ排気とともに下部後方機体(104)の領域に燃料が注入されて、抗力を低減し外部燃焼推力を発生させてよい。イジェクタが高速、高高度で遮断された後、ラムジェットおよびターボポンプ排気はノズルを満たして、推力を発生する。翼(105)および垂直尾翼(107)は、極超音速輸送手段の場合、全飛行外圍部にわたって低効力の補助翼部と高アスペクト比をもつ。補助上昇ロケットエンジン(116)は、ラムジェットのイジェクタを再点火した後に点火され、イジェクタラムジェットが遮断された後発火しつづけて、感知しうる大気から上段射出の高度まで航空宇宙機(50)を加速させる。

【0018】



図13を参照すると、航空宇宙機(50)の主要コンポーネントが拡大斜視図で示されており、再閉鎖可能なペイロードフェアリング(74)のフード(75)とランプ(76)と、貨物室、ペイロード射出用カタパルトシステム、補助着陸装置(114)、アビオニクス環境制御システム、電動式油圧システム、前方ピッチおよびヨー姿勢制御システム(108)(110)、機体ベント(111)、迅速に切り離して上段の機上サービスを行うための推進剤デリバリ、ダンプおよびベントシステムを含む前方機体(121)と、主要上昇燃料タンク(122)と、補助上昇ロケット燃料タンク(123)および酸化剤タンク(124)と、補助上昇ロケットカウル(101)およびエンジン(116)と、リターンクレードル燃料タンク(125)と、イジェクタラムジェットエンジンと空気誘導システム、主着陸装置(115)、補助上昇燃料タンク(127)、空気液化ユニット(128)、推進剤デリバリ、ダンプおよびベントシステム、ロール姿勢制御システム(109)、機体ベントを含むイジェクタラムジェットナセル(103)付き下部中間機体(126)と、イジェクタラムジェット酸化剤貯蔵タンク(129)、推進剤タンク圧力タンク(130)、主要内部動力ユニットおよび推進剤タンク(131)、後方ピッチおよびヨー姿勢制御システム(108)(110)、機体ベント(111)を含む下部後方機体(104)と、飛行制御アクチュエータ、酸化剤ベント(132)、翼と補助翼間にある機体ベントを含む翼(105)および補助翼(106)と、飛行制御アクチュエータ、燃料ベント(118)、翼と補助翼間にある機体ベントを含む垂直尾翼(107)および方向舵(117)と、補助着陸装置(114)と、主着陸装置と、前方主フレーム(133)と、下部中間フレーム(134)と、中間バルクヘッド(135)と、後方バルクヘッド(136)とを含む。ボイルオフを最小限に抑え、外面上に霜が発生するのを防止するために、すべての極低温推進剤タンクは多層隔離を用いる。前方機体、主上昇燃料タンク、補助上昇ロケット燃料および酸化剤タンクが、主機体構造である。クレードルタンク、下部中間機体および底部後方機体の副構造は、翼および垂直尾翼のように主フレームおよびバルクヘッドを介して主機体構造に載る。

【0019】

図14を参照すると、リターンクレードルタンク(125)の拡大斜視図が主要なコンポーネントを示す。クレードルタンク(125)は、タンク(137)と、カバー(138)と、キャップ(139)とからなる。タンク(137)は、偏球面端部(140)をもつ同心円状のマルチローブデザインである。ローブ(141)は、前方から後方へと進むにつれ半径が大きくなる円形の断面のものである。ローブ(141)は重なり合い、節点(142)で交差する。内側および外側の節点(142)は、構造上のタイおよびバッフルである孔あきウェブにより接続される。タンク(137)は、熱膨張補償装置とともに主フレーム(133)および(134)に前方および後方で取り付けられる。タンク(137)は、充填、ダンプ、ベントおよび定量装置を含む。タンク(137)は、半円錐台状のカバー(138)とキャップ(139)と空気力学的に正しく調整される。カバー(138)およびキャップ(139)は、メタリックサンドウィッチ構造で、節点(142)をタンク(137)に合う一連の同心フレーム(143)に固められる。カバー(138)およびキャップ(139)は、主フレーム(133)および(134)に取り付けられる。また、キャップ(139)は、共通の境界面に沿ってカバー(138)にも取り付けられる。

【0020】

図15を参照すると、航空宇宙機(50)のペイロード、支持体およびカタパルト射出システムが、前部機体の側面図に示されている。航空宇宙機(50)のペイロードは、貨物室の各下側にある一対のトラック(144)に設置される。再利用型宇宙機(51)は、折り畳んだ翼により露出される翼付け根に複数のローラ(145)を有する。さらに、再利用型宇宙機(51)は、航空宇宙機(50)のランプ(76)上に取り付けられたポスト(146)により支持され、ランプが開かれると、設置および射出中にポストが再利用型宇宙機(51)を除去できる。主要なミッションでは、ランプ(76)上のより前方に設けられたポスト(147)が、同じ除去機能をもつ再利用型軌道遷移機(52)を支持する。カタパルト(148)は、一体形のトロリーおよびシリンダ(149)と、複数の伸縮式ピストン(150)と、機体マウント(151)と、ロックおよびアンロック機構(152)と、充填、デリバリおよびダンプシステム(153)を備

えたガス貯蔵タンクとからなる高圧冷ガス作動式装置である。トロリー（149）は、再利用型宇宙機（51）の裏側のトラック（144）に設置され、両側および前方後方にビームが取り付けられたローラを有する。トロリー（149）は、翼基部構造の後ろ側にある再利用型宇宙機（51）上のバンパに端が接触している。トロリー（149）のビームは、搬送中に航空宇宙機（50）に再利用型宇宙機（51）を制止するためのロック機構を有する。トロリー（149）のビームは、中央線のシリンダに接合された前部および後部の交差ビームにより接続される。複数の伸縮式ピストンは、搬送中、トロリーシリンダ（149）内に折り畳まれている。上段が航空宇宙機（50）から射出される場合、フード（75）およびランプ（76）が開かれ、カタパルトが作動される。複数の伸縮式ピストンの最も内部にあるものが、航空宇宙機（50）の機体前部から後部へのスロット形マウント（151）にサイドピンを挿入させたトラニオンとして構成され、トラニオンおよびマウント（151）のラグを介して別の保持ピンにより搬送中適所に保持される後部キャップを有する。航空宇宙機（50）の制御システムが弁を開いて、貯蔵タンク（153）からシリンダ（149）に冷ガスが流れることができ、一方でピストン（150）が拡張し始めると、保持ピンは切れ、トラニオンサイドピンが航空宇宙機（50）の機体マウント（151）に後部に移動する。搬送抑制機構（152）が、トラニオンサイドピンが後部に移動して、マウント（151）の受座と接触することにより機構（152）を作動させると、アンロックされる。トラニオンサイドピンが、マウント（151）にあるスロットの後部部品に着座すると、伸縮式ピストン（150）が拡張して、再利用型宇宙機（51）とそのペイロードを航空宇宙機（50）から射出するようにトロリー（149）を前方に駆動する。カタパルト（148）は押すのを停止し、一方で再利用型宇宙機（51）は、重力差の再利用型宇宙機（51）への低推力線により誘導された逆のピッチアップモーメントを無効にするために、トラックに係合した十分な数のローラを備える。各ピストン（150）のヘッドは、シリンダ内に動的シールを有し、最も内側にあるピストン以外はすべてそのピストンにシリンダとして作用して、ピストンロッドを支持するブシュに動的シールを有する。ピストンとブシュ間の組立中に容積を密封することにより、冷ガス源が遮

断され、シリンダ(149)のガス圧が15ポンド/平方インチ絶対圧力まで急速に低下されると、トロリー(154)のストロークの端部にバッファが与えられる。放出されたガスは、航空宇宙機(50)の機体の両側から対称的に排気される。カタパルト(148)は、次のミッション用の地上引き返し中にリセットされる。

【0021】

図16を参照すると、イジェクタラムジェットエンジン(155)の流路が切欠上面斜視図に示されている。外部は、ミキサ(156)と、ディフューザ(157)と、燃焼器(158)と、ノズル(159)である。内部コンポーネントは、イジェクタ(160)と、ディフューザベーン(161)と、燃料噴射機(162)と、閉じたノズルプラグ(163)と、開いたノズルプラグ(164)と、ノズルプラグ伸縮軸である。また、イジェクタ動力供給マニホールド(165)とノズル再生式冷却マニホールド(166)も示されている。ノズルプラグ(163)は、再生冷却される。

【0022】

図17を参照すると、回収形態にある再利用型宇宙機(51)の平面図が示されている。パイロードマウントの球状部分(164)は前方に向き、主機体(166)内に整列される頭部が湾曲状の前部機体(165)内に整列される。後部機体終端部(167)は、再突入中に内部システムを保護する熱シールドである。下部パネルは、ロケットエンジン(169)のノズル用の熱シールド(168)である。翼(170)は高度に後部に流されて、空力ピットおよびロール制御用に後縁補助翼(171)を備える。傾斜された垂直尾翼(172)は、各翼(170)の先端上に取り付けられる。傾斜された垂直尾翼(172)の上反角は、翼(170)と傾斜された垂直尾翼(172)の領域を最大にするように設定しながら、航空宇宙機(50)の搬送容積を最小限に抑える。垂直尾翼(172)は方向安定性を与え、後縁方向舵(173)は方向制御を与える。外気圏姿勢は、ピッチおよびロール(172)およびヨー(175)のスラストにより制御される。推進剤システムを除く機体内圧は、ペント(176)により制御される。

【0023】

図18を参照すると、回収形態にある再利用型宇宙機(51)の側面図が示されている。地上操縦および着陸用の延長された位置にある補助着陸装置(177)および主着陸装置(178)が示されている。静止地線(179)上の立っている状態の再利用型宇宙機(51)が示されている。下部機体(166)側にあるフェアリング(180)は、翼取付構造と伸張およびロック機構と、主着陸装置(178)と、航空宇宙機(50)での設置用のローラ(145)とを収容する。前部機体(165)上には、フェアリング(180)にある姿勢制御スラスタ(174)および(175)とペント(176)とが示されている。また、球状部分(164)のフェアリングと、終端部(167)加熱シールド(168)と、ロケットエンジン(169)と、翼(170)と、垂直尾翼(172)と、方向舵(173)も示されている。

【0024】

図19を参照すると、機体コンポーネント(164)、(165)、(166)および(167)と、下部機体フェアリング(180)を示す再利用型宇宙機(51)の上面斜視図が示されている。また、翼(170)および補助翼(171)と、垂直尾翼(172)および方向舵(173)と、ロケットエンジン(169)と、熱シールド(168)と、ペント(176)と、ピッチおよびロールの姿勢制御スラスタ(174)と、ヨーの姿勢制御スラスタ(175)とが示されている。

【0025】

図20を参照すると、透視斜視図に再利用型宇宙機(51)の内部コンポーネントが示されている。ペイロードマウントと球状部分フェアリング(164)であるトレットは、上下でヒンジ留めされ、動力駆動(181)されると180度回転する。姿勢制御スラスタ(174)および(175)酸化剤推進剤タンク(182)および燃料タンク(183)は、補助着陸装置(177)およびその伸張アキュムレータ(184)と、アビオニクスとその環境制御システム(185)と、ペイロードアンビリカル(186)とを備える前部機体(165)に設けられる。主機体(166)の底部中央線に沿って、システム管路(187)があ

る。上部中央線に沿って、燃料ベント(188)がある。主機体(166)の前方部分は燃料タンク(189)であり、後方部分は酸化剤タンク(190)である。中央線には、酸化剤タンク(190)を介した燃料ライン(191)がある。酸化剤ライン(192)は、凹形のバルクヘッドの底部から中央線のロケットエンジン(169)まで送り込まれる。後部機体終端部内には、油圧システムおよび発電機(193)、油圧タンク(194)と、推進剤タンク(195)と、推進剤タンク圧力タンク(196)と、酸化剤ベント(197)とをもつ主動力ユニットがある。翼(170)には、飛行制御アクチュエータ(198)がある。

## 【0026】

図21を参照すると、航空宇宙機(50)外で使用するための搬送位置にある再利用型宇宙機(51)の上面斜視図には、前方に面しているペイロードマウント(199)と、レール(144)上の航空宇宙機(50)に設置するためのローラ(145)を露出している機体(166)に対して傾斜された垂直尾翼(172)を折り畳まれた翼(170)が示されている。

## 【0027】

図22を参照すると、部分透視上面斜視図に、翼(170)の伸張機構(200)と翼ダウンロック機構(201)が示されている。伸張機構(200)は、翼(170)を伸張させるためのプルロッド(203)をもつ単一の線形作動式ベルクランク(202)からなる。翼ダウンロック機構(201)は、両側にあるウォーム歯車装置(206)を回転させる駆動軸(205)をもつ単一のモータ(204)を用い、ウォーム歯車装置はトルクチューブ(207)を前および後翼(170)の桁に回転させ、スプライン移動ねじ付きテーパピン(208)が翼シールをロックし引き下げる。

## 【0028】

図23を参照すると、桁ジョイントでの再利用型宇宙機の翼(170)の断面が、折り畳まれた位置で示されている。上側ジョイント(209)はヒンジとして作用する。下側ジョイントは、テーパピン(208)用の一致したテーパ孔をもつラグ(210)とクレビス(211)からなる。テーパピン(208)は、

伸張された翼をロックし、セラミックマトリックス複合ペントシール(212)を偏向させ、可撓性のバックアップシール(213)を圧縮する。シールは、機体(166)と、断熱タイル(214)と、翼(170)の断熱タイル(215)上に取り付けられる。

【0029】

図24を参照すると、断熱システム(216)で被覆された一般的な下面領域の外部斜視図が示されている。断熱システムは、球状部分のノーズ(164)と、前部機体(165)と、機体(166)の底部と、下部機体フェアリング(180)と、ロケットノズル熱シールド(168)と、翼(170)の底部および上部後縁と、再利用型宇宙機(51)の垂直尾翼の両側に適用される。機体カバー(217)は、セラミック接着剤で接着されたセラミックフォーム(218)タイルを有する。セラミックマトリックス複合体のフェースシート(219)が外面をなす。これらは、フォームコアスプライスジョイント(220)と重なり合うように整列され、セラミック接着剤で接着される。

【0030】

図25を参照すると、回収形態の再利用型軌道遷移機(52)の平面図が示されている。前方機体は、回収動作中ペイロードマウントを覆う4つのドア(221)からなる。主機体(222)は、推進剤タンクとサブシステムとを含む。後方機体終端部(223)は、再突入中に内部システムを保護する熱シールドである。下部パネルは、ロケットエンジン(225)のノズル用の熱シールド(224)である。再利用型宇宙機(51)に取り付けるための外部トラス(226)がある。翼(227)は高度に後部に流されて、空力ピットおよびロール制御用に後縁補助翼(228)を備える。傾斜された垂直尾翼(229)は、各翼(227)の先端上に取り付けられる。傾斜された垂直尾翼(229)の上反角は、翼(227)と垂直尾翼(229)の領域を最大にするように設定しながら、航空宇宙機(50)の搬送容積を最小限に抑える。垂直尾翼(229)は方向安定性を与え、後縁方向舵(230)は方向制御を与える。外気圏姿勢は、ピッチおよびロール(231)およびヨー(232)のスラストにより制御される。推進剤システムを除く機体内圧は、ペント(233)により制御される。

## 【0031】

図26を参照すると、回収形態にある再利用型軌道遷移機(52)の側面図が示されている。地上操縦および着陸用の延長された位置にある補助着陸装置(234)および主着陸装置(235)が示されている。静止地線(236)上の立っている状態の再利用型軌道遷移機(52)が示されている。下部機体(222)側にあるフェアリング(237)は、翼取付構造と伸張およびロック機構と、主着陸装置(235)とを収容する。機体(222)の前部機体部分上には、フェアリング(237)にある姿勢制御スラスト(231)および(232)とベント(233)とが示されている。また、ペイロードマウントのカバードア(221)と、終端部加熱シールド(223)と、ロケットエンジン(225)と、熱シールド(224)と、翼(227)と、垂直尾翼(229)と、方向舵(230)も示されている。

## 【0032】

図27を参照すると、機体(222)と、終端部熱シールド(223)と、下部機体フェアリング(237)を示す再利用型軌道遷移機(52)の上面斜視図が示されている。また、翼(227)と、補助翼(228)と、垂直尾翼(229)と、方向舵(230)と、ロケットエンジン(225)と、取り付けトラス(226)と、熱シールド(224)と、ベント(223)と、ピッチおよびロールの姿勢制御スラスト(231)と、ヨーの姿勢制御スラスト(232)とが示されている。断熱処理、翼の伸張およびロック機構は、再利用型宇宙機と同様のものである。

## 【0033】

図28を参照すると、透視斜視図に再利用型軌道遷移機(52)の内部コンポーネントが示されている。ペイロードアンビリカル(239)と、アビオニクスとその環境制御システム(240)と、補助着陸装置(234)とその伸張アキュムレータ(241)と、姿勢システム酸化剤タンク(242)と燃料タンク(238)と、ピッチおよびロールの姿勢制御スラスト(231)と、ヨーの姿勢制御スラスト(232)が、前方機体(222)に設けられる。中間機体(222)は燃料タンク(244)である。後方機体(222)は酸化剤タンク(24



7)である。機体(222)には、システム管路(253)と、燃料ペント(245)と、酸化剤ペント(248)と、燃料ライン(246)と、酸化剤ライン(251)とが含まれる。終端部熱シールドは、油圧システムおよび発電機(252)と、推進剤タンク(243)と、推進剤タンク圧力タンク(249)とをもつ主動力ユニットを含む。翼には、飛行制御アクチュエータ(250)がある。下部機体フェアリング(237)には、主着陸装置(235)がある。また、ロケットエンジン(225)とマウントトラス(226)が示されている。

【0034】

図29を参照すると、好適な実施形態の主要なミッションでの搬送形態にある再利用型宇宙機(51)と、再利用型軌道遷移機(52)と、ペイロード隙間外囲部(53)の上面斜視図が示されている。

【0035】

図30を参照すると、円錐台状のマウント構造(254)に取り付けられたペイロード(53)をもつ搬送形態にある再利用型軌道遷移機(52)の側面図が示されている。ペイロードカバードア(221)は、開いた位置にある。

【0036】

図31を参照すると、使い捨て型の第2段(83)の上面斜視図が示されている。この段は、大重量のペイロードを静止軌道に直接載せるために使用される。使い捨て型の第2段(83)は、性能を上げるために重量部分を大きくして追加される推進剤の再利用型宇宙機(51)の再利用可能な特徴の容量と重量を交換する。これは、使い捨て型の第3段(82)を取り付けるためのインタフェース(225)と、航空宇宙機(50)に設置するためのローラ(256)を有する。

【0037】

図32を参照すると、使い捨て型の第3段(82)の上面斜視図が示されている。この段も、大重量のペイロードを静止軌道に直接載せるために使用される。使い捨て型の第3段(82)は、性能を上げるために重量部分を大きくして追加される推進剤の再利用型軌道遷移機(52)の再利用可能な特徴の容量と重量を交換する。これは、トロイダル状の燃料タンク(258)に窪みをつけたペイロ

ードインタフェース(257)と、レンズ状の酸化剤タンク(259)の前方を有する。

【0038】

図33を参照すると、使い捨て型の第4段(81)の上面後方斜視図が示されている。この段は、小重量のペイロードを惑星間飛行に乘せるために、再利用型宇宙機(51)と再利用型軌道遷移機(52)と組み合わせて使用される。使い捨て型の第4段(81)は、利用可能なソリッドロケットブースタ(260)と、段間(261)とからなる。

【0039】

図34を参照すると、航空宇宙機(50)の有人極超音速輸送機(262)タイプの上面斜視図が示されている。乗員用モジュール(263)が追加されている。ペイロード搭載室のドア(264)は、意図される貨物に合わせたものである。補助上昇ロケットシステムはなくなり正しく調整され(265)、酸化剤タンクは燃料に変えられる。主構造および工具類、イジェクタラムジェット推進剤およびサブシステムは、本質的に航空宇宙機(50)と同じである。

【0040】

本発明の図示された好適な実施形態を参照して本発明を詳細に示し記載してきたが、本発明の趣旨および範囲から逸脱することなく、形状および詳細の前述および他の変更がなされてよいことは当業者により理解されよう。

【図面の簡単な説明】

【図1】

3段式ミッションフライトオペレーションの動作段階を示す図である。

【図2】

別の基本的なミッションフライトオペレーションを示す図である。

【図3】

内側に取り付けられた再利用型宇宙機と、再利用型軌道遷移機と、ペイロード隙間外圍部とからなる航空宇宙機による搬送中の3段ミッション構成を示す部分透視図で示す打ち上げシステム輸送手段の図である。

【図4】

人または人に関連するペイロードを低地球軌道または中間地球軌道に運ぶミッションの内部構成を平面で示した航空宇宙機の頭部部分切欠図である。

【図5】

地球軌道を越えてペイロードを運ぶために使い捨て型の第4段を必要とするミッションの内部構成を平面で示した航空宇宙機の頭部部分切欠図である。

【図6】

重量超過のペイロードを低地球軌道または中間地球軌道に運ぶために使い捨て型の第3段を必要とするミッションの内部構成を平面で示した航空宇宙機の頭部部分切欠図である。

【図7】

ペイロードを静止軌道に運ぶか、または非常に重いペイロードを低地球軌道または中間地球軌道に運ぶために使い捨て型の第2段および第3段を必要とするミッションの内部構成を平面で示した航空宇宙機の頭部部分切欠図である。

【図8】

フライト設置用のペイロード処理を示す側面図である。

【図9】

概念上のシステムの作業基地要素および施設の斜視図である。

【図10】

航空宇宙機の平面図である。

【図11】

航空宇宙機の側面図である。

【図12】

航空宇宙機の特徴の上面斜視図である。

【図13】

航空宇宙機の主要コンポーネントの拡大図である。

【図14】

同心円状のマルチローブクレードル燃料タンクとフェアリングの斜視図である。

【図15】

航空宇宙機のペイロード、支持体およびカタパルト排気システムの側面図である。

【図16】

イジェクタラムジェットエンジンの流路の斜視図である。

【図17】

再利用型宇宙機の平面図である。

【図18】

再利用型宇宙機の側面図である。

【図19】

再利用型宇宙機の上面斜視図である。

【図20】

再利用型宇宙機の内部要素の上面斜視図である。

【図21】

搬送形態の再利用型宇宙機の上面斜視図である。

【図22】

再利用型宇宙機の翼展開システムの上面斜視図である。

【図23】

再利用型宇宙機の翼再入密閉システムの断面図である。

【図24】

熱保護システムの外部斜視図である。

【図25】

再利用型軌道遷移機の平面図である。

【図26】

再利用型軌道遷移機の平面図である。

【図27】

再利用型軌道遷移機の上面斜視図である。

【図28】

再利用型軌道遷移機の内部要素の上面斜視図である。

【図29】

ともに搬送形態にある再利用型宇宙機に連結された再利用型軌道遷移機と、ペイロード隙間外圍部の上面斜視図である。

【図30】

ペイロード外圍部を取り付けた搬送形態にある再利用型軌道遷移機の側面図である。

【図31】

使い捨て型の第2段の上面斜視図である。

【図32】

使い捨て型の第3段の上面斜視図である。

【図33】

使い捨て型の第4段の上面後方斜視図である。

【図34】

航空宇宙機の有人極超音速輸送実施形態の上面斜視図である。

【図1】

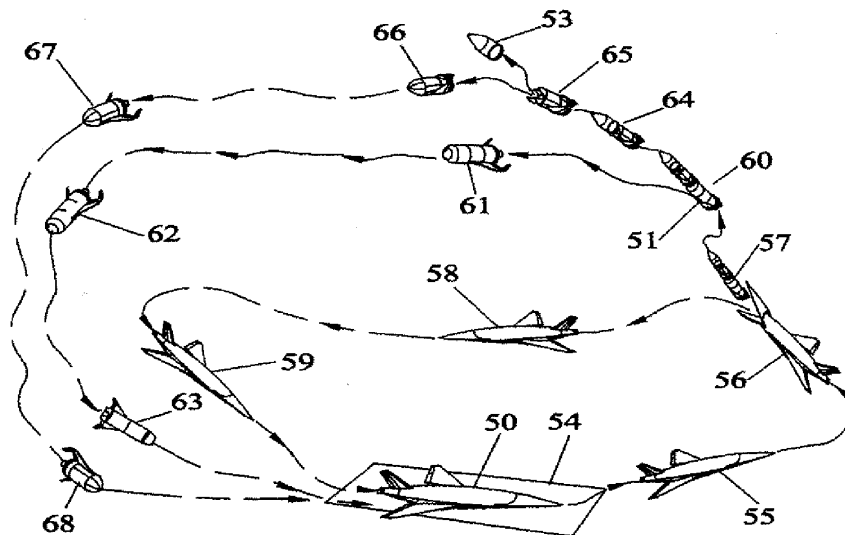
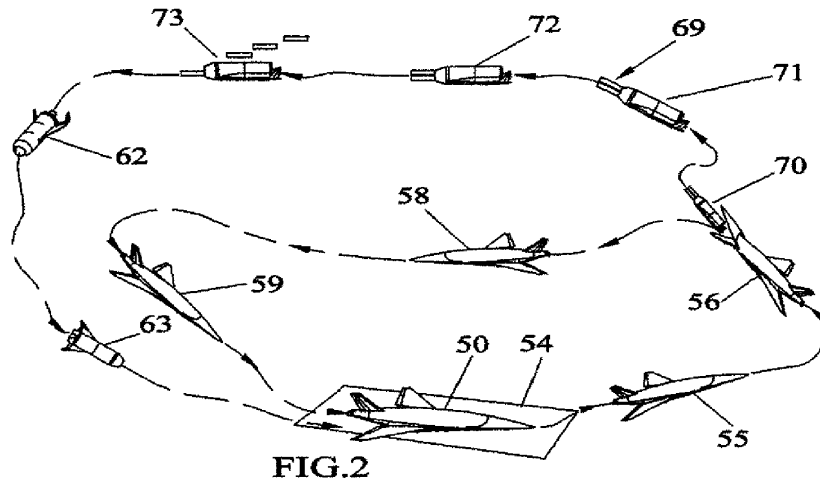
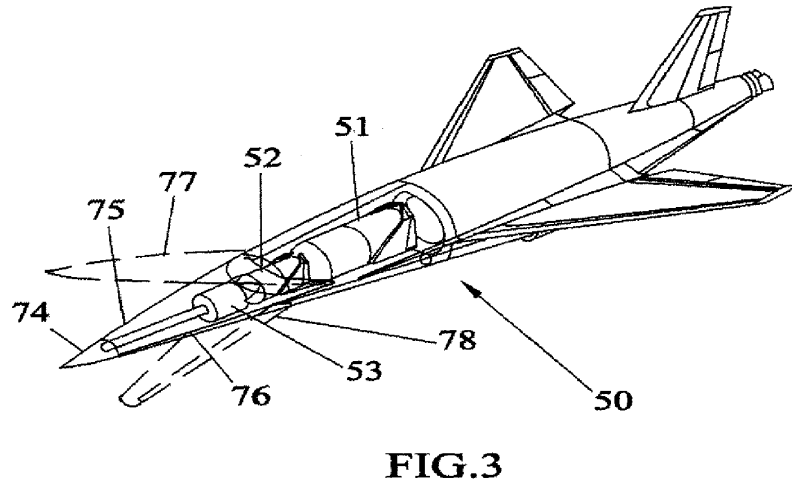


FIG.1

【 図 2 】



【 図 3 】



【 4 】

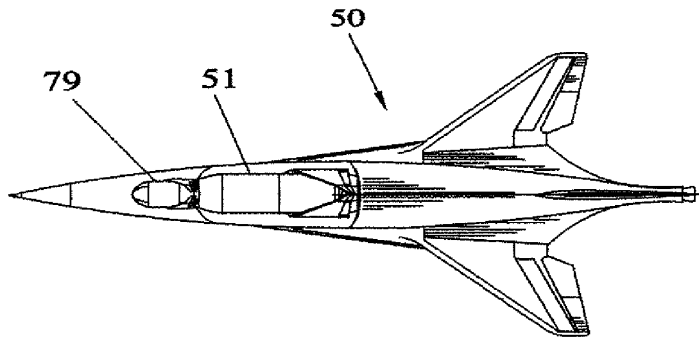


FIG. 4

【 5 】

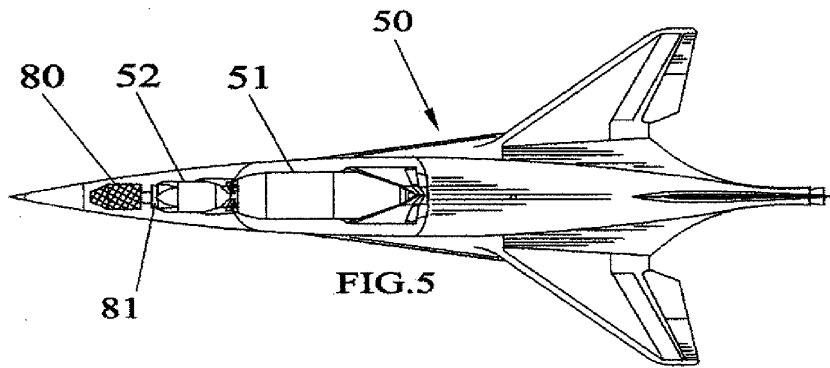


FIG. 5

【 6 】

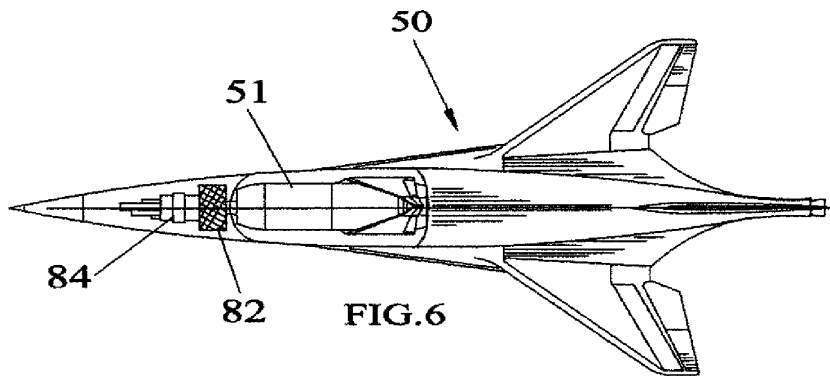
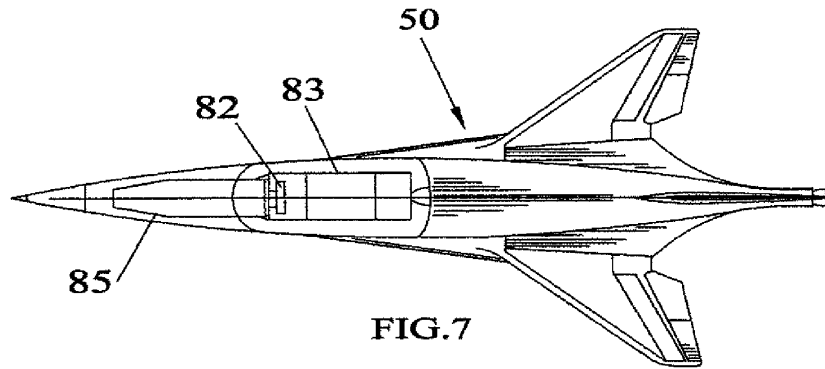
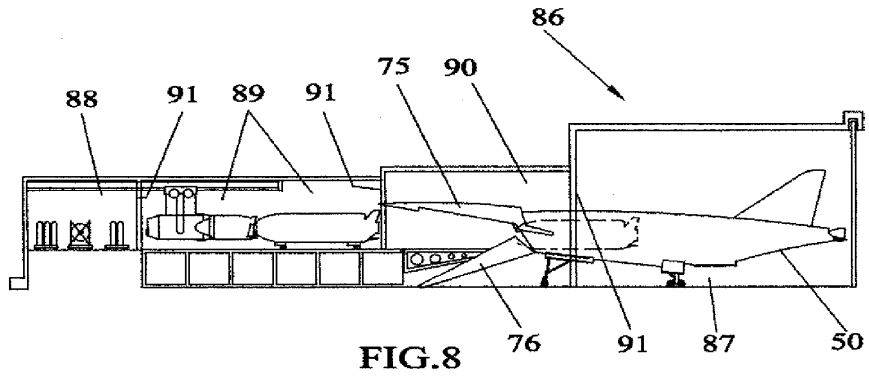


FIG. 6

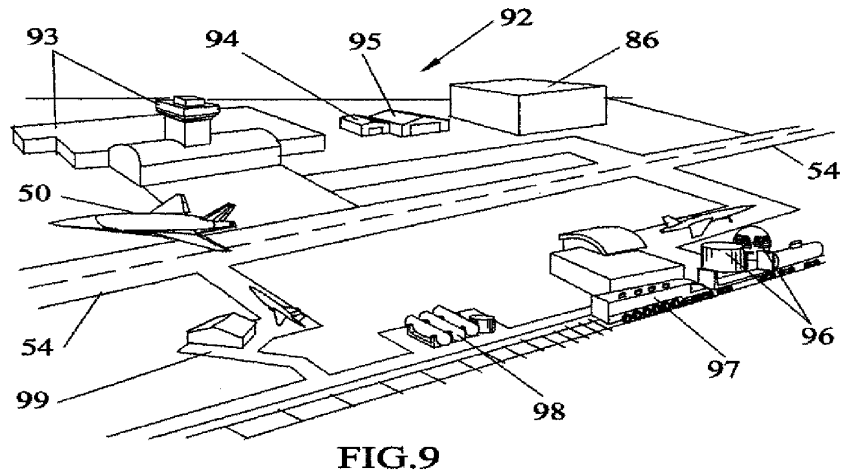
【 図 7 】



【 図 8 】



【 図 9 】





【 10 】

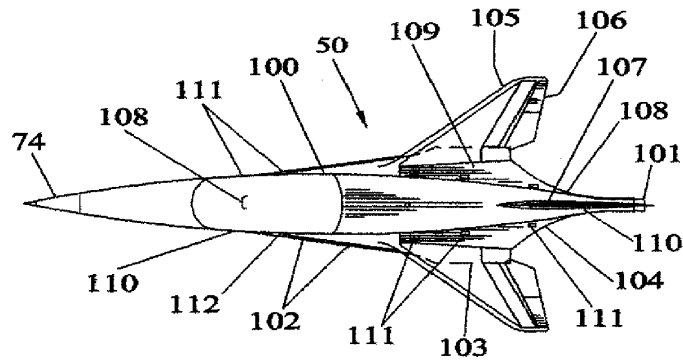


FIG. 10

【 11 】

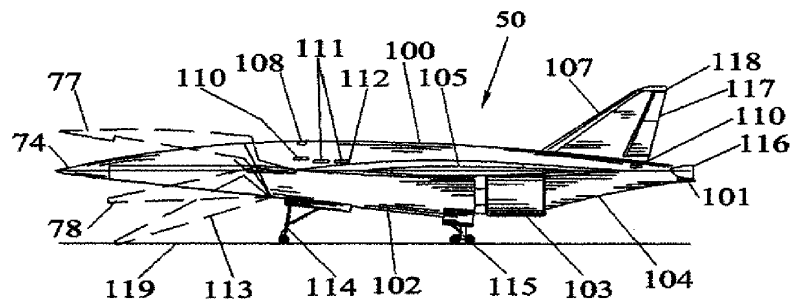


FIG. 11

【 12 】

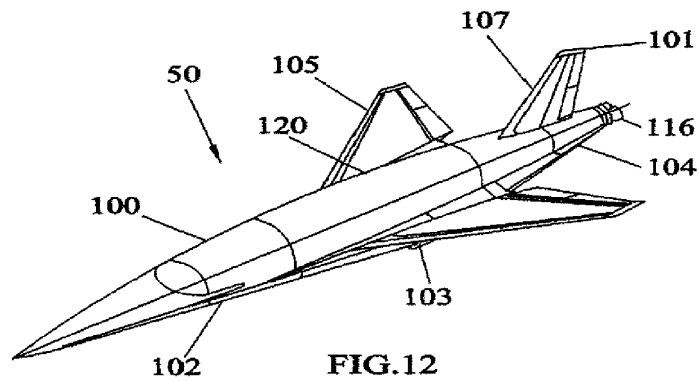
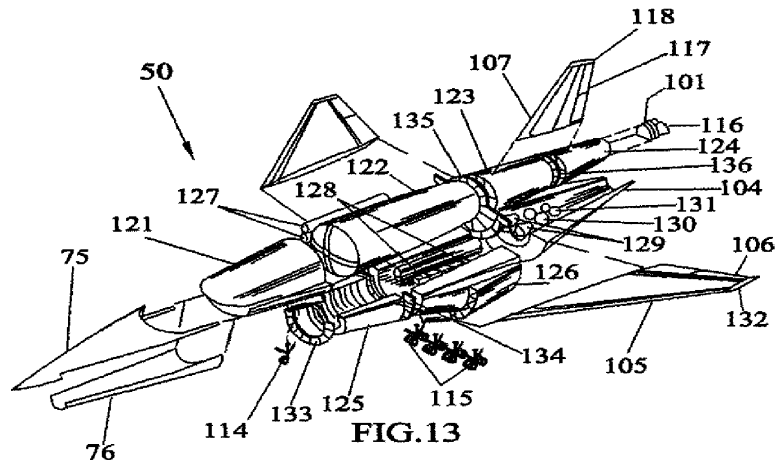


FIG. 12

【 図 1 3 】



【 図 1 4 】

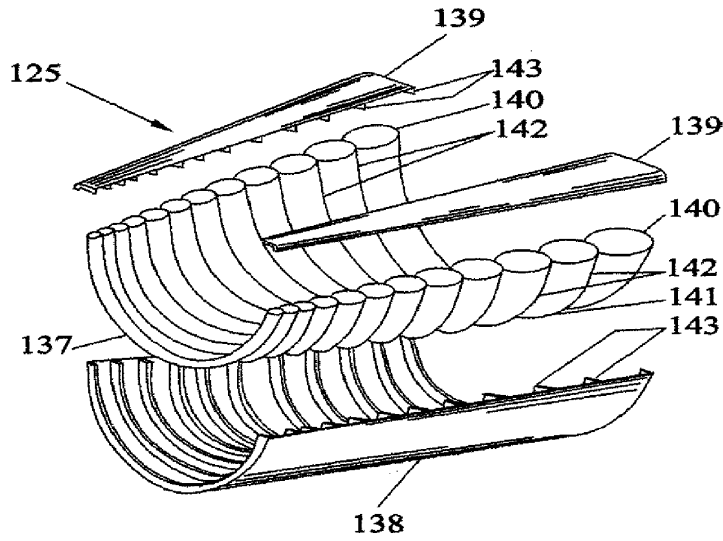


FIG. 14

【 図 15 】

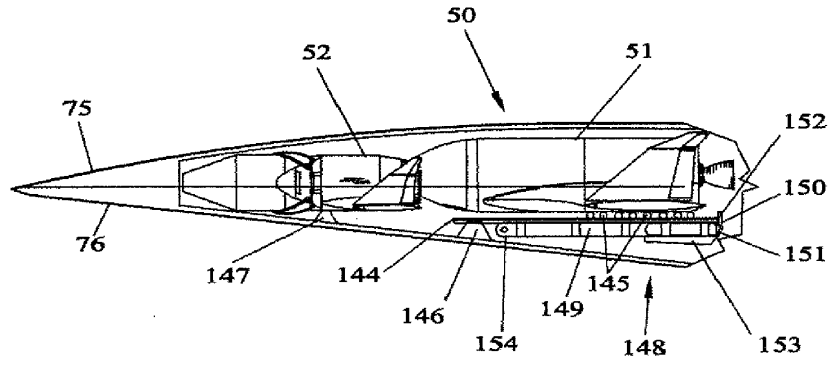


FIG.15

【 図 16 】

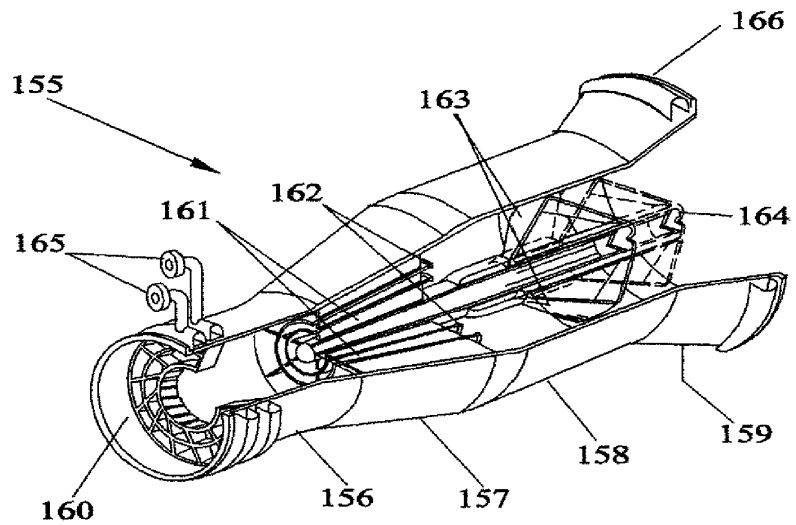


FIG.16

【 図 17 】

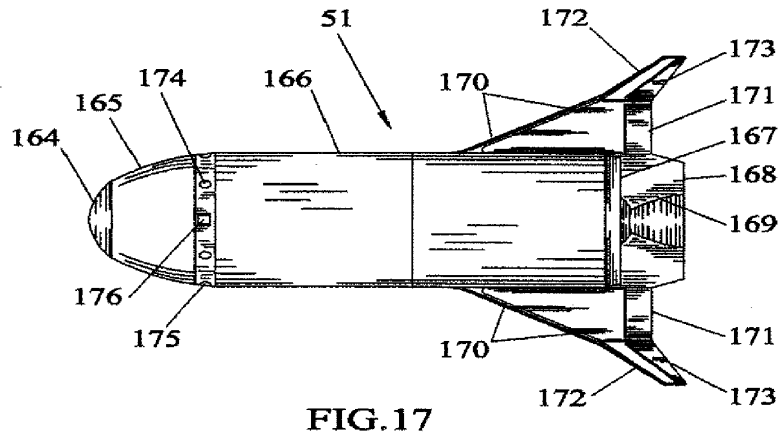


FIG.17

【 図 18 】

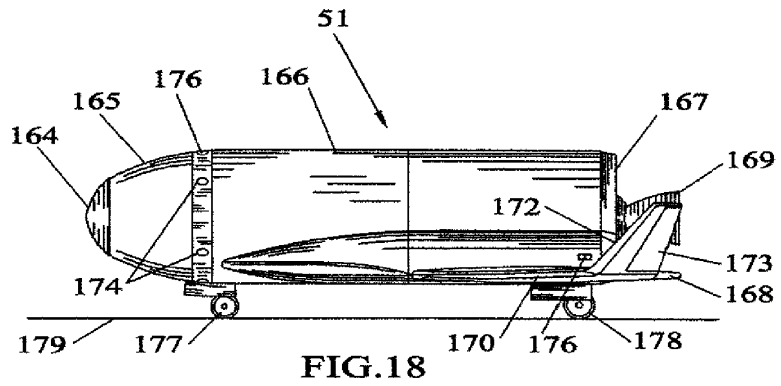


FIG.18

【 19 】

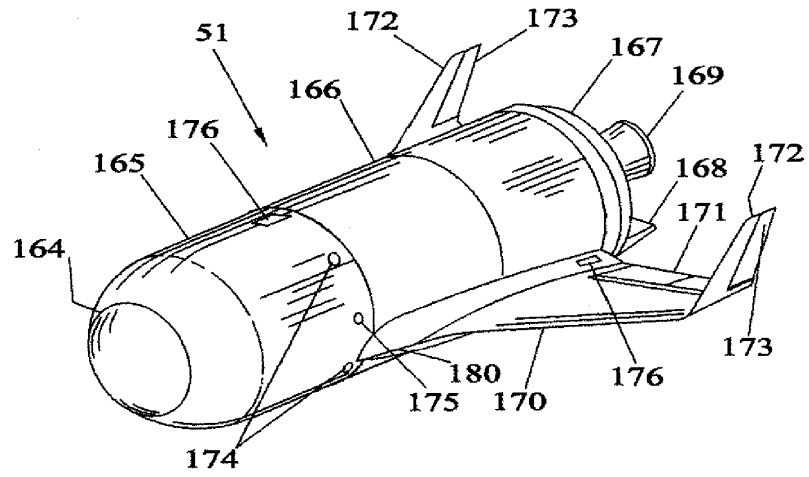


FIG.19

【 20 】

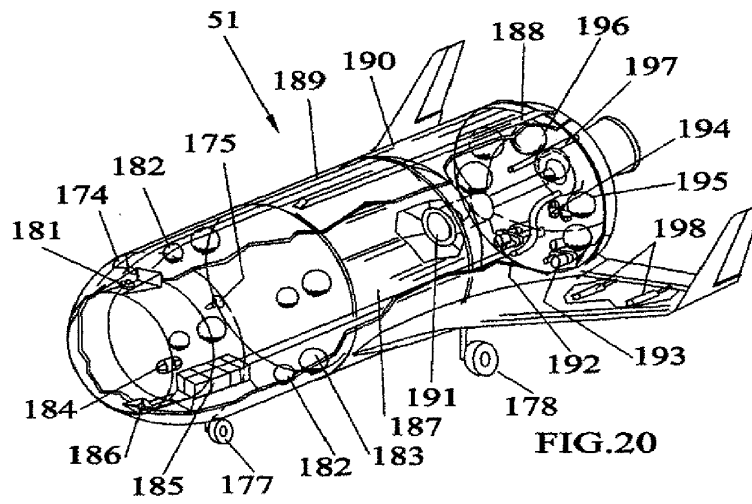
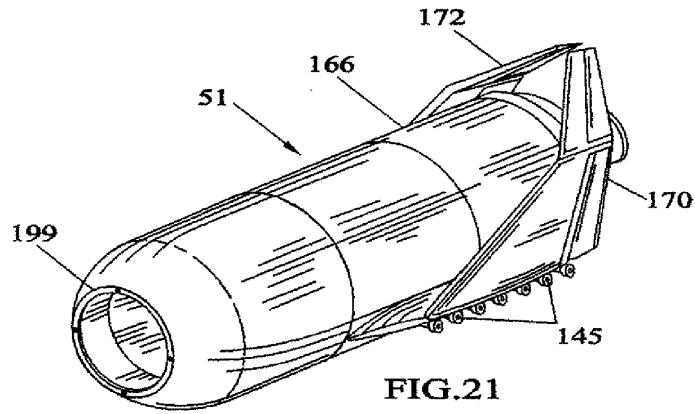
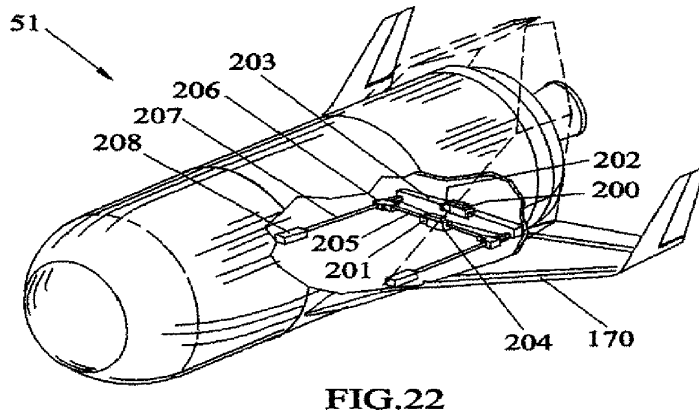


FIG.20

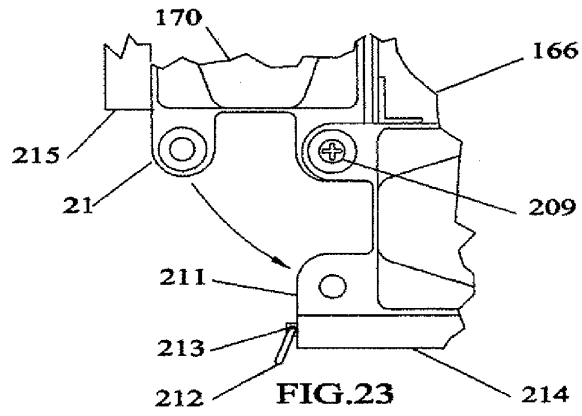
【 図 2 1 】



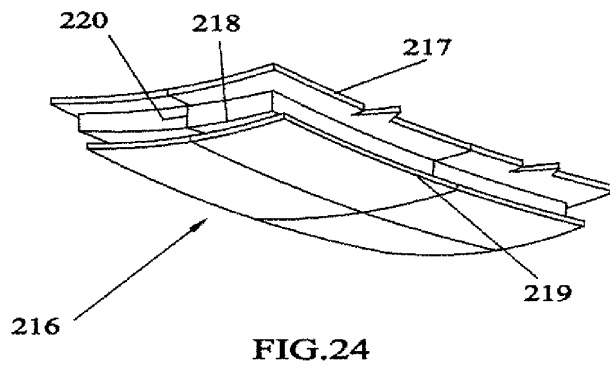
【 図 2 2 】



【 23 】



【 24 】



【 図 2 5 】

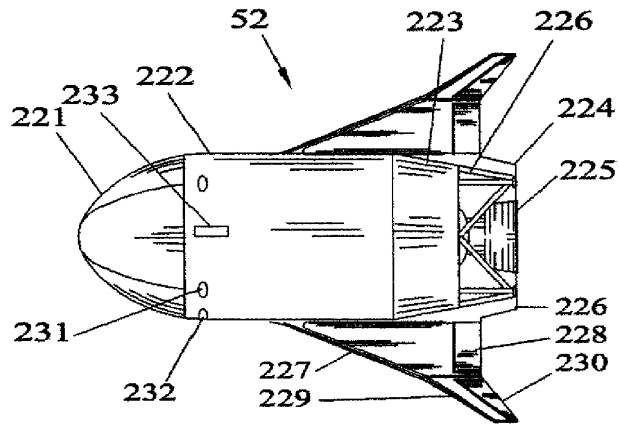


FIG.25

【 図 2 6 】

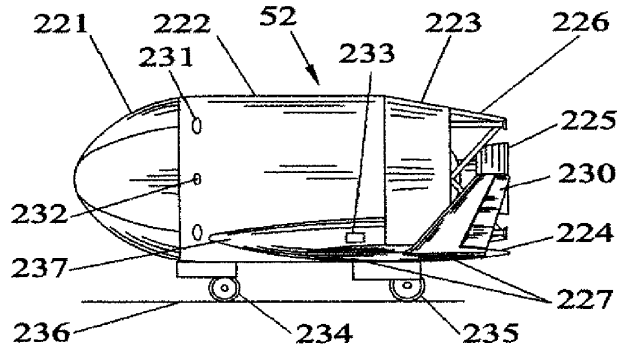


FIG.26



【 27 】

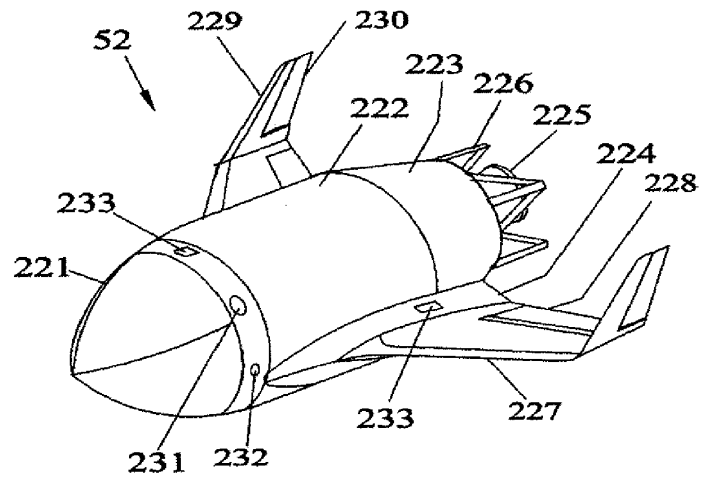


FIG.27

【 28 】

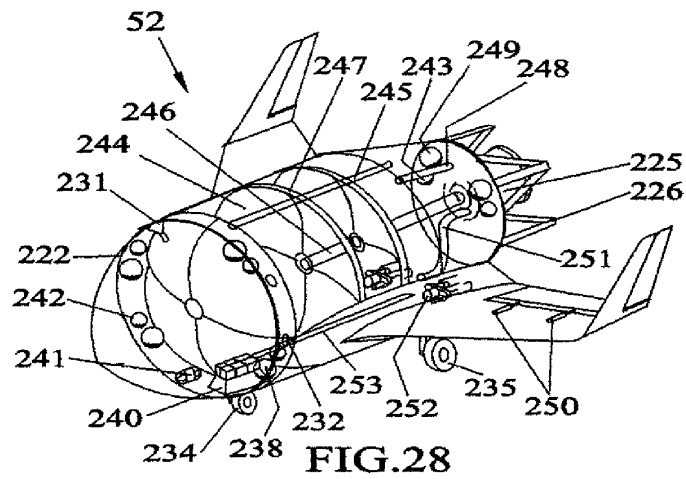


FIG.28

【 29 】

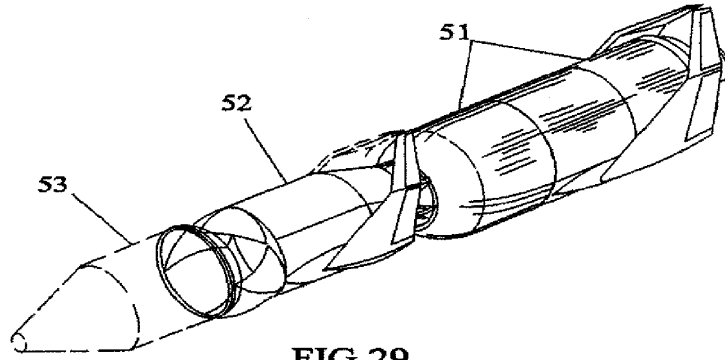


FIG.29

【 30 】

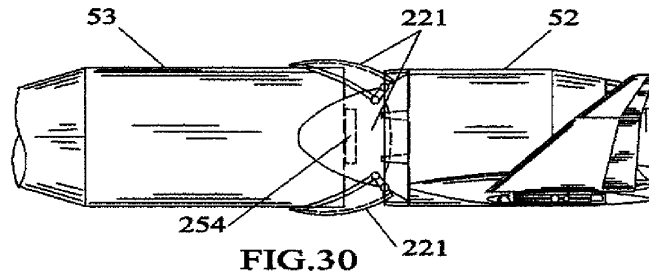


FIG.30

【 31 】

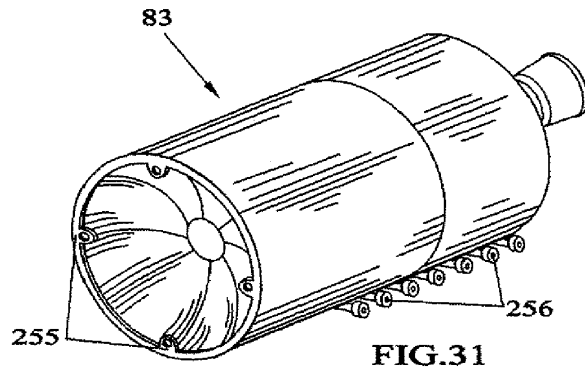


FIG.31

【 3 2 】

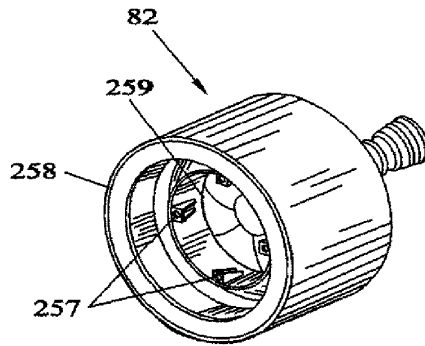


FIG.32

【 3 3 】

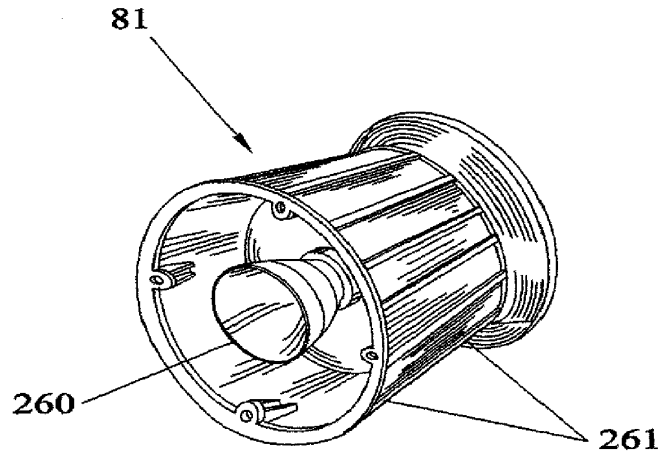
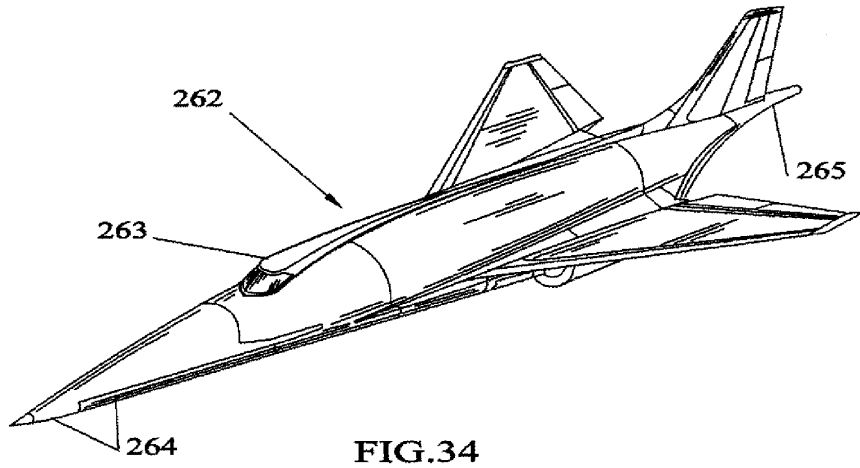


FIG.33

【 34 】



## 【 国際調査報告 】

INTERNATIONAL SEARCH REPORT		International application No. PCT/US99/31168
<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) : B64G 1/14 US CL : 244/2,36,73R,74,137.1,137.4,129.4,158R,160,161,172 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 244/2,36,73R,74,137.1,137.4,129.4,158R,160,161,172 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		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3,161,379 A (LANE) 15 DECEMBER 1964 (15/12/1964) SEE FIGURE 2	
A	US 3,211,401 A (DENNING et al) 12 OCTOBER 1965 (12/10/1965) SEE FIGURE 1	
A	US 4,557,444 A (JACKSON et al) 10 DECEMBER 1985 (10/12/1985) SEE FIGURE 1	
A	US 4,802,639 A (HARDY et al) 7 FEBRUARY 1989 (07/02/1989) SEE FIGURE 1	
A	US 5,402,965 A (CERVISI et al) 04 APRIL 1995 (04/04/1995) SEE FIGURES 2A AND 2B	
A	US 5,743,492 A (CHAN et al) 28 APRIL 1998 (28/04/1998) SEE FIGURE 6	
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family 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 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 *Z* document member of the same patent family		
Date of the actual completion of the international search 16 JUNE 2000		Date of mailing of the international search report <b>12 JUL 2000</b>
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer <i>Galen Barefoot</i> GALEN BAREFOOT Telephone No. (703) 308-2567

Form PCT/ISA/210 (second sheet) (July 1998)\*

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フロントページの続き

(81)指定国 EP(AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OA(BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG), AP(GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), EA(AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, 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, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW

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Electronic Patent Application Fee Transmittal				
<b>Application Number:</b>	12815306			
<b>Filing Date:</b>	14-Jun-2010			
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS			
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos			
<b>Filer:</b>	John M. Wechkin/Paula Quinanola			
<b>Attorney Docket Number:</b>	034563-8003.US02			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
Submission- Information Disclosure Stmt	2806	1	90	90
<b>Total in USD (\$)</b>				<b>90</b>



<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	17936448
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Paula Quinanola
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	034563-8003.US02
<b>Receipt Date:</b>	16-JAN-2014
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	17:00:11
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

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Payment was successfully received in RAM	\$ 90
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**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		8003US2_IDS_34563.pdf	417065 358d971658ef0f0fad7d8e845c34015838270654	yes	3
<b>Multipart Description/PDF files in .zip description</b>					
		<b>Document Description</b>	<b>Start</b>	<b>End</b>	
		Transmittal Letter	1	2	
		Information Disclosure Statement (IDS) Form (SB08)	3	3	
<b>Warnings:</b>					
<b>Information:</b>					
2	Foreign Reference	JP2000508601_final.pdf	151847 0aa2633c4d53b94d6ac15fe942bdd1618da9fc83	no	5
<b>Warnings:</b>					
<b>Information:</b>					
3	Foreign Reference	JP2002535193_final.pdf	1143850 dc19a64b04cc1390084da9a4aa57252e951ee242	no	44
<b>Warnings:</b>					
<b>Information:</b>					
4	Fee Worksheet (SB06)	fee-info.pdf	30608 ac200699a2b9b7e7e2ba2529d09439729d5c3c98	no	2
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			1743370		
<p><b>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.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>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.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>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.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>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.</b></p>					

Docket No.: 0345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3645

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: V. M. Rodriguez

**TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (IDS)**

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

Madam:

Pursuant to 37 CFR 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed more than three months after the U.S. filing date, OR more than three months after the date of entry of the national stage of a PCT application, AND after the mailing date of the first Office Action on the merits, whichever occurs first, but before the mailing date of any of a Final Office Action, a Notice of Allowance (37 C.F.R. § 1.97(c)) or an action that otherwise closes prosecution in the application.

34563-8003.US02/LEGAL29048028.1

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of foreign patents and non-patent literature in accordance with 37 C.F.R. § 1.98(a)(2).

This Information Disclosure Statement is not to be construed as a representation that: (i) a search has been made; (ii) additional information that may be material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the cited information is, or is considered to be, material to patentability. In addition, applicant does not admit that any enclosed item of information constitutes prior art to the subject invention and specifically reserves the right to demonstrate that any such reference is not prior art.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR 1.98 and the Examiner is respectfully requested to consider the listed references.

Please charge our credit card in the amount of \$90.00 covering the fee set forth in 37 C.F.R. § 1.17(p). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 0345638003US2.

Dated: January 16, 2014

Respectfully submitted,

By 

Stephen E. Arnett

Registration No.: 47,392

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Attorney for Applicant



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO. Includes details for application 12/815,306 filed 06/14/2010 by Jeffrey P. Bezos, with examiner RODRIGUEZ, VICENTE M and notification date 12/30/2013.

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):

patentprocurement@perkinscoie.com

<b>Applicant-Initiated Interview Summary</b>	<b>Application No.</b> 12/815,306	<b>Applicant(s)</b> BEZOS ET AL.	
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645	

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

(1) VICENTE RODRIGUEZ. (3) Mr. STEVE ARNETT.  
(2) ROB SWIATEK. (4) \_\_\_\_\_.

Date of Interview: 23 December 2013.

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

Exhibit shown or demonstration conducted:  Yes  No.  
If Yes, brief description: \_\_\_\_\_.

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: 4, 10, 14, 20.

Identification of prior art discussed: Brand, Buehler.

**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...)

Discussed finality of prior office action and agreed the finality should be withdrawn.  
Discussed salient features of claims 4, 10, 14 and the prior art of record in regards to claim 14: it was agreed that Brand and Buehler as combined did not read on claim 14 with respect to deployed flared surfaces and rocket engines.

**Applicant recordation instructions:** The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the 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

/V. R./ Examiner, Art Unit 3645	/Rob Swiatek/ Primary Examiner, Art Unit 3643
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## Summary of Record of Interview Requirements

### Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record

A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

### Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews

Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.

All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:

- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of the specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner,  
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

### Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Docket No.: 0345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3645

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: V. M. Rodriguez

**AMENDMENT AFTER FINAL ACTION UNDER 37 C.F.R. 1.116**

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

Madam:

**INTRODUCTORY COMMENTS**

In response to the Office Action dated July 29, 2013, finally rejecting claims 2-16 and 18-20, please amend the above-identified U.S. patent application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 8 of this paper.

34563-8003.US02/LEGAL27424537.1



**AMENDMENTS TO THE CLAIMS**

Please amend claims 14 and 20, and cancel claim 19 as set forth below.

1. (Canceled)
  
2. (Previously Presented) The method of claim 4 wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land.
  
3. (Previously Presented) The method of claim 4 wherein landing the space launch vehicle includes vertically landing the space launch vehicle on a floating platform in the body of water.
  
4. (Previously Presented) A method for operating a space launch vehicle, the method comprising:
  - launching the space launch vehicle from earth, wherein launching the space launch vehicle includes igniting one or more rocket engines on a booster stage;
  - positioning a landing structure in a body of water; and
  - landing the space launch vehicle on the landing structure in the body of water, wherein landing the space launch vehicle includes vertically landing the booster stage on the landing structure in the body of water.
  
5. (Previously Presented) The method of claim 4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation.

6. (Previously Presented) The method of claim 4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation while providing thrust from one or more vehicle engines in a tail-first direction.

7. (Previously Presented) The method of claim 4, further comprising reusing at least a portion of the space launch vehicle.

8. (Previously Presented) The method of claim 4, further comprising:  
transporting the space launch vehicle on the landing structure to a refurbishment facility;  
refurbishing at least a portion of the space launch vehicle at the refurbishment facility; and  
reusing at least a portion of the space launch vehicle after refurbishment.

9. (Previously Presented) The method of claim 4, further comprising transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle.

10. (Previously Presented) The method of claim 4 wherein the space launch vehicle includes a payload carried on an upper stage mounted to a booster stage, wherein launching the space launch vehicle from earth includes igniting one or more rocket engines on the booster stage to launch the space launch vehicle from a launch site on land in a nose-first orientation, wherein landing the space launch vehicle includes landing the space launch vehicle on a mobile landing platform in the body of water, and wherein the method further comprises:

turning off the one or more rocket engines on the booster stage;

separating the upper stage from the booster stage at a predetermined altitude;  
reorienting the booster stage to a tail-first orientation;  
receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information; and  
reigniting the one or more rocket engines on the booster stage prior to landing, wherein landing the space launch vehicle includes vertically landing the booster stage on the platform in the tail-first orientation while providing thrust from the reignited one or more rocket engines.

11. (Original) A method for transporting a payload to space, the method comprising:

coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion;  
positioning a floating platform in a body of water;  
igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;  
separating the payload from the booster stage;  
after separating, reorienting the booster stage from the nose-first orientation to a tail-first orientation; and  
landing the booster stage on the floating platform in the tail-first orientation.

12. (Original) The method of claim 11, further comprising:

turning off the one or more rocket engines positioned toward the aft end portion of the booster stage before reorienting the booster stage from the nose-first orientation to the tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage to decelerate

the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

13. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines and following a ballistic trajectory; and  
deploying an aerodynamic control surface from the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

14. (Currently Amended) A method for transporting a payload to space, the method comprising:

coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion;

positioning a floating platform in a body of water;

igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;

turning off the one or more rocket engines;

separating the payload from the booster stage;

~~after the booster stage has separated from the payload and followed~~ separating  
~~and following a ballistic trajectory;~~ deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation; and

landing the booster stage on the floating platform in the tail-first orientation.

15. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines; and

operating one or more propulsive thrusters mounted to the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

16. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines after separating the payload from the booster stage;  
moving an aerodynamic control surface on the booster stage to at least partially control a flight path of the booster stage toward the platform based on platform positional information received from the platform;  
moving the aerodynamic control surface on the booster stage to at least partially reorient the booster stage from the nose-first orientation to a tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

17. (Canceled)

18. (Previously Presented) The system of claim 20 wherein the means for landing include means for vertically landing at least a portion of the space launch vehicle on a floating platform.

19. (Cancelled)

20. (Currently Amended) A system for providing access to space, the system comprising:  
a space launch vehicle, wherein the space launch vehicle includes one or more rocket engines;

a launch site;

means for launching the launch vehicle from the launch site a first time, wherein the means for launching include means for igniting the one or more rocket engines and launching the vehicle in a nose-first orientation;

means for shutting off the one or more rocket engines;

means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing;

means for reigniting at least one of the ~~one or more of the~~ rocket engines when the launch vehicle is in the tail-first orientation to decelerate the vehicle;

means for landing at least a portion of the launch vehicle on a structure in a body of water, wherein the means for landing include means for landing in the tail-first orientation while the one or more rocket engines are thrusting; and

means for launching at least a portion of the launch vehicle from the launch site a second time.

**REMARKS**

Claims 2-16 and 18-20 were pending in the application at the time the present Office Action was mailed. Claims 14 and 20 have been amended herein solely for purposes of clarity. Accordingly, claims 14 and 20 have not been amended in a manner that would necessitate a new search of the prior art, and any subsequent rejection of claim 14 or claim 20 based on new grounds cannot be made final. Claim 19 has been cancelled without commenting on or conceding the merits of the rejection of this claim, and without prejudice to pursuing this claim in unamended or other forms in a continuation or other application. No claims have been added. Accordingly, Claims 2-16, 18 and 20 are currently pending in the present application.

Claims 2-16 and 18-20 were rejected in the present Office Action. More specifically, the status of the application in view of the present Office Action is as follows:

(A) Claims 2-8, 11-16 and 18-20 were rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 8,047,472 to Brand et al. ("Brand") in view of U.S. Patent Application Publication No. 2007/0012820 to Buehler ("Buehler");

(B) Claim 10 was rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Brand, Buehler, and further in view of U.S. Patent No. 6,176,451 to Drymon ("Drymon"); and

(C) Claim 9 was rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Brand, Buehler, and further in view of article "Solid Rocket Boosters and Post Launch Processing," NASA Facts, National Aeronautics and Space Administration, John F. Kennedy Space Center ("NASA").

The undersigned attorney wishes to thank Examiner Rodriguez and Examiner Swiatek for engaging in a telephone conference on December 23, 2013 to discuss the present Office Action. During the telephone conference, the parties discussed the

finality of the present Office Action, and the Examiners agreed that the finality was improper for at least the reason that the Office Action presented new grounds of rejection that were not necessitated by applicants' amendment. Accordingly, the Examiners agreed to withdraw the finality of the present Office Action. The parties also discussed the pending claim rejections, and the Examiners acknowledged that the proposed modification of Brand's lower stage with Buehler's upper stage engines did not appear to form a fair basis for rejecting the independent claims. The Examiners further agreed that the particular features of independent claim 14 patentably distinguished over the prior art of record.

The following remarks summarize the points discussed during the December 23, 2013 telephone conference and reflect the agreements reached. Accordingly, the applicants request that this paper constitute the applicants' Interview Summary. If Examiner Rodriguez notices any deficiencies in this regard, the Examiner is encouraged to contact the undersigned attorney so that any such deficiencies can be resolved.

A. Response to the Section 103 Rejections of Claims 2-8, 11-16 and 18-20

Claims 2-8, 11-16 and 18-20 were rejected under 35 U.S.C. Section 103(a) as being unpatentable over Brand in view of Buehler.

Independent Claims 4 and 11

Independent claim 4 is directed to a method for operating a space launch vehicle, and includes, *inter alia*, launching the space launch vehicle from earth by igniting one or more rocket engines on a booster stage, and vertically landing the booster stage on a landing structure positioned in a body of water. Independent claim 11 is directed to a method for transporting a payload to space, and includes, *inter alia*, igniting one or more rocket engines positioned toward an aft end portion of a booster stage and launching the rocket in a nose-first orientation. The method of claim 11 further includes



reorienting the booster stage from the nose-first orientation to a tail-first orientation, and landing the booster stage on a floating platform in the tail-first orientation.

In contrast to the rocket engines required by claims 4 and 11, Brand teaches the use of air breathing engines for his vehicle lower stage, and teaches away from the use of rocket engines citing “numerous deficiencies” associated with using rocket engines on reusable boosters. Buehler also does not teach the use of rocket engines on a reusable booster, but instead uses rocket engines on a reusable upper stage because the engines are made to “operate optimally” in the vacuum of space. Buehler explains that such engines present difficulties if used during reentry in the atmosphere. In view of these teachings, the Examiners acknowledged during the course of the December 23, 2013 telephone conference that the proposed combination of Brand and Buehler did not appear to form a fair basis for rejecting independent claims 4 and 11. Accordingly, the rejection of claims 4 and 11 should be withdrawn.

Claims 2, 3 and 5-8 depend from base claim 4, and claims 12, 13, 15 and 16 depend from base claim 11. Accordingly, the proposed combination of Brand and Buehler cannot support Section 103 rejections of dependent claims 2, 3, 5-8, 12, 13, 15 and 16 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claims 4 and 11, and for the additional features of these dependent claims. Therefore, the rejections of dependent claims 2, 3, 5-8, 12, 13, 15 and 16 should be withdrawn.

#### Independent claim 14

The Examiners acknowledged during the December 23, 2013 telephone conference that independent claim 14 patentably distinguished over the prior art of record. Accordingly, the rejection of claim 14 should be withdrawn.

#### Independent Claim 20

Independent claim 20 includes features similar to those of independent claim 11. For example, claim 20 is directed to a system for providing access to space that includes, *inter alia*, means for igniting rocket engines and launching a space launch vehicle in a nose-first orientation. The system further includes means for shutting off the rocket engines, means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation, and means for reigniting one or more of the rocket engines when the launch vehicle is in the tail-first orientation to decelerate the vehicle. The system additionally includes means for landing at least a portion of the launch vehicle on a structure in a body of water in the tail-first orientation while the one or more rocket engines are thrusting. For the reasons set forth above and discussed in detail in applicants' response to the non-Final Office Action mailed October 10, 2012 in regard to, e.g., claim 11, the proposed combination of Brand and Buehler cannot support a *prima facie* obviousness rejection of independent claim 20. Accordingly, the rejection of claim 20 should be withdrawn.

Claim 18 depends from base claim 20. Accordingly, the proposed combination of Brand and Buehler cannot support a Section 103 rejection of dependent claim 18 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 20, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 18 should be withdrawn.

Claim 19 has been cancelled without prejudice. Accordingly, the rejection of claim 19 is now moot.

**B. Response to the Section 103 Rejection of Dependent Claim 10**

Dependent claim 10 was rejected under 35 U.S.C. Section 103(a) as being unpatentable over Brand and Buehler and further in view of Drymon. Claim 10 depends from base claim 4. Brand and Buehler cannot support a section 103 rejection of base claim 4 for at least the reasons set forth above, and Drymon fails to cure the deficiencies of Brand and Buehler with respect to base claim 4. Accordingly, the

proposed combination of Brand, Buehler and Drymon cannot support a Section 103 rejection of dependent claim 10 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 4, and for the additional features of this dependent claim. Therefore, the rejection of claim 10 should be withdrawn for at least this reason.

Rejection of claim 10 should be withdrawn for additional reasons as well. For example, the method of claim 10 includes, *inter alia*, igniting one or more rocket engines on a booster stage to launch a space launch vehicle from land in a nose-first orientation. The method further includes turning off the one or more rocket engines, separating an upper stage from the booster stage, and reorienting the booster stage to a tail-first orientation. The method continues by controlling a trajectory of the booster stage as it moves toward a landing platform in a body of water in the tail-first orientation. Neither Brand nor Buehler disclose or suggest, *inter alia*, controlling a trajectory of a booster stage as it moves toward a landing platform in a tail-first orientation with one or more rocket engines turned off. Accordingly, the proposed combination of Brand, Buehler and Drymon cannot support a Section 103 rejection of dependent claim 10 for this additional reason, and the rejection should be withdrawn.

C. Response to the Section 103 rejection of dependent Claim 9

Claim 9 was rejected under 35 U.S.C. Section 103(a) as being unpatentable over Brand, Buehler and further in view of NASA. Claim 9 depends from base claim 4. Brand and Buehler cannot support a Section 103 rejection of base claim 4 for at least the reason set forth above. Moreover, NASA fails to cure the deficiencies of Brand and Buehler with respect base claim 4. Accordingly, the proposed combination of Brand, Buehler and NASA cannot support a Section 103 rejection of dependent claim 9 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 4, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 9 should be withdrawn.

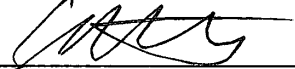
Conclusion

The applicants respectfully request that the Examiner reconsider the pending claims in view of the remarks set forth above. During the December 23, 2013 telephone conference, the Examiner agreed to contact the undersigned attorney by telephone to discuss the status of the application after consideration of the present response. The undersigned attorney thanks the Examiner for extending this courtesy, and looks forward to discussing the application at that time.

Please charge any deficiency in fees or credit any overpayment to our Deposit Account No. 50-0665, under Order No. 0345638003US2 from which the undersigned is authorized to draw.

Dated: December 30, 2013

Respectfully submitted,

By   
\_\_\_\_\_  
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Docket No.: 0345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3645

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: V. M. Rodriguez

**TRANSMITTAL OF INFORMATION DISCLOSURE STATEMENT (IDS)**

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

Madam:

Pursuant to 37 CFR 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed more than three months after the U.S. filing date, OR more than three months after the date of entry of the national stage of a PCT application, AND after the mailing date of the first Office Action on the merits, whichever occurs first, but before the mailing date of any of a Final Office Action, a Notice of Allowance (37 C.F.R. § 1.97(c)) or an action that otherwise closes prosecution in the application.

34563-8003.US02/LEGAL28884410.1

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of foreign patents in accordance with 37 C.F.R. § 1.98(a)(2).

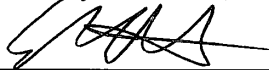
This Information Disclosure Statement is not to be construed as a representation that: (i) a search has been made; (ii) additional information that may be material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the cited information is, or is considered to be, material to patentability. In addition, applicant does not admit that any enclosed item of information constitutes prior art to the subject invention and specifically reserves the right to demonstrate that any such reference is not prior art.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR 1.98 and the Examiner is respectfully requested to consider the listed references.

Please charge our credit card in the amount of \$90.00 covering the fee set forth in 37 C.F.R. § 1.17(p). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 0345638003US2.

Dated: December 30, 2013

Respectfully submitted,

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)		<b>Complete if Known</b>	
		Application Number	12/815,306-Conf. #1105
		Filing Date	June 14, 2010
		First Named Inventor	Jeffrey P. Bezos
		Art Unit	3645
		Examiner Name	V. M. Rodriguez
Sheet	1	of	1
		Attorney Docket Number	0345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-4,896,847	01-30-1990	Gertsch	
		US-3,210,025	10-05-1965	Lubben et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				
		JP-2003239698-A	08-27-2003	Sasaki Giken Kk		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>

Examiner Signature	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with an single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.



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Bibliographic data: JP2003239698 (A) — 2003-08-27

## RESIN BOLT

No documents available for this priority number.

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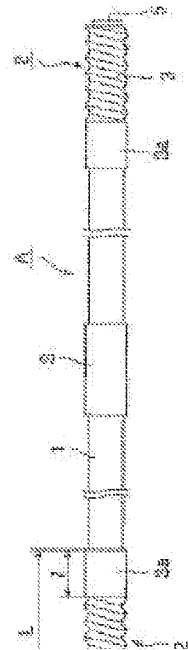
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**Classification:** - **international:** *E02D5/80; E21D20/00; F16B35/00*; (IPC1-7): E02D5/80; E21D20/00; F16B35/00  
- **cooperative:**

**Application number:** JP20020036914 20020214

**Priority number (s):** JP20020036914 20020214

Abstract of JP2003239698 (A)



<http://worldwide.espacenet.com/publicationDetails/biblio?DB=worldwide.espacenet.com...> 12/10/2013



PROBLEM TO BE SOLVED: To provide a resin bolt, in which torsional fracture-resistant strength is increased by preventing an abrasion by a contact with a drilling wall surface while improving the rigidity of a screw section by removing a thin wall section at an end section on the inner end side of a screw metal fitting, in the resin bolt mainly used as a drilling bolt, an anchor bolt or the like in tunneling works. ; SOLUTION: In the resin bolt in which the screw metal fittings having the screw sections on outer peripheral surfaces are installed at both end sections of a hollow bolt body made of a fiber-reinforced synthetic resin, straight sections having no screw thread are mounted on the screw metal fittings, and a protective sleeve made of a metal or a synthetic resin is fitted externally and fixed at approximately the center of the hollow bolt body section. ; COPYRIGHT: (C)2003,JPO



Last updated: 09.10.2013 Worldwide Database 5.8.11.5; 93p

<http://worldwide.espacenet.com/publicationDetails/biblio?DB=worldwide.espacenet.com...> 12/10/2013

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E 0 2 D	5/80	E 0 2 D 5/80	J
F 1 6 B	35/00	F 1 6 B 35/00	Z
			N
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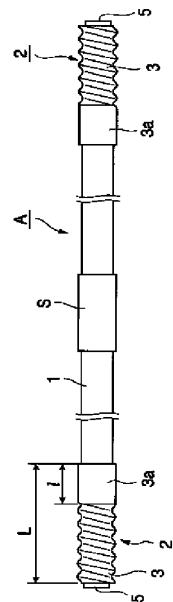
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(54) 【発明の名称】 樹脂ボルト

(57) 【要約】

【課題】 主にトンネル工事で穿孔ボルトやアンカーボルト等として用いられる樹脂ボルトにおいて、削孔壁面との接触による摩耗を防止し耐ねじれ破壊強度を高めるとともに、ねじ金具の内端側端部の薄肉部を無くして当該ねじ部の剛性を高めた樹脂ボルトを提供する。

【解決手段】 繊維強化合成樹脂製の中空ボルト本体の両端部に、外周面にねじ部を有するねじ金具が装着されてなる樹脂ボルトにおいて、前記ねじ金具にねじ山のないストレート部分を設け、さらに前記中空ボルト本体部のほぼ中央部に金属製または合成樹脂製の保護スリーブを外嵌固着したことを特徴とする。



【特許請求の範囲】

【請求項1】 繊維強化合成樹脂製の中空ボルト本体の両端部に、外周面にねじ部を有するねじ金具が装着されてなる樹脂ボルトにおいて、前記両端部のねじ金具間の中空ボルト本体に金属製または合成樹脂製保護スリーブが少なくとも1つ外嵌固着されていることを特徴とする樹脂ボルト。

【請求項2】 繊維強化合成樹脂製の中空ボルト本体の両端部に、外周面にねじ部を有するねじ金具が装着されてなる樹脂ボルトにおいて、前記ねじ金具は内端側端部にねじ山のないストレート部分を有することを特徴とする樹脂ボルト。

【請求項3】 繊維強化合成樹脂製の中空ボルト本体の両端部に、外周面にねじ部を有するねじ金具が装着されてなる樹脂ボルトにおいて、前記ねじ金具は内端側端部にねじ山のないストレート部分を有し、前記中空ボルト本体部のほぼ中央部に金属製または合成樹脂製保護スリーブが外嵌固着されていることを特徴とする樹脂ボルト。

【請求項4】 前記金属製または合成樹脂製保護スリーブは、一体物または複数分割構造からなることを特徴とする請求項1ないし3のうちいずれか1項記載の樹脂ボルト。

【請求項5】 前記金属製または合成樹脂製保護スリーブの部分に、中空ボルト本体内部に通ずる注入孔を有することを特徴とする請求項1ないし4のうちいずれか1項記載の樹脂ボルト。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、主にトンネル工事で穿孔ボルトやアンカーボルト等として用いられる樹脂ボルトに係り、より詳しくはボルト本体の両端部にねじ金具を装着してなる樹脂ボルトに関するものである。

【0002】

【従来の技術】従来、トンネル工事用資材として、鋼鉄製のボルトに替えて、ポリエステル、エポキシレジン等の熱硬化性樹脂等の合成樹脂製のボルト（単に樹脂ボルトともいう）が耐食性および軽量化等の点で優れていることから多く採用されつつある。例えば、特公平5-20559号公報には、ガラス繊維強化合成樹脂からなる中空ボルトを、炭坑等の坑道壁部を支持するためのアンカーボルトとして使用することが開示されており、また特開平9-184400号公報には、繊維強化合成樹脂からなる中空ボルトを、トンネル工事での穿孔機能および注入材料（硬化材等）の充填機能を兼備させた自穿孔ボルトとして使用することが開示されている。

【0003】ところで、この種の樹脂ボルトにおいては、他の部材（例えばアンカーボルトの場合加圧ナット、自穿孔ボルトの場合削孔クラウンおよび穿孔機等）と自在に結合するために、端部にねじ部を形成する必要

があり、またそのねじ部の剛性を高めるために、外周面にねじ部を有する金属製の部材すなわちねじ金具をボルト本体の端部に装着することが通常行われている（特開平9-184400号公報参照）。図5、図6はその樹脂ボルトを例示したもので、その構造は繊維強化合成樹脂製の中空ボルト本体11の両端部に、外周面にねじ部13を有するステンレス製のねじ金具12が装着されたもので、ねじ金具12は中空ボルト本体11の端部に予め形成したねじ部14にねじ込まれかつ両者間に充填した二液性硬化型エポキシ樹脂等の接着剤により固着されている。また、中空ボルト本体11の開口端部には、鏝部15aを有する鋼鉄製の筒体15bがその鏝部15aをボルト本体11の開口端面に当接させる位置まで圧入されている。なお、トンネル工事用の樹脂ボルトの全長は2m～6m、ねじ金具12の長さは100mm、肉厚は0.5～0.8mm、ねじ部14は山部および谷部に丸みを持たせたいわゆるローブねじである。

【0004】

【発明が解決しようとする課題】しかるに、図5、図6に示すような構造の従来の樹脂ボルトには、次に記載する問題点がある。例えば掘削中のトンネルの天端部に前記樹脂ボルトを打込んで地山を補強する場合は、図7に示すように先端に削孔ビット17を螺着した樹脂ボルトAの後端に注入孔付きの接続スリーブ（継手）16を介して後続の樹脂ボルトAを順次接続しながら回転穿孔機によって高速で回転させて穿孔しながら打込み、その打込んだ樹脂ボルトAを岩盤に残存させたまま最後尾の樹脂ボルトAの基端部に注入アダプター18を接続し、注入機によりモルタル等の硬化材を地山に注入するが、樹脂ボルトAを回転穿孔機によって高速で回転させて地山に打込む際、図8に示すように長尺の樹脂ボルトの場合穿孔機によってかかる大きな押圧力によって当該樹脂ボルトが縄跳びの縄のように弓状に湾曲し、当該樹脂ボルトAの両端のねじ金具12を除く中空ボルト本体11のほぼ中央部分が削孔壁面19に接触して摩擦し、過度に摩擦するとその部分からねじれ破壊を起こすことがある。また、従来の樹脂ボルトの場合は、図6に拡大して示すように中空ボルト本体11の端部にねじ込まれ接着剤にて固着されたねじ金具12の内端側端部のボルト本体の外周面に必然的に溝11aが形成されて当該部分のボルトの肉厚が薄肉となり、当該部分の剛性強度が低下することにより樹脂ボルトが前記のように弓状に湾曲したりすると前記薄肉部分への応力集中により当該部分から折損することがあった。

【0005】本発明は、上記した従来技術の問題点を解決するためになされたもので、削孔壁面との接触による摩擦を防止し耐ねじれ破壊強度を高めるとともに、ねじ金具の内端側端部の薄肉部を無くして当該ねじ部の剛性を高めた樹脂ボルトを提供しようとするものである。

【0006】

【課題を解決するための手段】本発明に係る樹脂ボルトは、繊維強化合成樹脂製の中空ボルト本体の両端部に、外周面にねじ部を有するねじ金具が装着されてなる樹脂ボルトにおいて、前記両端部のねじ金具間の中空ボルト本体に金属製または合成樹脂製の保護スリーブが少なくとも1つ外嵌固着されていることを特徴とするものである。また、前記ねじ金具は内端側端部にねじ山のないストレート部分を有するものを用いることを特徴とする。さらに、本発明は前記ストレート部分を有するねじ金具と、中空ボルト本体部のほぼ中央部に前記保護スリーブを備えたものの特徴とするものである。なお、前記金属製または合成樹脂製保護スリーブは、一体物または複数分割構造からなるものを選択して用いることができる。また、前記金属製または合成樹脂製保護スリーブの部分に、中空ボルト本体内部に通ずる注入孔を設け、当該部分からもモルタル等の硬化材を地山に注入できるようにすることもできる。

【0007】本発明において、中空ボルト本体の両端部のねじ金具間に金属製または合成樹脂製保護スリーブを装着することとしたのは、穿孔機によりかかる大きな押圧力によって当該樹脂ボルトが弓状に湾曲した際に削孔壁面に接触してボルト自体が摩耗するのを防止するためと、樹脂ボルト自体の剛性強度をより高めるためである。したがって、この保護スリーブは1個の場合は樹脂ボルトのほぼ中央部付近に設けるのが好ましく、複数の場合は樹脂ボルトの中央部と他の任意の位置に設ければよい。また、ねじ金具にねじ山のないストレート部分を設けたのは、ねじ金具の内端側端部の薄肉部を無くして当該ねじ部の剛性を高めるためである。さらに、前記保護スリーブおよび中空ボルト本体に、該ボルト本体内部に通ずる注入孔を設けて、当該部分からもモルタル等の硬化材を地山に注入できるようにすれば、樹脂ボルトの最先端部および継手部分だけでなく、この保護スリーブの部分にも地山補強部が形成され、樹脂ボルトと地山の一体性がより強固になって樹脂ボルトの引張強度が増大することとなる。なお、前記保護スリーブは金属製の場合はねじ金具と同じ材質のステンレス製が一般的であり、樹脂製の場合はボルト本体と同じ材質、例えばポリエステル、エポキシレジン等の熱硬化性樹脂を用いることができる。

【0008】

【発明の実施の形態】図1は本発明にかかる樹脂ボルトの一実施例を一部省略して示す側面図、図2は同上樹脂ボルトの一方のねじ金具の部分を拡大して示す縦断側面図、図3は同上樹脂ボルトの保護スリーブの部分を拡大して示す縦断側面図、図4は本発明の他の実施例を示す図3相当図であり、1は中空ボルト本体、2はねじ金具、3はねじ金具のねじ部、3aはねじ部のないストレート部、4はボルト本体のねじ部、5は筒体、Sは保護スリーブである。

【0009】すなわち、図1に示す樹脂ボルトAは、ガラス繊維等の強化繊維を内包した繊維強化合成樹脂製（例えばポリエステル製）の中空ボルト本体1と、このボルト本体の両端部にそれぞれ装着されたステンレス製のねじ金具2と、中空ボルト本体1のほぼ中央部に外嵌固着されたステンレス製の保護スリーブSを備えている。

【0010】中空ボルト本体1は、従来のものと同様、両端部にねじ部4が形成され、このねじ部の中空孔端部内には鏝部5aを有する鋼鉄製の筒体5がその鏝部5aをボルト本体1の端面に当接させる位置まで圧入されている。なお、ねじ部4は従来のものと同様、山部および谷部に丸みを持たせたいわゆるローブねじである。

【0011】ねじ金具2は、中空ボルト本体1のねじ部4に対応した形状のねじ部3と、前記筒体5と反対側の端部にこのねじ部3と連続して設けたねじ部のないストレート部3aとからなり、ストレート部3aの内径は中空ボルト本体1の外径とほぼ同一サイズであり、その軸方向長さLは該金具全体の長さLの約1/5～2/5程度である。このねじ金具2は、ストレート部3aが該ボルト本体1のねじ部のない外周面部に外嵌されるとともに、ねじ部3が該ボルト本体1のねじ部4にねじ込まれ、かつ該ねじ金具2のストレート部3aおよびねじ部3がそれぞれ中空ボルト本体1との間に充填した二液性硬化型エポキシ樹脂等の接着剤により固着されている。したがって、このねじ金具2の場合は、ストレート部3aが中空ボルト本体1のねじ部のない表面フラットの外周面部に外嵌されるので、該中空ボルト本体1のねじ部の剛性が確実に保持される。

【0012】また保護スリーブSは、ステンレス製のパイプ体からなり、長さは特に限定するものではないが、30～100mm、肉厚は0.3～1.0mmである。この保護スリーブSは一体物に限らず、狭幅のリングを複数個重ねて構成した複数分割構造のものでもよい。この保護スリーブSも前記ねじ金具2と同様、二液性硬化型エポキシ樹脂等の接着剤により固着されている。この保護スリーブSを設ける位置は、その目的からして1個の場合は中空ボルト本体1のほぼ中央部付近に設けるのが好ましく、複数の場合は樹脂ボルトの中央部と他の任意の位置に設ければよい。

【0013】さらに、図4に示す本発明の他の実施例は、中空ボルト本体1と保護スリーブSに、該ボルト本体1内部に通ずる注入孔1a、1aを設けて、当該部分からもモルタル等の硬化材を地山に注入できるようにしたものである。

【0014】上記構成の樹脂ボルトは、中空ボルト本体1の両端部のねじ金具2間のほぼ中央部に金属製または合成樹脂製保護スリーブSを装着した場合には、穿孔中に当該樹脂ボルトが弓状に湾曲する現象が起こり削孔壁面に接触するような事態が発生しても、この保護スリー

ブSで保護されるためボルト自体の摩耗は防止される。さらに、この保護スリーブSによってボルト自体の剛性強度も高められる。また、ねじ金具2にねじ山のないストレート部分3aを設けたことにより、ねじ金具2自体の剛性強度が高められるばかりでなく、ねじ金具2の内端側端部に溝等の応力集中部が全くできないため耐ねじれ破壊強度も強い。さらに、中空ボルト本体1の端部に形成したねじ部4の部分は、当該ボルトの肉厚内に長手方向に配向した補強繊維がねじの山と谷の部分で切れているためねじ部の剛性が他の部分(ねじのない部分)に比べて弱い、ねじ山のないストレート部分3aを有するねじ金具2の作用によりこのねじ部4の剛性強度を高めることができる。さらにまた、保護スリーブおよび中空ボルト本体に、該ボルト本体内部に通ずる注入孔を設けた場合には、当該保護スリーブの部分からもモルタル等の硬化材を地山に注入することができる。

【0015】

【発明の効果】以上説明したごとく、本発明の樹脂ボルトは、以下に記載する効果を奏する。

(1) 中空ボルト本体の両端部のねじ金具間に装着した金属製または合成樹脂製保護スリーブの作用により、削孔壁面との接触によるボルト自体の摩耗を防止できる上、樹脂ボルト自体の剛性強度もより一層高められるため、削孔壁面との摩擦による折損を防止できる。

(2) ねじ金具にねじ山のないストレート部分を設けたことにより、ねじ金具自体の剛性が高められるのみならずねじ金具の内端側端部の薄肉部も無くなるので、ボルトのねじ部の剛性が高められるとともに応力集中等も皆無となるので、ボルトのねじれ破壊、折損を防止できる。

(3) 保護スリーブの部分からもモルタル等の硬化材を

地山に注入できるので、この保護スリーブの部分にも地山補強部を形成することができ、樹脂ボルトと地山の一体性がより強固になって樹脂ボルトの引張強度を増大できる。(4) 耐久性に優れ、高寿命が得られるため、トンネル掘削工事での穿孔機能および注入材料(硬化材等)の充填機能を兼備させた自穿孔ボルトとして極めて実用性に富む。

【図面の簡単な説明】

【図1】本発明にかかる樹脂ボルトの一実施例を一部省略して示す側面図である。

【図2】同上樹脂ボルトの一方のねじ金具の部分を拡大して示す縦断側面図である。

【図3】同上樹脂ボルトの保護スリーブの部分を拡大して示す縦断側面図である。

【図4】本発明の他の実施例を示す図3相当図である。

【図5】本発明の対象とする従来の樹脂ボルトの一例を一部省略して示す側面図である。

【図6】同上の樹脂ボルトの一方のねじ金具の部分を拡大して示す半截側面図である。

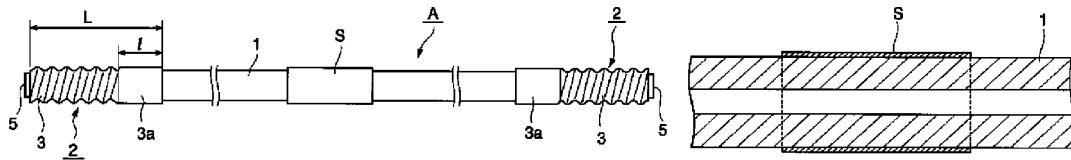
【図7】同上の樹脂ボルトを複数本接続して穿孔する際の状態の一例を一部省略して示す側面図である。

【図8】同上の樹脂ボルトが削孔内で弓状に湾曲し削孔壁面に接触した状態の一例を示す概略図である。

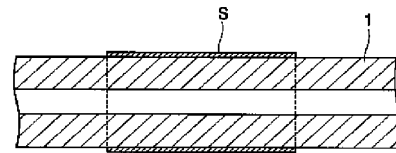
【符号の説明】

- 1 中空ボルト本体
- 2 ねじ金具
- 3 ねじ金具のねじ部
- 3a ねじ部のないストレート部
- 4 ボルト本体のねじ部
- 5 筒体
- S 保護スリーブ

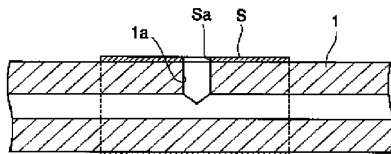
【図1】



【図3】



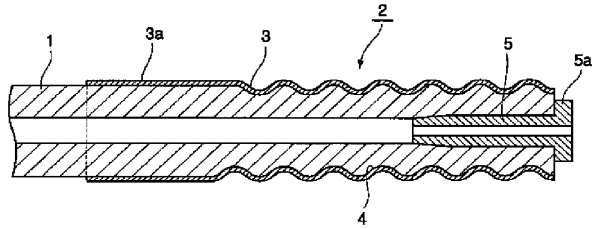
【図4】



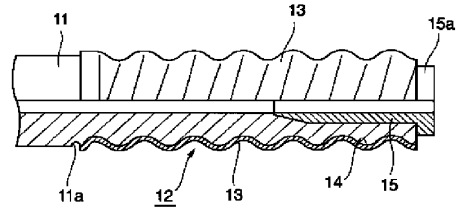
【図5】



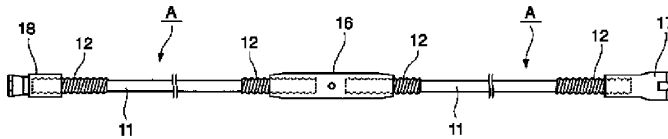
【図2】



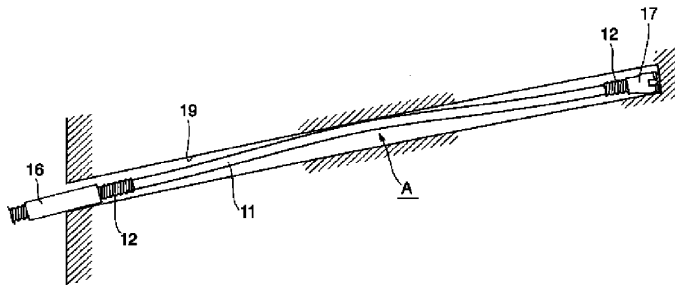
【図6】



【図7】



【図8】



フロントページの続き

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Fターム(参考) 2D041 GA01 GC14

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	12815306			
<b>Filing Date:</b>	14-Jun-2010			
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS			
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos			
<b>Filer:</b>	Stephen Arnett/Sarah Arnold			
<b>Attorney Docket Number:</b>	034563-8003.US02			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				
Extension - 2 months with \$0 paid	2252	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
Submission- Information Disclosure Stmt	2806	1	90	90
<b>Total in USD (\$)</b>				<b>390</b>



<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	17784161
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	Stephen Arnett/Sarah Arnold
<b>Filer Authorized By:</b>	Stephen Arnett
<b>Attorney Docket Number:</b>	034563-8003.US02
<b>Receipt Date:</b>	30-DEC-2013
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	19:59:00
<b>Application Type:</b>	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.)
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1		20131230ResptoFinalOAandID S345638003US2.PDF	1333645 <small>ae886d98bdcdf15c4b7b194f792ab40a40e8aacf</small>	yes	17
<b>Multipart Description/PDF files in .zip description</b>					
		<b>Document Description</b>	<b>Start</b>	<b>End</b>	
		Transmittal Letter	1	1	
		Response After Final Action	2	2	
		Claims	3	8	
		Applicant Arguments/Remarks Made in an Amendment	9	14	
		Transmittal Letter	15	16	
		Information Disclosure Statement (IDS) Form (SB08)	17	17	
<b>Warnings:</b>					
<b>Information:</b>					
2	Foreign Reference	JP2003239698.PDF	370038 <small>a8e3453af93c66cdf5b386e983fc35d8c7293a9bf</small>	no	7
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<b>Information:</b>					
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<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			1736045		

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**

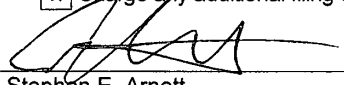
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**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.

<b>AMENDMENT TRANSMITTAL LETTER</b>			Docket No. 0345638003US2		
Application No. 12/815,306-Conf. #1105	Filing Date June 14, 2010	Examiner V. M. Rodriguez	Art Unit 3645		
Applicant(s): Bezos et al.					
Invention: SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS					
<b>TO THE COMMISSIONER FOR PATENTS</b>					
Transmitted herewith is an amendment in the above-identified application.					
The fee has been calculated and is transmitted as shown below.					
<b>CLAIMS AS AMENDED</b>					
	Claims Remaining After Amendment	Highest Number Previously Paid	Number Extra Claims Present	Rate	
<b>Total Claims</b>	17	- 20 =	0	x	
<b>Independent Claims</b>	4	- 4 =	0	x	
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					
<b>Other fee (please specify):</b> Extension for response within second month Information Disclosure Statement				300.00	
				90.00	
<b>TOTAL ADDITIONAL FEE FOR THIS AMENDMENT:</b>				<b>390.00</b>	
<input type="checkbox"/> Large Entity		<input checked="" type="checkbox"/> Small Entity			
<input type="checkbox"/> No additional fee is required for this amendment.					
<input type="checkbox"/> Please charge Deposit Account No. _____ in the amount of \$ _____.					
<input type="checkbox"/> A check in the amount of \$ _____ to cover the filing fee is enclosed.					
<input checked="" type="checkbox"/> Payment by credit card.					
<input checked="" type="checkbox"/> The Director is hereby authorized to charge and credit Deposit Account No. <u>50-0665</u> as described below.					
<input checked="" type="checkbox"/> Credit any overpayment.					
<input checked="" type="checkbox"/> Charge any additional filing or application processing fees required under 37 C.F.R. § 1.16 and 1.17.					
 _____ Stephen E. Arnett Attorney/Agent Reg. No.: 47,392 PERKINS COIE LLP P.O. Box 1247 Seattle, Washington 98111-1247 (206) 359-8000				Dated: <u>December 30, 2013</u>	

34563-8003.US02/LEGAL28884528.1

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.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>12/815,306</b>	Filing Date <b>06/14/2010</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

(Column 1) (Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> 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 \$ =	
<input type="checkbox"/> 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).			
<input type="checkbox"/> 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**

(Column 1) (Column 2) (Column 3)

AMENDMENT	12/30/2013	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	-	17	Minus	** 20	= 0	X \$40 =	0
Independent (37 CFR 1.16(h))	-	4	Minus	***4	= 0	X \$210 =	0	
<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))								
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))								
						TOTAL ADD'L FEE	<b>0</b>	

(Column 1) (Column 2) (Column 3)

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	-	Minus	**	=	X \$ =	
Independent (37 CFR 1.16(h))	-	Minus	***	=	X \$ =		
<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))							
<input type="checkbox"/> 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  
/DIANA BATES/

This collection of information is required by 37 CFR 1.16. 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, 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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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO. Includes details for application 12/815,306, inventor Jeffrey P. Bezos, and examiner RODRIGUEZ, VICENTE M.

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):

patentprocurement@perkinscoie.com

<b>Office Action Summary</b>	<b>Application No.</b> 12/815,306	<b>Applicant(s)</b> BEZOS ET AL.	
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645	<b>AIA (First Inventor to File) Status</b> No

**-- 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 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 04/10/2013.  
 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) 1-20 is/are pending in the application.  
5a) Of the above claim(s) 1 and 17 is/are withdrawn from consideration.
- 6)  Claim(s) \_\_\_\_\_ is/are allowed.
- 7)  Claim(s) 2-16 and 18-20 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](http://www.uspto.gov/patents/init_events/pph/index.jsp) or send an inquiry to [PPHfeedback@uspto.gov](mailto:PPHfeedback@uspto.gov).

**Application Papers**

- 10)  The specification is objected to by the Examiner.
- 11)  The drawing(s) filed on 14 June 2010 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/08)  
Paper No(s)/Mail Date 4/10/2013, 5/2/2013.
- 3)  Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 4)  Other: \_\_\_\_\_.

### **DETAILED ACTION**

Claims 2-20 are pending in the current Office Action. Claims 1, 17 have been cancelled.

Claims 2, 3, 5-10 are now dependent upon newly independent claim 4. Claim 14 is made independent. Claim 20 is made independent with claims 18 and 19 now dependent on claim 20. Claims have been grouped with respect to dependence.

#### ***Response to Amendment***

The amendments to the claims, filed 4/10/2013, have been entered into the record.

#### ***Response to Arguments***

Applicant's arguments, in regards to claims 4, 11, 14, 20 have been fully considered but they are not persuasive.

In response to Brand et al (8047472), Brand, teaching away from the use of rocket engines for the lower stage, as stated on page 12 of Applicants' remarks, in column 1 Brand states:

*Problems associated with the second approach include expending or requiring refurbishment of a larger structural mass (external tanks expended and solid rocket boosters refurbished in the case of the shuttle). A heat resistant surface is required for the upper stage and there is still a need to place into orbit more than four times the*



*actual payload mass. The recovered upper stage portion of the launch system must be designed for re-entry speeds up to Mach 25 and extreme heating. Also, as evidenced by the space shuttle, the high-speed re-entry tends to require extensive inspection and maintenance during turn-around for subsequent launches.*

Brand has based this statement on the space shuttle system, whereby an external tank is used only once, and the boosters land in the ocean. The apparatus of Brand is designed to land on a barge, offsetting the associated refurbishment entailed by a salt water landing, and comprises devices to slow the descent of each stage, column 4 line 40.

In response to the statement on page 13:

*Buehler teaches that the "propulsion modules built for the upper stage are made to operate optimally in vacuum."*

Buehler (20070012820) in paragraph [0029], does make said statement. However, further in the same paragraph Buehler addresses these concerns. Buehler describes "The nozzle must switch from a nozzle designed for a vacuum environment to one for operation near the Earth's surface in dense atmosphere." Buehler describes "various methods" that can be employed to operate at the earth's surface.

In response to the statement on page 13:

*"The rocket engines allegedly used by Buehler would not provide the idle and/or thrust vector control features provided by the turbofan engines 116 of Brand. To the*

*contrary, Buehler teaches away from replacing the air breathing engines on the lower stage of Brand with rocket engines.”*

Buehler in paragraph [0032] states “*Using the propulsion module in a powered vertical landing provides much higher landing precision than is typical.*”

And further states in paragraph [0061] “*it (engine nozzle) does not gimbal but achieves the required thrust vector authority by peroxide side injection in the throat of the nozzle.*” Therefore Buehler discloses said engines thrust-vector control.

#### ***Claim Rejections - 35 USC § 103***

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

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 4, 2, 3, 5-8 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Brand et al (8047472), Brand in view of Buehler (20070012820).**

**In regards to claim 4**, Brand discloses a method for operating a space launch vehicle, the method comprising:

- launching the space launch vehicle from earth (C1:22),
- positioning a landing structure in a body of water; and (C5:41-42)

- landing the space launch vehicle on the landing structure in the body of water,  
wherein landing the space launch vehicle includes vertically landing the booster  
stage on the landing structure in the body of water (C5:37-42).

Brand does not disclose wherein launching the space launch vehicle includes igniting one or more rocket engines on a booster stage.

Buehler teaches a reusable upper stage for a multistage rocket. Buehler further discloses a lower/booster stage for said rocket powered by rocket engines which are used to propel said rocket into space ([0055]).

It would have been obvious at the time of the invention to one of ordinary skill in the art to use the rocket engines of Buehler in the booster of Brand in order to carry more payload into orbit.

**In regards to claim 2**, the combination of Brand and Buehler disclose the method of claim 4 wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land (Brand Fig. 5).

**In regards to claim 3**, the combination of Brand and Buehler disclose the method of claim 4 wherein landing the space launch vehicle includes vertically landing the space launch vehicle on a floating platform in the body of water (C5:40-42).

**In regards to claim 5**, the combination of Brand and Buehler disclose the method of claim 4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation (Brand Fig. 5), and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation (Brand C5:37-42).

**In regards to claim 6**, the combination of Brand and Buehler disclose the method of claim 4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation (Brand, Fig 5), and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch (Brand, Fig 5 discloses space launch vehicle of Brand reorienting to tail first), wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation while providing thrust from one or more vehicle engines in a tail-first direction (Brand, C5:38-40).

**In regards to claim 7**, the combination of Brand and Buehler disclose the method of claim 4, further comprising reusing at least a portion of the space launch vehicle (Brand, abstract).

**In regards to claim 8**, the combination of Brand and Buehler disclose the method of claim 4, further comprising: transporting the space launch vehicle on the

landing structure to a refurbishment facility (Brand, C8:60 discloses landing barge transporting lower stage for refurbishment); refurbishing at least a portion of the space launch vehicle at the refurbishment facility; and reusing at least a portion of the space launch vehicle after refurbishment (Brand, abstract).

**In regards to claim 11**, Brand discloses a method for transporting a payload to space (abstract), the method comprising:

- coupling the payload to a booster stage of a rocket (C3:27-32), the booster stage having a forward end portion spaced apart from an aft end portion;
- positioning a floating platform in a body of water (C5:42);
- launching the rocket in a nose-first orientation (Fig 5);
- separating the payload from the booster stage (C3 50-51);
- after separating, reorienting the booster stage from the nose-first orientation to a tail-first orientation (C5:38 discloses rotation of booster); and
- landing the booster stage on the floating platform in the tail-first orientation (Fig 5)

Brand however does not disclose igniting one or more rocket engines positioned toward the aft end portion of the booster stage.

Buehler teaches a reusable upper stage for a multistage rocket. Buehler further discloses a lower/booster stage for said rocket powered by rocket engines which are used to propel said rocket into space ([0055]).

It would have been obvious at the time of the invention to one of ordinary skill in the art to use the rocket engines of Buehler in the booster of Brand in order to carry more payload into orbit.

**In regards to claim 12**, Brand discloses the limitations of claim 11 but does not disclose turning off the one or more rocket engines positioned toward the aft end portion of the booster stage before reorienting the booster stage from the nose-first orientation to the tail-first orientation; and after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage to decelerate the booster stage.

Buehler teaches a reusable upper stage for a multistage rocket. Buehler further discloses whereby said upper stage's rocket engines are both shut down ([0023]) and later re-ignited in order to slow decelerate the stage ([0024], Fig 3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use rocket engines of Buehler in the apparatus of Brand in order to allow for more payload and to be able to use said engines in the vacuum of space.

**In regards to claim 13**, the combination of Brand and Buehler disclose the method of claim 11, further comprising:

- turning off the one or more rocket engines and following a ballistic trajectory (Buehler [0021]); and
- deploying an aerodynamic control surface from the booster stage to facilitate

reorienting the booster stage from the nose-first orientation to a tail-first orientation (Buehler, [0025], [0074], [0075]).

**In regards to claim 15**, the combination of Brand and Buehler disclose the method of claim 11, further comprising:

- turning off the one or more rocket engines; and operating one or more propulsive thrusters mounted to the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation (Buehler claim 5 discloses thrust steering).

**In regards to claim 16**, the combination of Brand and Buehler disclose the method of claim 11, further comprising:

- turning off the one or more rocket engines after separating the payload from the booster stage (Buehler [0023]);
- moving an aerodynamic control surface to at least partially control a flight path toward the platform based on platform positional information received from the platform (Buehler [0025], [0074], [0075]);
- moving the aerodynamic control surface to at least partially reorient from nose-first orientation to a tail-first orientation (Buehler [0074], [0075]); and
- after reorienting, reigniting the one or more rocket engines, wherein landing includes performing a powered, vertical landing (Buehler, abstract).

**In regards to claim 14**, the combination of Brand and Buehler disclose a method for transporting a payload to space, the method comprising:

- coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion (Brand, C3:27-32, Fig. 5 discloses forward end of booster );
- positioning a floating platform in a body of water (Brand C5:42);
- igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;
- turning off the one or more rocket engines;
- separating the payload from the booster stage;
- after separating and following a ballistic trajectory;
- deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation (Buehler [0074], Brand Fig. 4c, d ); and
- landing the booster stage on the floating platform in the tail-first orientation.

**In regards to claim 20**, the combination of Brand and Buehler disclose a system for providing access to space, the system comprising:

- a space launch vehicle, wherein the space launch vehicle includes one or more rocket engines (Brand, abstract);
- a launch site (Brand, Fig. 5);



- means for launching the launch vehicle from the launch site a first time, wherein the means for launching include means for igniting the rocket engines and launching the vehicle in a nose-first orientation (Brand, Fig. 5);
- means for shutting off the rocket engines (Brand, [0023]);
- means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing (Brand, C5:37-38); and
- means for reigniting one or more of the rocket engines when the launch vehicle is in the tail-first orientation to decelerate the vehicle (Buehler Fig. 3);
- means for landing at least a portion of the launch vehicle on a structure in a body of water (Brand, Fig. 5, C5:42), wherein the means for landing include means for landing in the tail-first orientation (Brand, Fig. 5) while the one or more rocket engines are thrusting (Buehler Fig. 3); and
- means for launching at least a portion of the launch vehicle from the launch site a second time (Brand, abstract reusable booster).

**In regards to claim 18**, the combination of Brand and Buehler disclose the system of claim 20 wherein the means for landing include means for vertically landing at least a portion of the space launch vehicle on a floating platform (Brand C5:42).

**In regards to claim 19**, the combination of Brand and Buehler disclose the system of claim 20 wherein the means for launching include means for launching the launch vehicle in a nose-first orientation (Brand Fig. 5), wherein the system further

comprises means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing (Brand, C5:37), and wherein the means for landing include means for landing in the tail-first orientation (Brand, C5:37).

**Claim 10 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Brand, Buehler as applied to claim 4 above, and further in view of Drymon (6176451).**

**In regards to claim 10**, the combination of Brand and Buehler disclose the limitations of claim 4 and further shows the space launch vehicle includes a payload carried on an upper stage mounted to a booster stage (Brand, C3:27-29), but does not show said booster receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information;

Drymon teaches a method comprising a ground control station and an unmanned airborne vehicle that is used to relay data to and from a space vehicle such as a rocket (C1:56-57). Said method further includes guidance and control (C3:6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the data communication method of Drymon in the invention of Brand as said method is cost effective and may be used over a large geographic expanse that may be covered by a returning spacecraft.

**Claim 9 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Brand, Buehler as applied to claim 4 above, and further in view of Solid Rocket Boosters and Post-Launch Processing, FS-2004-07-012-KSC (Rev. 2006), NASA Facts, National Aeronautics and Space Administration, John F. Kennedy Space Center.**

In regards to claim 9, Brand teaches the limitations to claim 4, but does not disclose transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle.

NASA Facts discloses a recovery of a solid rocket booster from a water landing by a recovery ship. The recovery ship tows said booster to booster refurbishment area. Further, booster frustum is lifted by crane onto said recovery ship for transport (pg 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the transferring of said booster frustum to recovery ship for transport to refurbishment area in the invention of Brand to provide for a quicker delivery of booster to refurbishment facility and to allow for landing barge to remain on station for more landings.

### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VICENTE RODRIGUEZ whose telephone number is (571)272-4798. The examiner can normally be reached on Monday-Thursday 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Isam Alsomiri can be reached on 571-272-6970. 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

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Art Unit: 3645

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/V. R./

Examiner, Art Unit 3645

/ISAM ALSOMIRI/

Supervisory Patent Examiner, Art Unit 3645

Receipt date: 04/10/2013

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PTO/SB/08b (07-09)

Approved for use through 07/31/2012. OMB 0651-0031

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Substitute for form 1449/PTO		<b>Complete if Known</b>	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)		Application Number	12/815,306-Conf. #1105
		Filing Date	June 14, 2010
		First Named Inventor	Jeffrey P. Bezos
		Art Unit	4147
		Examiner Name	V. M. Rodriguez
		Attorney Docket Number	345638003US2
Sheet	1	of	1

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-20060113425-A1	06-01-2006	Rader	
		US-20080078884-A1	04-03-2008	Trabandt et al.	
		US-20090206204-A1	08-20-2009	Rosen	
		US-20100327107-A1	12-30-2010	Featherstone	
		US-2,464,827	03-22-1949	H. Noyes	
		US-5,568,901	10-29-1996	Stiennon	
		US-5,871,173	02-16-1999	Frank et al.	
		US-5,873,549	02-23-1999	Lane et al.	
		US-6,193,187	02-27-2001	Scott et al.	
		US-6,666,402	12-23-2003	Rupert et al.	
		US-6,926,576	08-09-2005	Alway et al.	
		US-6,929,576	08-16-2005	Armstrong et al.	
		US-7,344,111	03-18-2008	Janeke	
		US-8,408,497	04-02-2013	Boelitz et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>

Examiner Signature	Vicente Rodriguez/	Date Considered	07/10/2013
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with an asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

34563-8003.US02/LEGAL26330273.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.R./

PTO/SB/08b (07-09)

Approved for use through 07/31/2012. OMB 0651-0031

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)			<b>Complete if Known</b>		
			Application Number	12/815,306-Conf. #1105	
			Filing Date	June 14, 2010	
			First Named Inventor	Jeffrey P. Bezos	
			Art Unit	4147	
			Examiner Name	V. M. Rodriguez	
Sheet	1	of	1	Attorney Docket Number	345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)	MM-DD-YYYY		
		US-3,903,801	09-09-1975	Senoski	
		US-5,080,306	01-14-1992	Porter et al.	
		US-5,927,653	07-27-1999	Mueller et al.	

FOREIGN PATENT DOCUMENTS						
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		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)	MM-DD-YYYY			
		JP-2001501151-A	01-30-2001			

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>

Examiner Signature	/Vicente Rodriguez/	Date Considered	07/10/2013
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with a single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

<b>Index of Claims</b> 	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

✓	<b>Rejected</b>
=	<b>Allowed</b>


-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant		<input type="checkbox"/> CPA		<input type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47			
CLAIM		DATE							
Final	Original	09/20/2012	07/10/2013						
	1	✓	-						
	2	✓	✓						
	3	✓	✓						
	4	✓	✓						
	5	✓	✓						
	6	✓	✓						
	7	✓	✓						
	8	✓	✓						
	9	✓	✓						
	10	✓	✓						
	11	✓	✓						
	12	✓	✓						
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	14	✓	✓						
	15	✓	✓						
	16	✓	✓						
	17	✓	-						
	18	✓	✓						
	19	✓	✓						
	20	✓	✓						



<b>Search Notes</b>  	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

CPC- SEARCHED		
Symbol	Date	Examiner

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Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
244	158.9, 158.1	09/18/2012	VR

SEARCH NOTES		
Search Notes	Date	Examiner
inventer name search	09/13/2012	VR
NPL search, NASA technical reports server	09/17/2012	VR
updated search in response to amended claims	7/8/2013	VR
consulted with T. Dien	6/25/2013	VR

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)			<b>Complete if Known</b>		
			Application Number	12/815,306-Conf. #1105	
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			First Named Inventor	Jeffrey P. Bezos	
			Art Unit	4147	
			Examiner Name	V. M. Rodriguez	
Sheet	1	of	1	Attorney Docket Number	345638003US2

U.S. PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Document Number		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)				
		US-3,903,801		09-09-1975	Senoski	
		US-5,080,306		01-14-1992	Porter et al.	
		US-5,927,653		07-27-1999	Mueller et al.	

FOREIGN PATENT DOCUMENTS							
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document		Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)					
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No documents available for this priority number.



**Espacenet**

**Bibliographic data: JP2001501151 (A) — 2001-01-30**

**VEHICLE ROTATION AND CONTROL MECHANISM**

**Inventor(s):**

**Applicant(s):**

**Classification:** - international: **B64G1/14; B64G1/24; B64G1/28; B64G1/62;** (IPC1  
-7): B64G1/14  
- cooperative: **B64G1/24; B64G1/28; B64G1/62**

**Application number:** JP19980515720 19970918

**Priority number (s):** US19960719457 19960925 ; WO1997US16516 19970918

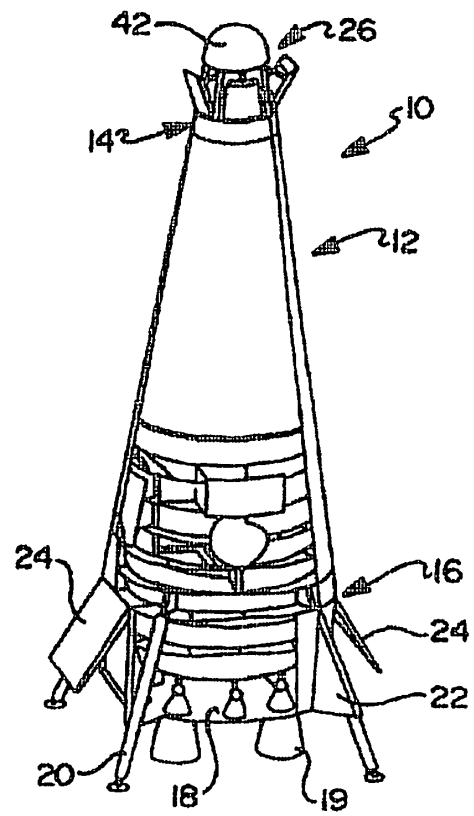
**Also published as:** WO9813260 (A1) US5873549 (A) EP0928269 (A1)  
EP0928269 (A4) EP0928269 (B1) more

**Abstract not available for JP2001501151 (A)**  
**Abstract of corresponding document: WO9813260 (A1)**

A nose assembly (26) and method for controlling the rotation and stabilizing the orientation of a vehicle (10) during landing maneuvers. The vehicle (10) includes a nose assembly (26). The vehicle flap assembly (30) includes an actuator (32) and a flap (38a) from and between a fully retracted position and a fully extended position in response to a guidance signal received from a flight control computer. In a preferred embodiment, the flap assembly (30) includes a plurality of flaps (38a-38c) each coupled to the nose assembly frame (26) and an actuator that selectively positions the plurality of flaps (38a-38c) in response to a signal. The method for rotating a vehicle (10) in nose-forward flight, rotating the vehicle (10) in a first direction, and selectively actuating one of a first and second flaps (38a-38c) from a retracted position toward an extended position to generate a damping moment tending to position the vehicle (10) in a base-forward orientation.

Last updated: 13.03.2013 Worldwide Database 5.8.6.6, 92p

<http://worldwide.espacenet.com/publicationDetails/biblio?DB=worldwide.espacenet.com&...> 4/11/2013



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最終頁に続く

(54) 【発明の名称】 ビークル回転/制御機構

(57) 【要約】

着陸運動中にビークル10の回転を制御し、その配向を安定させるための機首アセンブリ26およびその方法。ビークル10は、機首アセンブリ26を含む。ビークルのフラップ・アセンブリ30は、アクチュエータ32と、操縦コンピュータから受信した誘導信号にตอบสนองして、完全に引き込まれた位置および完全に延びた位置から、またそれらの位置の間で移動するフラップ38aとを含む。好ましい実施形態では、フラップ・アセンブリ30は、機首アセンブリ・フレーム26にそれぞれ結合された複数のフラップ38a~38cと、信号にตอบสนองして複数のフラップ38a~38cを選択的に位置決めするアクチュエータとを含む。機首を前に向けた飛行状態にビークル10を回転させ、ビークル10を第1の方向に回転させ、第1および第2のフラップ38a~38cの一方を引き込まれた位置から延びた位置まで選択的に作動して、基部を前に向けた配向にビークル10を位置決めするのに役立つ制動モーメントを発生させる方法である。

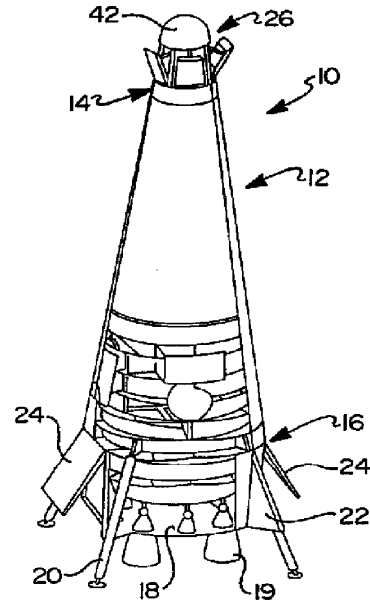


FIG 1

【特許請求の範囲】

1. 誘導信号を生成する操縦コンピュータを有するビークルであって、  
機体、ならびに

前記機体に結合された機首アセンブリを含み、前記機首アセンブリが、フレームと、完全に引き込まれた位置および完全に延びた位置から、またそれらの位置の間で移動するように前記フレームに結合されたフラップを有するフラップ・アセンブリとを有し、前記フラップ・アセンブリが、誘導信号にตอบสนองして前記の完全に引き込まれた位置および前記の完全に延びた位置から、またそれらの位置の間で、前記フラップを移動させるための作動手段をさらに含むビークル。

2. 前記作動手段が、前記フラップに結合された作動部材と、前記入力信号にตอบสนองして前記作動部材を動かすアクチュエータとを含む、請求の範囲第1項に記載のビークル。

3. 前記作動部材が、前記フラップに結合された第1端部と前記アクチュエータに結合された第2端部とを有する、請求の範囲第2項に記載のビークル。

4. 前記作動部材が第1部材および第2部材を含むテレスコープ形アームであり、前記第1部材が、前記アクチュエータに結合された第1端部を有し、前記第2部材が、前記第1部材に結合され、それに対して相対的に移動する第1端部と、前記フラップに結合された第2端部とを有する、請求の範囲第3項に記載のビークル。

5. 前記フラップが、前記フレームに旋回可能に結合された第1端部と、前記の完全に引き込まれた位置および前記の完全に延びた位置から、またそれらの位置の間で移動可能な第2端部とを含む、請求の範囲第1項に記載のビークル。

6. 前記フラップ・アセンブリが、前記機首アセンブリの周りの円周上に配置された4枚のフラップを含み、前記フラップがそれぞれ前記作動手段および前記フレームに結合され、前記の完全に引き込まれた位置および前記の完全に延びた位置から、またそれらの位置の間で移動するようになっている、請求の範囲第1項に記載のビークル。

7. 基部および前部胴体を画定する機体と、この基部に接続された推進システ

ムと、フラップ位置決め信号を生成する操縦系統とを有するタイプのビークルで使用する機首アセンブリであって、

機体の前部胴体に接続可能なフレームと、

前記フレームに結合され、引き込まれた位置と延びた位置との間で移動する複数のフラップ、および前記複数のフラップに結合され、信号に応答して前記複数のフラップを選択的に位置決めする作動手段を含むフラップ・アセンブリからなる機首アセンブリ。

8. 前記フレームが隔壁を含み、前記複数のフラップがそれぞれ旋回可能に前記隔壁に結合される、請求の範囲第7項に記載のビークル。

9. 前記フレームが、上側隔壁と、下側隔壁と、前記の上側隔壁および下側隔壁に結合された複数の支持部材とを含む、請求の範囲第7項に記載のビークル。

10. 前記機首アセンブリが、前記上側隔壁に結合されたキャップをさらに含み、前記の上側隔壁、下側隔壁、複数の支持部材、および外側表面をそれぞれ含む複数のフラップが、前記フラップが前記の引き込まれた位置にあるときに、協働して前記機首アセンブリの外側表面を画定する、請求の範囲第9項に記載のビークル。

11. 前記作動手段がハブおよび複数の作動部材を含み、前記ハブが前記フレームに結合され、前記複数の作動部材がそれぞれ、前記ハブ、および前記複数のフラップの1つに結合される、請求の範囲第7項に記載のビークル。

12. 前記複数の作動部材がそれぞれ、第1部材および第2部材を含むテレスコープ形アームであり、前記第2部材が前記第1部材に結合され、それに対して相対的にテレスコープ形に移動し、前記第1部材が、前記ハブの1つおよび前記複数のフラップの1つに結合され、第2部材が、前記ハブのその他の1つおよび前記複数のフラップの前記の1つに結合される、請求の範囲第11項に記載のビークル。

13. 前部胴体と、基部と、基部に結合された推進機構と、機首を前に向けた飛行の安定化アセンブリと、前記前部胴体に結合されたフラップ・アセンブリとを含み、前記フラップ・アセンブリが、第1フラップおよび第2フラップと、前記第1および第2のフラップを完全に延びた位置と完全に引き込まれた位置の間

でそれぞれ作動させる手段とを含むビークルを、機首を前に向けた配向から基部を前に向けた配向まで回転させる方法であって、

(a) 機首を前に向けた飛行状態にビークルを配向する段階と、

(b) ビークルを第1の方向に回転させる段階と、

(c) 第1フラップおよび第2のフラップの一方を、引き込まれた位置から延びた位置まで選択的に作動し、基部を前に向けた配向にビークルを位置決めするのに役立つ制動モーメントを発生させる段階とを含む方法。

14. 段階(a)が、機首を前に向けた飛行の安定化アセンブリを活動化する段階を含む、請求の範囲第13項に記載の方法。

15. 段階(b)が、機首を前に向けた飛行の安定化アセンブリを非活動化する段階を含む、請求の範囲第14項に記載の方法。

16. 段階(b)が、推進機構をオフ状態にする段階を含む、請求の範囲第13項に記載の方法。

17. ビークルが、第1の方向に回転したときに、前表面および後ろ表面を規定し、前記第1フラップがビークルの前表面に結合され、第2フラップがビークルの後ろ表面に結合され、段階(c)が、前記第1フラップを延びた位置に配置し、それにより前記第1の方向とは反対向きに、ビークルの回転慣性に対抗するように作用する制動力を発生させる段階を含む、請求の範囲第13項に記載の方法。

18. 基部を前に向けた配向でビークルを安定させる段階をさらに含む、請求の範囲第13項に記載の方法。

19. 基部を前に向けた配向でビークルを安定させる段階が、第1および第2のフラップのそれぞれを選択的に延びた位置に配置する段階を含む、請求の範囲第18項に記載の方法。



【発明の詳細な説明】

ビークル回転／制御機構

発明の背景

1. 技術分野

本発明は一般に、エアロスペース・ビークル用の方向制御アセンブリに関し、さらに詳細には、進入運動および着陸前運動中にビークルを回転および安定させるための、再使用可能な打上げ用ビークルの前部胴体のフラップ・アセンブリに関する。

2. 考察

地球の周りの所定の軌道に人工衛星を配備するために使用される再使用可能な打上げ用ビークルは、その所期のオペレーションを実行し、ビークルのいかなる部分も投下することなく地球に帰還するように設計された一段軌道（「SSTO」）ビークルを含む。したがって、SSTOビークルは、廃棄可能なブースター・ロケットまたは燃料タンクを含まない。その代わりに、SSTOビークルの燃料供給エレメントは飛行中を通じて保持され、その結果、軌道まで搬送される使用できない重量を減少させるために燃料消費量を最小限に抑える必要性が増す。本発明は、推進薬獲得サブシステム、および着陸に備えてビークルを適当に位置決めするのに必要な推進薬を減少させるビークル回転／制御機構を提供することにより、これらの問題に対処する。

垂直着陸式SSTOビークルは一般に、安全に飛行するために機首を前方に向けて構成された円錐形の機体を含む。しかし、このビークルは後部すなわち尾部を先にして垂直に着陸するので、着陸シーケンス中にビークルを回転させる必要がある。現在では、このクラスのSSTOビークルは、エンジンのパワーを使用して回転運動を実行している。より具体的に言えば、この運動は、いくつかのメイン・エンジンを始動する段階と、進入フラップを引き込み、ビークルが縦揺れして回転を開始するようにする段階と、選択的にエンジンの推力を上げ、回転を抑止し、ビークルを所望の基部を先に向けた配向にする段階とを含む。着陸シーケンスの回転段階から接地段階の間にエンジンが消費する推進薬の量を最小限に

抑えるために、この回転運動は一般に比較的低い高度で行われる。この手順は実行可能であるが、始動中にかなりの量の推進薬が使用され、エンジンおよび推進薬供給システムの操作は困難かつ複雑になる。さらに、高度が比較的低いことで、着陸作業がより短いタイムライン内に圧縮される。

#### 発明の概要

本発明は、着陸運動中にエアロスペース・ビークルの回転を制御し、その配向を安定させるための機首アセンブリおよびその方法を提供する。このビークルは、機体に結合された、フレームおよびフラップ・アセンブリを有する機首アセンブリを含む。フラップ・アセンブリは、作動手段とフレームに結合されたフラップとを含み、作動手段が、操縦コンピュータからの誘導信号にตอบสนองして、フラップを完全に引き込まれた位置および完全に延びた位置から、またそれらの位置の間で移動させるようになっている。本発明の好ましい実施形態では、フラップ・アセンブリは、機首アセンブリ・フレームにそれぞれ結合された4枚のフラップと、信号にตอบสนองして各フラップを選択的に位置決めする作動手段とを含む。本発明による、機首を前に向けた配向から基部を前に向けた配向までビークルを回転させる方法は、機首を前に向けた飛行状態にビークルを配向する段階と、ビークルを第1の方向に回転させる段階と、第1および第2のフラップの一方を選択的に作動して延びた位置にし、基部を前に向けた配向にビークルを位置決めするのに役立つ制動モーメントを発生させる段階とを含む。

#### 図面の簡単な説明

本発明のその他の目的および利点は、以下の詳細な説明を読み、図面を参照すれば明らかになるであろう。

図1は、本発明による再使用可能な打上げ用ビークルを示す斜視図である。

図2は、分かりやすくするためにフラップを除去した、図1に示すビークルのノーズ・コーンを示す正面部分断面図である。

図3は、図2に示すノーズ・コーンの分解斜視図である。

図4は、図1に示す一段軌道ビークルの着陸時の回転シーケンス中の配向および機首フラップの位置を示す概略図である。

詳細な説明

以下の本発明の好ましい実施形態の説明は、本質的に例示に過ぎず、請求する本発明の範囲を制限するためのものではない。さらに、一段軌道（「SSTO」）ビークルにおいて本発明を記述するが、この記述は、様々なエアロスペース・ビークルにおいて、本明細書で記載および請求するビークル回転／制御機構およびその方法を作成および使用することを当業者に十分に教示するためのものである。

図面の図1に示すように、垂直着陸式の再使用可能な打上げ用ビークル10は、一般に前部胴体14およびスラスト構造16を規定する円錐形の機体12を含む。スラスト構造16は、着陸装置20、フィン22、および後部フラップ24がその付近で機体12に結合される、基部18を含む。後部フラップ24の前方部分は、当技術分野で既知の方法で機体12に旋回可能に接続され、作動機構（図示せず）は、操縦コンピュータ（図示せず）と通信し、また後部フラップ24に結合され、機体12に対するその角度位置を制御する。機首を先に向けた通常の飛行中には、飛行コンピュータは後部フラップ24を選択的に位置決めし、ビークル10の飛行経路および配向を安定させる。

機体12の前部胴体14は、上側隔壁リング28に接続されたフラップ作動装置32を有するフラップ・アセンブリ30を含めて図2および図3に示す、ノーズ・コーン26を含む。ノーズ・コーン26は、下側隔壁リング34と、ヒンジ・アセンブリ40を介して下側リング34に旋回可能に接続された複数のフラップ38a、38b、38c、および38dと、当技術分野で既知の方法で上側リング28に固定可能なキャップ42（図1）と、上側隔壁28に接続された第1端部46、および下側隔壁34と協働するように構成された第2端部47を有するストリング44とをさらに含む。アセンブリ30は、ビークルの飛行中に反対の制動モーメントをもたらすことができるフラップ対を形成する、円周上で対向し、別個に動作可能な4枚のフラップを含むことが好ましい。図2から最もよく分かるようにフラップ38aおよび38bは、対向するフラップの対の一方を示すものであり、フラップ38aは完全に延びた位置、すなわち完全に旋回した位置で示し、フラップ38bは完全に引き込まれている。当技術分野で既知の方法

で、作動装置 32 は、ビークルの飛行コンピュータ（図示せず）から受信した入力信号に応答して、完全に延びた位置および完全に引き込まれた位置で、またはそれらの位置の間で、フラップ 38 a および 38 b を選択的に位置決めする。

本明細書に記載するように、また図 2 から最もよく分かるように構成すると、キャップ 42、上側リング 28、フラップ 38 の外側表面 48、およびストリング 44 の径方向外側表面 50 は協働して、空洞 52 を取り囲む比較的滑らかかつ空気力学的な外側表面を画定する。好ましい実施形態では、空洞 52 は、補助液体酸素タンク 54 および作動装置 32 を格納する。より詳細には、円錐支持体 56 は、下側隔壁リング 34 に固定された下側フランジ 58、および補助タンク 54 を支持するために接続された上側フランジ 59 を含めて示してある。タブ 63 を円錐支持体 56 に接続し、さらにタンク 54 を支持する。ただし、タンク 54 および作動装置 32 の両方について、ビークル 10 内で様々な代替位置を利用することができることを当業者なら理解するであろう。当技術分野ではよくあるように、ノーズ・コーン 26 の構造部材、すなわち上側隔壁リング 28、下側隔壁リング 34、キャップ 42、ストリング 44、および円錐支持体 56 はそれぞれ、グラファイト・エポキシなどの高強度低重量の複合材から構成される。同様に、再進入中に大気にさらされる各部材の部分が、アルミナ強化断熱層（AETB）タイルなどの耐熱材料を備えることを当業者なら理解するであろう。

図 2 および図 3 を参照すると、フラップ・アセンブリ 30 の作動装置 32 は、アクチュエータ・ハウジング 60 と上側リング 28 とを相互接続する径方向に延びる複数の取付けアーム 62 などによってノーズ・コーン 26 に結合された、アクチュエータ・ハウジング 60 を含むことが好ましい。アクチュエータ・ハウジング 60 は、当技術分野で既知の方法で操縦コンピュータに結合されてこれと通信し、また第 1 端部 66 がアクチュエータ・ハウジング 60 に結合され、末端 68 がフラップ 38 に結合されたテレスコープ形アーム 64 を介して、フラップ 38 a、38 b、38 c、および 38 d に動作可能に接続される。作動装置 32 は、例えば米国オハイオ州 Cleveland の B. F. Goodrich 製油圧式アクチュエータ部品番号 ARG 7376-5007 や、米国カリフォルニア州 Torrance の Allied-Signal から市販されている油圧式また

は電気機械式アクチュエータなど、当技術分野で既知の様々な油圧式または電気機械式アクチュエータを含むことができる。ただし、等価な様々な作動アセンブリを容易に入手し、本発明とともに使用することに適合させることができる。

打上げ用ビークル10は通常は機首を前に向けて運転される。しかし、着陸準備中には、後部または基部を先に向けた配向にビークル10を配向し直し、着陸装置20が着陸表面と接触するように位置決めする必要がある。本発明は、現在のこのタイプのSSTOビークル・システムと比較して推進薬の消費を制限して、また比較的高い高度で、回転および降下シーケンスを実行する。具体的に言うと、本発明のフラップ・アセンブリ30により、操縦系統は、後ろ向き飛行中にフラップ38a、38b、38c、および38dを選択的に位置決めして、再使用可能な打上げ用ビークル10を安定させることができ、またフラップ位置を調整して、ビークル10を着陸させるのに必要な回転運動を実行することができる。

作動装置32によってフラップ38を選択的に作動すると、図4に示し、本明細書に記載する着陸シーケンス70など特定のシーケンスに従って、ビークル10が回転する。着陸シーケンス70を開始する前に、後部フラップ24は部分的または完全に延びた位置にあり、再進入ステージ72に示すように再使用可能な打上げビークル10の飛行経路および配向を安定させる。推進薬の消費を最小限に抑えるために、着陸シーケンス70を開始する間、ビークルのエンジン19はオフ状態に維持され、ほぼ放物線の飛行経路78に沿って移動するにまかせる。後部フラップ24によってもたらされる再進入ステージ72におけるビークル10の初期安定化について記述したが、添付の請求の範囲を逸脱することなく、その他の安定化の技術および構造を使用することもできることを当業者なら理解するであろう。

着陸シーケンス70は、縦揺れステージ74に示すように、後部フラップ24を引き込み、それによりビークル10の縦揺れを開始することによって開始される。ビークル10の操縦コンピュータは、矢印76で示すビークル10の時計回りの回転を減速させる所定の制動モーメントを与えるのに十分な角度に風下の機首フラップ38aを転向させるようにプログラムされている。

図4に示す好ましい回転シーケンスでは、縦揺れステージ74で発生した回転は、延びたフラップ38aの制動効果が回転を解消する前に、後ろ向き飛行の配向を越えてビークル10を時計回りに回転させる。したがって、オーバーシュート・ステージ80に示すように所定の反時計周りの回転速度が得られ、その後操縦コンピュータが、フラップ38bを所定の延びた位置まで旋回させるよう作動装置32に通信するまで、フラップ38aは延びた位置に維持される。この位置で、フラップ38bは、矢印82で示すビークル10の反時計回りの回転を制動する。操縦コンピュータは、ビークル10の縦軸84が飛行経路78とほぼ整列し、ビークルが後ろ向き飛行になるまで、フラップ38bを前述の延びた位置で維持し、ビークル10の回転を制動するようにプログラムされている。次いで操縦コンピュータは、フラップ38aおよび38bを両方とも延ばし、着陸シーケンス70の降下ステージ86に示すように飛行経路を安定させるよう作動装置に通信する。

前述の着陸シーケンス70の説明ではフラップ38aおよび38bにしか言及していないが、さらに別のフラップ38cおよび38dの対(図1)がノーズ・コーン26に設けられ、縦軸84および飛行経路78に対するビークル10の角度位置にかかわらずフラップ・アセンブリ30が適切な制御を実現することを当業者なら理解するであろう。より具体的に言うと、ビークル10は、時々着陸シーケンス70中にその軸84の周りで回転することもあり、これに反応して操縦コンピュータは反応制御システム(図示せず)を作動して、着陸シーケンス70を実行することが予想される。

最後に、操縦コンピュータは、降下ステージ86中にフラップ38a、38b、38c、および38dそれぞれの位置を調節し、ビークルの後ろ向き飛行を着陸に備えて安定させるように構成されている。より具体的に言うと、操縦コンピュータは、飛行中にビークルを安定させるのに十分な縦揺れモーメントを提供するのに必要な最小限のフラップ転向角を維持し、また前述の必要な制動モーメントを生み出すようにフラップ転向角を差動的に調整するように構成されることが好ましい。降下ステージ86中にフラップ転向角を調整することで、後ろ向き飛

行中の縦揺れおよび片揺れの制御を実現し、誘導および航行のエラーならびに風によって引き起こされる飛行のディスパージョンを回避する。したがって、本発明

は、回転および着陸中にビークルの回転を制御し、その飛行経路を安定させる差動フラップ調整装置を、再使用可能な打上げ用ビークル10の機首中に提供する。操縦コンピュータがビークルのエンジン19も制御し、ビークル10の降下速度および接地速度を調節することを当業者なら理解するであろう。

前述のように、本発明は、推進薬を消費する必要なく、回転および着陸シーケンス70中にビークル10の位置および配向を制御する。したがって、比較的高い高度で回転シーケンスを行いながら、機首を前に向けた配向で推進薬を獲得する必要があることからビークルに追加される任意の空重量を最小限に抑えることができる。軌道まで搬送される使用できない重量を減少させることにより、再使用可能な打上げ用ビークル10のペイロード容量は増加する。

本発明の様々なその他の利点は、下記の請求の範囲と併せて前述の本文および図面を検討すれば当業者には明らかになるであろう。

【 1 】

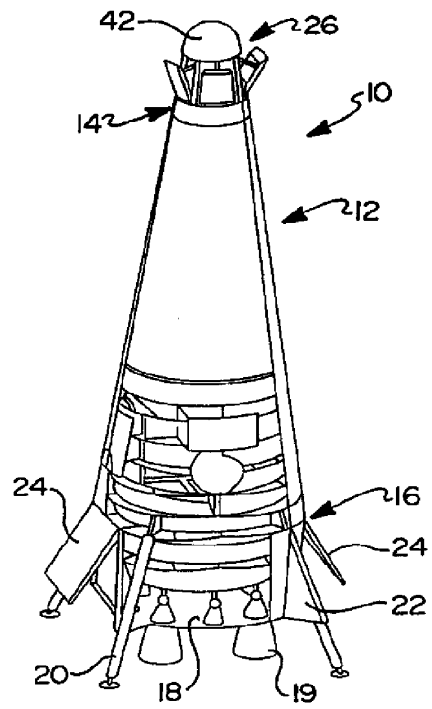
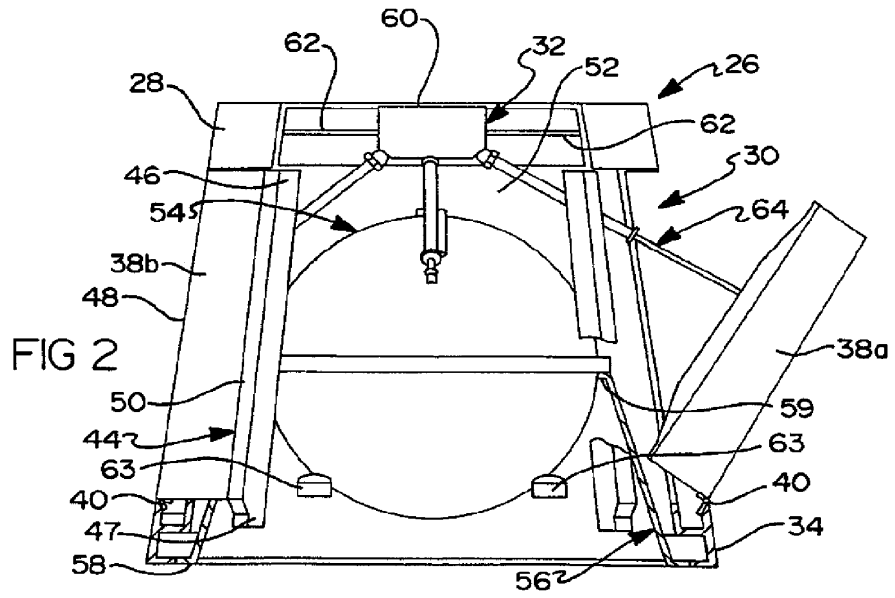


FIG 1



【 図 2 】



【 図 3 】

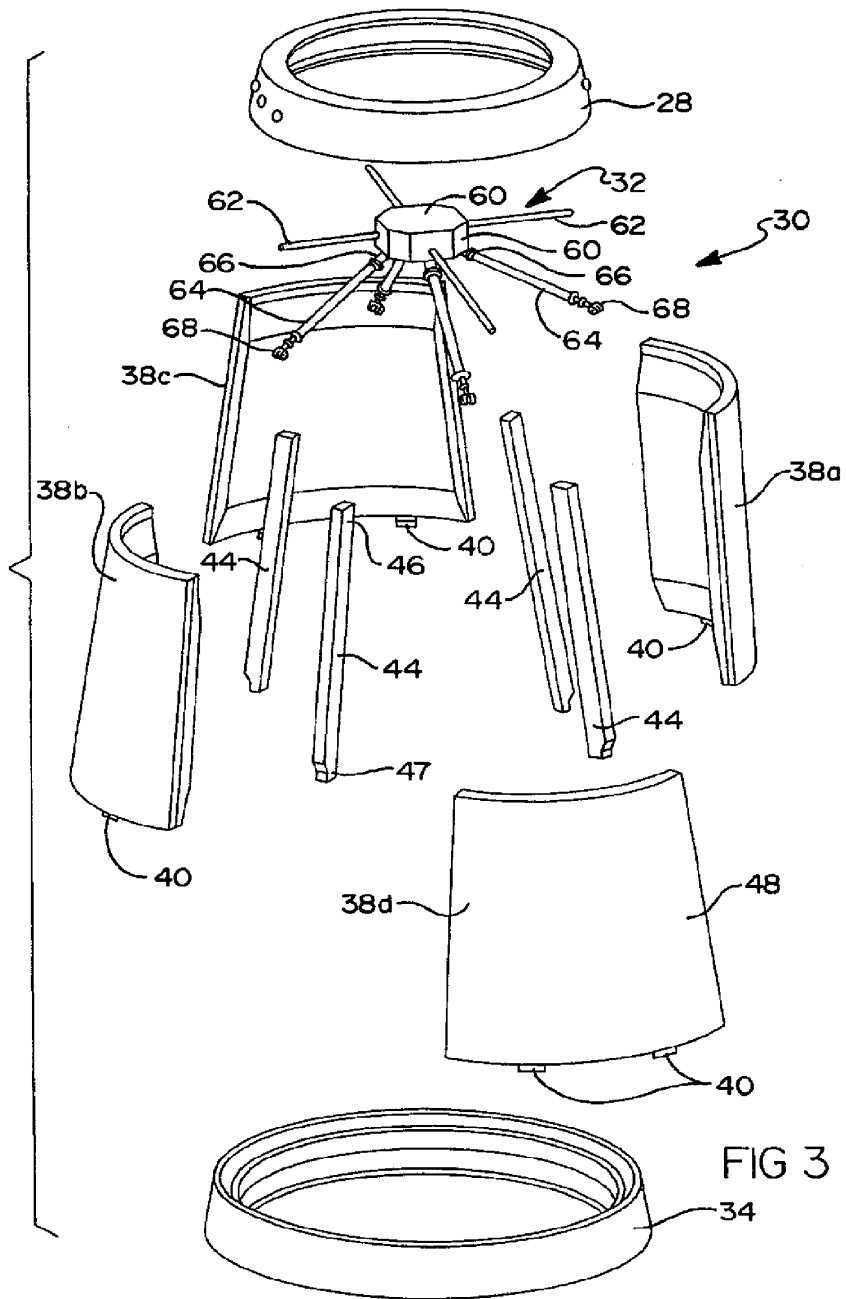


FIG 3

【 4 】

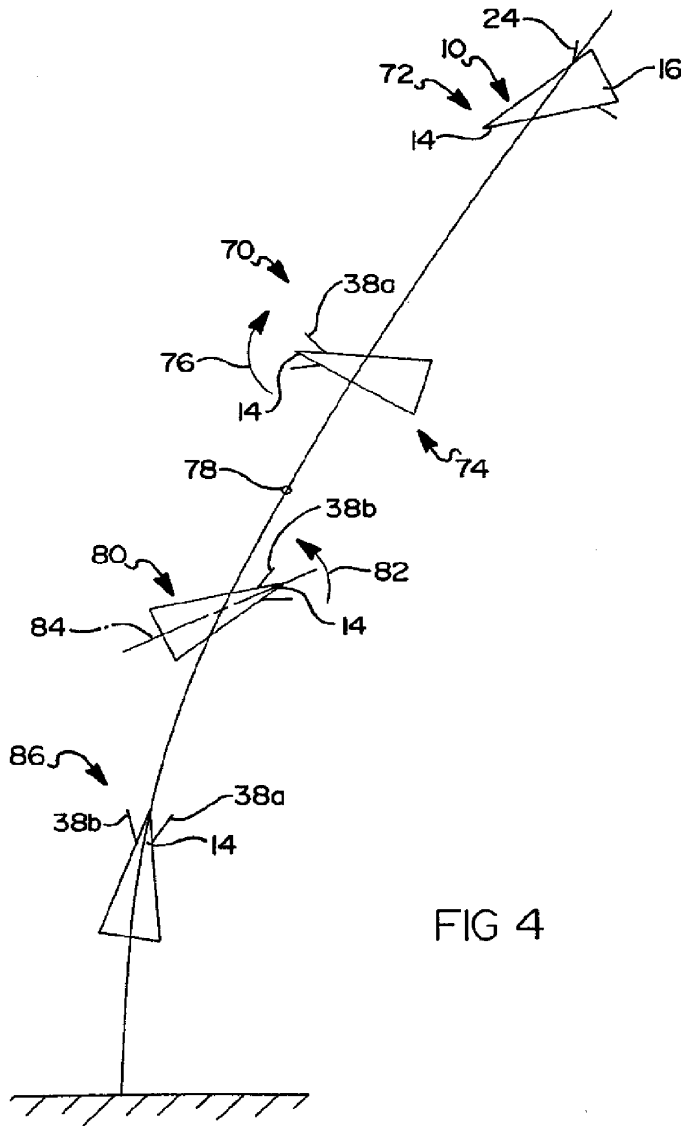


FIG 4

## 【 国際調査報告 】

INTERNATIONAL SEARCH REPORT		International application No. PCT/US97/16516
<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(6) : B64G 01/62; F42B 10/14, 10/50, 13/01 US CL : 244/3.28, 138A, 139, 160 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 244/3.28, 3.29, 138A, 139, 160, 164  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		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,246,864 A (MACK et al.) 19 April 1966, see entire document.	1-3, 7,8,11
Y		5, 6, 9, 13-16, 18 & 19
Y	US 3,903,801 A (SEKOSKI) 09 September 1975, see entire document.	13-16, 18 & 19
Y	US 3,098,445 A (JACKSON) 23 July 1963, see Figures 1 and 2.	5, 6, & 9
A	US 1,324,433 A (PHILLIPS, Jr.) 09 December 1919, see Figure 1.	
A	US 2,840,326 A (RICHARDSON et al.) 24 June 1958, see Figure 3.	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: *A* document defining the general state of the art which is not considered to be of particular relevance *B* 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 understate 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 *F* document member of the same patent family
Date of the actual completion of the international search 13 JANUARY 1998		Date of mailing of the international search report 02 MAR 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230		Authorized officer VIRNA LISSI MOJICA Telephone No. (703) 308-2260

Form PCT/ISA/210 (second sheet)(July 1992)\*

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/16516

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 3,766,490 A (WEIS) 04 December 1973, see col. 2, lines 38-44.	
A	US 4,007,505 A (NOWATZKI) 15 February 1977, see Figure 4.	

Form PCT/ISA/210 (continuation of second sheet)(July 1992)\*

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フロントページの続き

(81)指定国 EP(AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OA(BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), AP(GH, KE, LS, MW, SD, SZ, UG, ZW), AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	12815306			
<b>Filing Date:</b>	14-Jun-2010			
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS			
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos			
<b>Filer:</b>	John M. Wechkin/Paula Quinanola			
<b>Attorney Docket Number:</b>	34563.8003US02			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Miscellaneous:</b>				
Submission- Information Disclosure Stmt	2806	1	90	90
<b>Total in USD (\$)</b>				<b>90</b>



<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	15672489
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Paula Quinanola
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	34563.8003US02
<b>Receipt Date:</b>	02-MAY-2013
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	12:07:57
<b>Application Type:</b>	Utility under 35 USC 111(a)

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RAM confirmation Number	9796
Deposit Account	
Authorized User	

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		8003US2_IDS.pdf	271763 018088fa6d0891535db0f59326cc985c1bf58e1f	yes	3
<b>Multipart Description/PDF files in .zip description</b>					
		<b>Document Description</b>	<b>Start</b>	<b>End</b>	
		Transmittal Letter	1	2	
		Information Disclosure Statement (IDS) Form (SB08)	3	3	
<b>Warnings:</b>					
<b>Information:</b>					
2	Foreign Reference	JP2001501151.pdf	477646 c7215b26c1a2a987db63e59661784ab7edd716	no	20
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<b>Information:</b>					
3	Fee Worksheet (SB06)	fee-info.pdf	30606 a3a365d048b95ff54d0ac1293b95fe494861d697	no	2
<b>Warnings:</b>					
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<b>Total Files Size (in bytes):</b>			780015		
<p><b>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.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>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.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>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.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>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.</b></p>					

Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 4147

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: V. M. Rodriguez

**INFORMATION DISCLOSURE STATEMENT (IDS)**

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

Madam:

Pursuant to 37 CFR 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed more than three months after the U.S. filing date, OR more than three months after the date of entry of the national stage of a PCT application, AND after the mailing date of the first Office Action on the merits, whichever occurs first, but before the mailing date of any of a Final Office Action, a Notice of Allowance (37 C.F.R. § 1.97(c)) or an action that otherwise closes prosecution in the application.

34563-8003.US02/LEGAL26498124.1

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of foreign patents in accordance with 37 C.F.R. § 1.98(a)(2).

This Information Disclosure Statement is not to be construed as a representation that: (i) a search has been made; (ii) additional information that may be material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the cited information is, or is considered to be, material to patentability. In addition, applicant does not admit that any enclosed item of information constitutes prior art to the subject invention and specifically reserves the right to demonstrate that any such reference is not prior art.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR 1.98 and the Examiner is respectfully requested to consider the listed references.

Please charge our credit card in the amount of \$90.00 covering the fee set forth in 37 C.F.R. § 1.17(p). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 345638003US2.

Dated: May 1, 2013

Respectfully submitted,

By 

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Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3645

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: V. M. Rodriguez

**AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION**  
**UNDER 37 C.F.R. 1.111**

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

Madam:

**INTRODUCTORY COMMENTS**

In response to the Office Action dated October 10, 2012, please amend the above-identified U.S. patent application as follows:

**Amendments to the Claims** are reflected in the listing of claims which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 9 of this paper.

34563-8003.US02/LEGAL24886084.1

**AMENDMENTS TO THE CLAIMS**

Please amend claims 2-10, 14 and 18-20, and cancel claims 1 and 17 as set forth below.

1. (Cancelled)

2. (Currently Amended) The method of claim ~~4~~4 wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land.

3. (Currently Amended) The method of claim ~~4~~4 wherein landing the space launch vehicle includes vertically landing the space launch vehicle on a floating platform in the body of water.

4. (Currently Amended) ~~The method claim 4A~~ a method for operating a space launch vehicle, the method comprising:

launching the space launch vehicle from earth, wherein launching the space launch vehicle includes igniting one or more rocket engines on a booster stage;

positioning a landing structure in a body of water; and

landing the space launch vehicle on the landing structure in the body of water, and wherein landing the space launch vehicle includes vertically landing the booster stage on the landing structure in the body of water.

5. (Currently Amended) The method of claim ~~4~~4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation.

6. (Currently Amended) The method of claim ~~4~~4 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation while providing thrust from one or more vehicle engines in a tail-first direction.

7. (Currently Amended) The method of claim ~~4~~4, further comprising reusing at least a portion of the space launch vehicle.

8. (Currently Amended) The method of claim ~~4~~4, further comprising:  
transporting the space launch vehicle on the landing structure to a refurbishment facility;  
refurbishing at least a portion of the space launch vehicle at the refurbishment facility; and  
reusing at least a portion of the space launch vehicle after refurbishment.

9. (Currently Amended) The method of claim ~~4~~4, further comprising transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle.

10. (Currently Amended) The method of claim 4-4 wherein the space launch vehicle includes a payload carried on an upper stage mounted to a booster stage, wherein launching the space launch vehicle from earth includes igniting one or more rocket engines on the booster stage to launch the space launch vehicle from a launch site on land in a nose-first orientation, wherein landing the space launch vehicle includes landing the space launch vehicle on a mobile landing platform in the body of water, and wherein the method further comprises:

turning off the one or more rocket engines on the booster stage;  
separating the upper stage from the booster stage at a predetermined altitude;  
reorienting the booster stage to a tail-first orientation;  
receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information; and  
reigniting the one or more rocket engines on the booster stage prior to landing, wherein landing the space launch vehicle includes vertically landing the booster stage on the platform in the tail-first orientation while providing thrust from the reignited one or more rocket engines.

11. (Original) A method for transporting a payload to space, the method comprising:

coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion;  
positioning a floating platform in a body of water;  
igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;  
separating the payload from the booster stage;  
after separating, reorienting the booster stage from the nose-first orientation to a tail-first orientation; and



landing the booster stage on the floating platform in the tail-first orientation.

12. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines positioned toward the aft end portion of the booster stage before reorienting the booster stage from the nose-first orientation to the tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage to decelerate the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

13. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines and following a ballistic trajectory; and  
deploying an aerodynamic control surface from the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

14. (Currently Amended) ~~The method of claim 11, further comprising:~~ A method for transporting a payload to space, the method comprising:  
coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion;  
positioning a floating platform in a body of water;  
igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation;  
turning off the one or more rocket engines;  
separating the payload from the booster stage;  
after separating and following a ballistic trajectory; and

deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation; and  
landing the booster stage on the floating platform in the tail-first orientation.

15. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines; and  
operating one or more propulsive thrusters mounted to the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

16. (Original) The method of claim 11, further comprising:  
turning off the one or more rocket engines after separating the payload from the booster stage;  
moving an aerodynamic control surface on the booster stage to at least partially control a flight path of the booster stage toward the platform based on platform positional information received from the platform;  
moving the aerodynamic control surface on the booster stage to at least partially reorient the booster stage from the nose-first orientation to a tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

17. (Cancelled)

18. (Currently Amended) The system of claim ~~17-20~~ wherein the means for landing include means for vertically landing at least a portion of the space launch vehicle on a floating platform.

19. (Currently Amended) The system of claim ~~17-20~~ wherein the means for launching include means for launching the launch vehicle in a nose-first orientation, wherein the system further comprises means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing, and wherein the means for landing include means for landing in the tail-first orientation.

20. (Currently Amended) ~~The system of claim 19A~~ system for providing access to space, the system comprising:

a space launch vehicle, wherein the space launch vehicle includes one or more rocket engines;

a launch site;

means for launching the launch vehicle from the launch site a first time, wherein the means for launching include means for igniting the rocket engines and launching the vehicle in a nose-first orientation, ~~and wherein the system further comprises;~~

means for shutting off the rocket engines;

means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing; ~~and~~

means for reigniting one or more of the rocket engines when the launch vehicle is in the tail-first orientation to decelerate the vehicle;

means for landing at least a portion of the launch vehicle on a structure in a body of water, wherein the means for landing include means for landing in the tail-first orientation while the one or more rocket engines are thrusting; and

means for launching at least a portion of the launch vehicle from the launch site a second time.

**REMARKS**

Claims 1-20 were pending in the application at the time the present Office Action was issued (October 10, 2012). Claims 2-10, 14 and 18-20 have been amended herein, and claims 1 and 17 have been cancelled without conceding the merits of the rejections of these claims, and without prejudice to pursuing one or more of these claims in unamended or other forms in a continuation or other application. In particular, claims 4, 14 and 20 have been rewritten in independent form to include all the features of the corresponding base claims and any intervening claims. Accordingly, claims 4, 14 and 20 have not been amended in a manner that would necessitate a new search of the prior art, and any subsequent rejection of these claims based on new grounds cannot be made final. No new claims have been added. Accordingly, claims 2-16 and 18-20 are currently pending in the present application.

The status of the application in view of the present Office Action is as follows:

(A) Claims 1-3, 5-8 and 17-19 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 8,047,472 to Brand et al. ("Brand");

(B) Claims 4 and 11-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand in view of U.S. Patent Application Publication No. 2007/0012820 to Buehler ("Buehler");

(C) Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Brad, Buehler and further in view of U.S. Patent No. 6,176,451 to Drymon ("Drymon"); and

(D) Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand in view of article "Solid Rocket Boosters and Post Launch Processing," NASA Facts, National Aeronautics and Space Administration, John F. Kennedy Space Center ("NASA").

I. Response to the Section 102 Rejections of Claims 1-3, 5-8 and 17-19

Claims 1-3, 5-8 and 17-19 were rejected under 35 U.S.C. § 102(e) as being anticipated by Brand. Claims 1 and 17 have been cancelled without prejudice, and without conceding that Brand is prior art to the claims. Accordingly, the rejections of claims 1 and 17 are now moot.

Claims 2, 3 and 5-8 have been amended to depend from base claim 4. Base claim 4 is allowable over the combination of Brand and Buehler for at least the reasons set forth in detail below. Accordingly, Brand cannot support a Section 102 rejection of dependent claims 2, 3 and 5-8 for at least the reason that Brand cannot support a Section 102 rejection of corresponding base claim 4, and for the additional features of these dependent claims. Therefore, the rejections of claims 2, 3 and 5-8 should be withdrawn.

Claims 18 and 19 have been amended to depend from base claim 20. The goal of examination is to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity. (MPEP §706). In the present case, however, the Office Action has failed to address claim 20 or articulate any basis for rejecting this claim. Therefore, claim 20 has not been rejected in a manner to which the applicant can respond. Moreover, the applicant respectfully submits that claim 20 is allowable over the applied references. Accordingly, claims 18 and 19 are allowable for at least the reason that claim 20 is allowable, and for the additional features of these dependent claims. Therefore, the rejections of claims 18 and 19 should be withdrawn.

II. Response to the Section 103 Rejections of Claims 4 and 11-16

Claims 4 and 11-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand in view of Buehler. To establish *prima facie* obviousness, the Examiner must provide a factual basis showing that all limitations in a claim are found in

the applied art. See, e.g., *In re Warner*, 379 F.2d 1011, 1017 (C.C.P.A. 1967). Even if the Examiner is able to find every element of a claim in a combination of prior art, this alone is still insufficient to establish obviousness of the claim. Indeed, as the Supreme Court clarified in *KSR Int'l Co. v. Teleflex Inc.*, "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). To the contrary, "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." *Id.* In the present case, the Office Action has not established a *prima facie* obviousness rejection of claim 4 based on the combination of Brand and Buehler for at least the reasons set forth below.

#### Independent Claims 4 and 11

Independent claim 4 is directed to a method for operating a space launch vehicle that includes, *inter alia*, launching the space launch vehicle from Earth by igniting one or more rocket engines on a booster stage, and vertically landing the booster stage on a landing structure positioned in a body of water. Independent claim 11 is directed to a method for transporting a payload to space, and includes features that are at least generally similar to those of independent claim 4. For example, the method of claim 11 includes coupling the payload to a booster stage of a rocket, igniting one or more rocket engines positioned toward an aft end portion of the booster stage, and launching the rocket toward space in a nose-first orientation. The method of claim 11 further includes separating the payload from the booster stage, reorienting the booster stage after separation from the nose-first orientation to a tail-first orientation, and landing the booster stage on a floating platform in the tail-first orientation.

In contrast to the rocket engines of claims 4 and 11, Brand explicitly teaches the use of air breathing engines for vehicle lower stages. (See, e.g., Brand Abstract; col. 1 at lns. 26-27; col. 3 at lns. 32-34; etc.) More specifically, Brand discloses a booster stage 106 having a plurality of air breathing engines 116 connected to fins 112. (Brand;

Figure 1; col. 3 at lns. 65-67.) In a preferred embodiment, the air breathing engines 116 are turbofan engines, preferably a total of 18 turbofan engines, arranged in a star configuration. (Brand; col. 6 at lns. 28-38.) Brand also teaches the use of air breathing engines 117 (e.g., ramjet engines) for a middle stage 130. (Brand; col. 6 at lns. 61-67.)

The Office Action acknowledges that Brand fails to disclose the use of rocket engines on the lower stage 106. (Office Action; pgs. 5, 11.) To cure this deficiency, the Office Action asserts that it would have been obvious to one of ordinary skill in the art to replace the air breathing engines of Brand with the rocket engines from Buehler's booster stage. (Office Action; pg. 5.) This conclusory assertion, however, directly contradicts Brand's express teaching-away from the use of rocket engines for his lower stage 106. Indeed, Brand specifically points out that there are "numerous deficiencies" associated with using rocket engines on reusable boosters. The deficiencies include the required use of "a plurality of different propellants," a "low usable life for the main rocket stage," the required use of "reaction control devices for the main stage," and "increased turn-around time for reuse due to the rocket engine main stage." (Brand; col. 1 at lns. 56-65.)

Although Brand contemplates rocket engines for use on his upper stage 100, throughout his disclosure Brand expressly teaches that *air breathing* propulsion "provides a reusable booster first stage with significantly increased user life and significantly decreased turn-around time and maintenance compared to current systems." Brand further notes that one of the primary objectives of his invention is "to provide lower and middle stages that employ a single type of fuel using air breathing engines with a high specific impulse." (Brand; col. 2 at lns. 19-28.) Brand notes that air breathing engines require only a single fuel tank (and no oxidizer tank), and explains that such engines "are currently available "off the shelf" with minor modifications," and therefore "require significantly less maintenance and preparation between missions than current launch system parts/systems." (Brand; col. 6 at lns. 40-42; col. 3 at lns. 38-45.) Accordingly, utilizing rocket engines for Brand's lower stage 106 as the Office Action



suggests would destroy the advantageous properties of Brand's vehicle by requiring it to carry both fuel and oxidizer, and requiring the other noted complications associated with rocket engines.

Not only are rocket engines decidedly different than the air breathing "off the shelf" engines called for by Brand, but rocket engines would also not provide the relatively simple thrust-vector control features and/or idle thrust capabilities provided by the air breathing engines taught by Brand. More specifically, Brand explains that during decent, a portion of the air breathing engines 116 are at idle thrust and another portion of the air breathing engines 116 have accelerated to partial thrust. (Brand; col. 5 at Ins. 14-16.) Brand further explains that rotation for the pitch-up maneuver is accomplished by thrust vector control of the outboard turbofan engines 116 that have exhaust vanes to deflect the flow of exhaust gases. The rocket engines allegedly used by Buehler would not provide the idle and/or thrust vector control features provided by the turbofan engines 116 of Brand. To the contrary, Buehler teaches away from replacing the air breathing engines on the lower stage of Brand with rocket engines.

More specifically, Buehler teaches that the "propulsion modules built for the upper stage are made to operate optimally in vacuum." (Buehler at [0029]). Buehler further explains that without extensive modifications to the nozzles on the upper stage propulsion, "flow separation could possibly occur leading to unpredictable thrust vectors and side loads on a nozzle designed for low-pressure or vacuum rather than atmospheric operation." (Buehler at [0077].) Accordingly, one would not look to such engines for use on the lower stage 106 of Brand that operates primarily in the atmosphere. Indeed, Buehler goes to great lengths to explain the modifications necessary to the upper stage propulsion unit nozzle to provide thrust vector authority during decent. Buehler also explains that because of the aerodynamic loads on the engine nozzle, the engine nozzle does not gimble but instead achieves required thrust vector authority by peroxide side injection in the throat of the nozzle. (Buehler at [0061].) In view of all of the complications taught by Buehler as being necessary to

provide thrust vector control on a rocket nozzle during reentry, it is unreasonable to assert that one of ordinary skill in the art would have been motivated to replace the relatively simple "off the shelf" air breathing engines 116 of Brands with the rocket engines of Buehler as suggested by the Office Action.

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983). It is also improper to combine references in a way that would "destroy an advantageous property" of the prior art. *See, e.g., Eisai Co. Ltd. v. Dr. Reddy's Labs., Ltd.*, 533 F.3d 1353 (Fed. Cir. 2008). For all of the foregoing reasons, it would not have been obvious to one of ordinary skill in the art to replace the air breathing engines on the lower stage 106 of Brand with the rocket engines allegedly used in the booster stage of Buehler. Accordingly, the proposed combination of Brand and Buehler cannot support Section 103 rejections of independent claims 4 and 11 for at least this reason, and the rejections should be withdrawn.

Claims 12, 13, 15 and 16 depend from base claim 11. Accordingly, the proposed combination of Brand and Buehler cannot support Section 103 rejections of dependent claims 12, 13, 15 and 16 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 11, and for the additional feature of these dependent claims. Therefore, the rejections of dependent claims 12, 13, 15 and 16 should be withdrawn.

The rejections of dependent claims 12 and 16 should be withdrawn for at least one additional reason. The methods of claims 12 and 16 require reigniting rocket engines on the booster "after reorienting the booster stage" from the nose-first orientation to the tail-first orientation. The Office Action acknowledges that Brand fails to disclose these features, but suggests that because Buehler teaches shutting down and later reigniting upper stage engines, one of ordinary skill in the art would have been motivated to use the upper stage rocket engines of Buehler in the apparatus of Brand.

The applicant notes, however, that even *if* the air breathing engines of Brand were replaced by the upper stage rocket engines of Buehler, this combination would still fail to cure the deficiencies of Brand.

More specifically, claims 12 and 16 expressly require that the rocket engines on the booster stage be reignited *after reorientation* of the booster stage. In contrast, Brand explicitly teaches that the air breathing engines on the lower stage 106 must be operating (either at idle thrust or partial thrust) in order to accomplish the "pitch-up" rotation of the lower stage. (Brand; col. 5 at lns. 14-18.) Engine thrust is required because the "rapid pitch-up maneuver is instigated by cooperatively deflecting the exhaust of the outboard fanjet engines 116 and simultaneously deflecting the all-moving control surfaces comprising the outer tips of the fins 118." (Brand; col. 5 at lns. 32-35.) Accordingly, Brand explicitly teaches that the air breathing engines 116 must remain *on* and thrusting to accomplish the reorientation maneuver. Therefore, even *if* one of ordinary skill in the art was somehow motivated to replace the air breathing engines 116 of Brand with the rocket engines of Buehler, this would still fail to result in a booster stage that turns off the rocket engines during the reorientation maneuver. Therefore, the rejections of dependent claims 12 and 16 should be withdrawn for at least this additional reason.

#### Independent Claim 14

Independent claim 14 is directed to a method for transporting a payload to space that includes, *inter alia*, separating the payload from a booster stage, and following a ballistic trajectory, "deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation." The Office Action suggests that paragraph [0025] of Buehler discloses the flared surfaces of claim 14. (Office Action at page 7.) Paragraph [0025], however, merely discloses that "the spacecraft has fins...." Notwithstanding the fact that the mere mention of "fins" cannot reasonably be construed

as teaching the claimed "flared control surface," neither the Figures nor the cited text of Buehler discloses or even suggests that the "fins" are located on a *forward end portion* of the "spacecraft," much less on a forward end portion of a *booster stage* as claimed. Accordingly, the proposed combination of Brand and Buehler cannot support a Section 103 rejection of claim 14 for at least this reason, and the rejection should be withdrawn.

Moreover, the method of claim 14 includes "deploying one or more flared control surfaces from the forward end portion of the booster stage ...." The words of a claim must be given their plain meaning, unless such meaning is inconsistent with the specification. The plain meaning of a term means the ordinary customary meaning given to the term by those of ordinary skill in the art at the time of the invention. (MPEP § 2111.01.) In the present case, the plain meaning of "deploying" is "to position, or to bring in to action." (See, e.g., the American Heritage College Dictionary, Third Edition.) Nowhere does the cited portion of Buehler disclose or suggest that the "fins" are deployed, much less deployed for reorientation of a booster stage from a nose-first orientation to a tail-first orientation. Moreover, the plain meaning of a "flared" control surface means a control surface that is "expand[ed] or open[ed] outward in shape." (See, e.g., the American Heritage College Dictionary, Third Edition.) Nowhere does the cited portion of Buehler disclose or suggest deployment of such a control surface.

It is well settled law that the failure of an asserted combination to teach or suggest each and every feature of a claim is fatal to an obviousness rejection. See *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). In the present case, the asserted combination of Buehler and Brand fail to disclose or suggest deploying one or more flared control surfaces from a forward end portion of a booster stage to facilitate reorienting the booster stage. Accordingly, the proposed combination of Brand and Buehler cannot support a Section 103 rejection of independent claim 14 for at least this reason, and the rejection should be withdrawn.

III. Response to the Section 103 Rejection of Claim 10

Claim 10 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand and Buehler, and further in view of Drymon. Claim 10 depends from base claim 4. Brand and Buehler cannot support a Section 103 rejection of base claim 4 for at least the reason set forth in detail above. Moreover, Drymon fails to cure the deficiencies of Brand and Buehler with respect to base claim 4. Accordingly, the proposed combination of Brand, Buehler and Drymon cannot support a Section 103 rejection of dependent claim 10 for at least the reason that this combination of references cannot support a Section 103 rejection of corresponding base claim 4, and for the additional features of this dependent claim. Therefore, the rejection of claim 10 should be withdrawn.

IV. Response the Section 103 Rejection of Claim 9

Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Brand in view of NASA. Claim 9 depends from base claim 4. Brand cannot support a Section 103 rejection of base claim 4 for at least the reason set forth in detail above. Moreover, NASA fails to cure the deficiencies of Brand with respect to base claim 4. Accordingly, the proposed combination of Brand and NASA cannot support a Section 103 rejection of dependent claim 9 for at least the reason that these references cannot support a Section 103 rejection of corresponding base claim 4, and for the additional features of this dependent claim. Therefore, the rejection of dependent claim 9 should be withdrawn.

Conclusion

The applicant respectfully requests that the Examiner reconsider the pending claims in view of the amendments and remarks set forth above. If the Examiner believes that a telephone conference would expedite prosecution of the present application in any way, the Examiner is encouraged to contact the undersigned attorney at the number below.

Application No. 12/815,306  
Reply to Office Action of October 10, 2012

Docket No.: 345638003US2

Please charge any deficiency in fees or credit any overpayment to our Deposit Account No. 50-0665, under Order No. 345638003US2 from which the undersigned is authorized to draw.

Dated: April 10, 2013

Respectfully submitted,

By 

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Attorney for Applicant

Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 4147

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: V. M. Rodriguez

**INFORMATION DISCLOSURE STATEMENT (IDS)**

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

Madam:

Pursuant to 37 CFR 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed more than three months after the U.S. filing date, OR more than three months after the date of entry of the national stage of a PCT application, AND after the mailing date of the first Office Action on the merits, whichever occurs first, but before the mailing date of any of a Final Office Action, a Notice of Allowance (37 C.F.R. § 1.97(c)) or an action that otherwise closes prosecution in the application.

34563-8003.US02/LEGAL26330190.1

Application No.: 12/815,306

Docket No.: 345638003US2

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications.

This Information Disclosure Statement is not to be construed as a representation that: (i) a search has been made; (ii) additional information that may be material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the cited information is, or is considered to be, material to patentability. In addition, applicant does not admit that any enclosed item of information constitutes prior art to the subject invention and specifically reserves the right to demonstrate that any such reference is not prior art.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR 1.98 and the Examiner is respectfully requested to consider the listed references.

Please charge our credit card in the amount of \$90.00 covering the fee set forth in 37 C.F.R. § 1.17(p). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 345638003US2.

Dated: April 10, 2013

Respectfully submitted,

By 

Stephen E. Arnett

Registration No.: 47,392

PERKINS COIE LLP

P.O. Box 1247

Seattle, Washington 98111-1247

(206) 359-8000

(206) 359-7198 (Fax)

Attorney for Applicant



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.

Substitute for form 1449/PTO		<b>Complete if Known</b>	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)		Application Number	12/815,306-Conf. #1105
		Filing Date	June 14, 2010
		First Named Inventor	Jeffrey P. Bezos
		Art Unit	4147
		Examiner Name	V. M. Rodriguez
		Attorney Docket Number	345638003US2
Sheet	1	of	1

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-20060113425-A1	06-01-2006	Rader	
		US-20080078884-A1	04-03-2008	Trabandt et al.	
		US-20090206204-A1	08-20-2009	Rosen	
		US-20100327107-A1	12-30-2010	Featherstone	
		US-2,464,827	03-22-1949	H. Noyes	
		US-5,568,901	10-29-1996	Stiennon	
		US-5,871,173	02-16-1999	Frank et al.	
		US-5,873,549	02-23-1999	Lane et al.	
		US-6,193,187	02-27-2001	Scott et al.	
		US-6,666,402	12-23-2003	Rupert et al.	
		US-6,926,576	08-09-2005	Alway et al.	
		US-6,929,576	08-16-2005	Armstrong et al.	
		US-7,344,111	03-18-2008	Janeke	
		US-8,408,497	04-02-2013	Boelitz et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with an asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

34563-8003.US02/LEGAL26330273.1

Electronic Patent Application Fee Transmittal				
<b>Application Number:</b>	12815306			
<b>Filing Date:</b>	14-Jun-2010			
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS			
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos			
<b>Filer:</b>	John M. Wechkin/Paula Quinanola			
<b>Attorney Docket Number:</b>	34563.8003US02			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Basic Filing:</b>				
<b>Pages:</b>				
<b>Claims:</b>				
Independent Claims in Excess of 3	2201	1	210	210
<b>Miscellaneous-Filing:</b>				
<b>Petition:</b>				
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension - 3 months with \$0 paid	2253	1	700	700
<b>Miscellaneous:</b>				
Submission- Information Disclosure Stmt	2806	1	90	90
<b>Total in USD (\$)</b>				<b>1000</b>

<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	15487143
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Paula Quinanola
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	34563.8003US02
<b>Receipt Date:</b>	10-APR-2013
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	19:45:52
<b>Application Type:</b>	Utility under 35 USC 111(a)

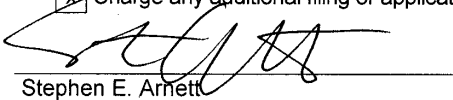
**Payment information:**

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$ 1000
RAM confirmation Number	6084
Deposit Account	
Authorized User	

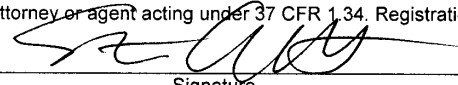
**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		8003US2_AM.pdf	1007613 b3e05c0460d3aef0aba3bfb513b563ab089af6b3	yes	23
<b>Multipart Description/PDF files in .zip description</b>					
		<b>Document Description</b>	<b>Start</b>	<b>End</b>	
		Miscellaneous Incoming Letter	1	1	
		Extension of Time	2	2	
		Amendment/Req. Reconsideration-After Non-Final Reject	3	3	
		Claims	4	10	
		Applicant Arguments/Remarks Made in an Amendment	11	20	
		Transmittal Letter	21	22	
		Information Disclosure Statement (IDS) Form (SB08)	23	23	
<b>Warnings:</b>					
<b>Information:</b>					
2	Fee Worksheet (SB06)	fee-info.pdf	34164 ee03605e2a56b32050fbb2f5cafb2f5808af4176	no	2
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			1041777		
<p><b>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.</b></p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  <b>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.</b></p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  <b>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.</b></p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  <b>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.</b></p>					

<b>AMENDMENT TRANSMITTAL LETTER</b>			Docket No. 345638003US2		
Application No. 12/815,306-Conf. #1105	Filing Date June 14, 2010	Examiner V. M. Rodriguez	Art Unit 4147		
Applicant(s): Bezos et al.					
Invention: SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS					
<b>TO THE COMMISSIONER FOR PATENTS</b>					
Transmitted herewith is an amendment in the above-identified application.					
The fee has been calculated and is transmitted as shown below.					
<b>CLAIMS AS AMENDED</b>					
	Claims Remaining After Amendment	Highest Number Previously Paid	Number Extra Claims Present	Rate	
<b>Total Claims</b>	18	- 20 =	0	x 40.00	0.00
<b>Independent Claims</b>	4	- 3 =	1	x 210.00	210.00
Multiple Dependent Claims (check if applicable) <input type="checkbox"/>					
Other fee (please specify): Extension for response within third month Information Disclosure Statement					700.00 90.00
<b>TOTAL ADDITIONAL FEE FOR THIS AMENDMENT:</b>					<b>1,000.00</b>
<input type="checkbox"/> Large Entity <span style="margin-left: 300px;"><input checked="" type="checkbox"/> Small Entity</span>					
<input type="checkbox"/> No additional fee is required for this amendment.					
<input type="checkbox"/> Please charge Deposit Account No. _____ in the amount of \$ _____.					
<input type="checkbox"/> A check in the amount of \$ _____ to cover the filing fee is enclosed.					
<input checked="" type="checkbox"/> Payment by credit card.					
<input checked="" type="checkbox"/> The Director is hereby authorized to charge and credit Deposit Account No. <u>50-0665</u> as described below.					
<input checked="" type="checkbox"/> Credit any overpayment.					
<input checked="" type="checkbox"/> Charge any additional filing or application processing fees required under 37 C.F.R. § 1.16 and 1.17.					
 Stephen E. Arnett Attorney/Agent Reg. No.: 47,392 PERKINS COIE LLP P.O. Box 1247 Seattle, Washington 98111-1247 (206) 359-8000			Dated: <u>April 10, 2013</u>		

34563-8003.US02/LEGAL26334958.1

<b>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b>		Docket Number (Optional) 345638003US2																															
Application Number 12/815,306-Conf. #1105		Filed June 14, 2010																															
For SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS																																	
Art Unit 4147		Examiner V. M. Rodriguez																															
<p>This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.</p> <p>The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;">Fee</th> <th style="text-align: center; border-bottom: 1px solid black;">Small Entity Fee</th> <th style="text-align: center; border-bottom: 1px solid black;">Micro Entity Fee</th> <th style="width: 10%;"></th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> One month (37 CFR 1.17(a)(1))</td> <td style="text-align: center;">\$200</td> <td style="text-align: center;">\$100</td> <td style="text-align: center;">\$50</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td><input type="checkbox"/> Two months (37 CFR 1.17(a)(2))</td> <td style="text-align: center;">\$600</td> <td style="text-align: center;">\$300</td> <td style="text-align: center;">\$150</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td><input checked="" type="checkbox"/> Three months (37 CFR 1.17(a)(3))</td> <td style="text-align: center;">\$1,400</td> <td style="text-align: center;">\$700</td> <td style="text-align: center;">\$350</td> <td style="text-align: center;">\$ 700.00</td> </tr> <tr> <td><input type="checkbox"/> Four months (37 CFR 1.17(a)(4))</td> <td style="text-align: center;">\$2,200</td> <td style="text-align: center;">\$1,100</td> <td style="text-align: center;">\$550</td> <td style="text-align: center;">\$ _____</td> </tr> <tr> <td><input type="checkbox"/> Five months (37 CFR 1.17(a)(5))</td> <td style="text-align: center;">\$3,000</td> <td style="text-align: center;">\$1,500</td> <td style="text-align: center;">\$750</td> <td style="text-align: center;">\$ _____</td> </tr> </tbody> </table> <p><input checked="" type="checkbox"/> Applicant asserts small entity status. See 37 CFR 1.27.</p> <p><input type="checkbox"/> Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.</p> <p><input type="checkbox"/> A check in the amount of the fee is enclosed.</p> <p><input checked="" type="checkbox"/> Payment by credit card.</p> <p><input type="checkbox"/> The Director has already been authorized to charge fees in this application to a Deposit Account.</p> <p><input checked="" type="checkbox"/> The Director is hereby authorized to charge any deficiency in fees or credit any overpayment, to Deposit Account Number <u>50-0665</u>.</p> <p><input type="checkbox"/> Payment made via EFS-Web.</p> <p><b>WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.</b></p> <p>I am the</p> <p><input type="checkbox"/> applicant/inventor.</p> <p><input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).</p> <p><input checked="" type="checkbox"/> attorney or agent of record. Registration number <u>47,392</u>.</p> <p><input type="checkbox"/> attorney or agent acting under 37 CFR 1.34. Registration number _____.</p> <p style="text-align: center;">           _____          Signature     </p> <p style="text-align: center;">         _____          Date          April 10, 2013     </p> <p style="text-align: center;">         _____          Typed or printed name          Stephen E. Arnett     </p> <p style="text-align: center;">         _____          Telephone Number          (206) 359-8000     </p> <p><b>NOTE:</b> This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.</p> <p><input checked="" type="checkbox"/> *Total of <u>1</u> forms are submitted.</p>					Fee	Small Entity Fee	Micro Entity Fee		<input type="checkbox"/> One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____	<input type="checkbox"/> Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____	<input checked="" type="checkbox"/> Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 700.00	<input type="checkbox"/> Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____	<input type="checkbox"/> Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____
	Fee	Small Entity Fee	Micro Entity Fee																														
<input type="checkbox"/> One month (37 CFR 1.17(a)(1))	\$200	\$100	\$50	\$ _____																													
<input type="checkbox"/> Two months (37 CFR 1.17(a)(2))	\$600	\$300	\$150	\$ _____																													
<input checked="" type="checkbox"/> Three months (37 CFR 1.17(a)(3))	\$1,400	\$700	\$350	\$ 700.00																													
<input type="checkbox"/> Four months (37 CFR 1.17(a)(4))	\$2,200	\$1,100	\$550	\$ _____																													
<input type="checkbox"/> Five months (37 CFR 1.17(a)(5))	\$3,000	\$1,500	\$750	\$ _____																													

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.

<b>PATENT APPLICATION FEE DETERMINATION RECORD</b> Substitute for Form PTO-875	Application or Docket Number <b>12/815,306</b>	Filing Date <b>06/14/2010</b>	<input type="checkbox"/> To be Mailed
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ENTITY:  LARGE  SMALL  MICRO

**APPLICATION AS FILED – PART I**

(Column 1) (Column 2)

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> 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 \$ =	
<input type="checkbox"/> 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).			
<input type="checkbox"/> 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**

(Column 1) (Column 2) (Column 3)

AMENDMENT	04/10/2013	CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	+ 18	-	-	** 20	= 0	x \$40 =
Independent (37 CFR 1.16(h))	+ 4	-	-	***3	= 1	x \$210 =	210
<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))							
<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
TOTAL ADD'L FEE							<b>210</b>

(Column 1) (Column 2) (Column 3)

AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT	MINUS	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	+	-	-	**	=	X \$ =
Independent (37 CFR 1.16(h))	+	-	-	***	=	X \$ =	
<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))							
<input type="checkbox"/> 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  
/PAMELA YOUNG/

This collection of information is required by 37 CFR 1.16. 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, 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.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.





UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
Row 1: 12/815,306, 06/14/2010, Jeffrey P. Bezos, 34563.8003US02, 1105
Row 2: 25096, 7590, 10/10/2012, PERKINS COIE LLP PATENT-SEA, P.O. BOX 1247, SEATTLE, WA 98111-1247, EXAMINER RODRIGUEZ, VICENTE M, ART UNIT 3645, PAPER NUMBER, NOTIFICATION DATE 10/10/2012, DELIVERY MODE 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):

patentprocurement@perkinscoie.com

<b>Office Action Summary</b>	<b>Application No.</b> 12/815,306	<b>Applicant(s)</b> BEZOS ET AL.	
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645	

**-- 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 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, 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 14 June 2010.
- 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) 1-20 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) 1-20 is/are rejected.
- 8)  Claim(s) \_\_\_\_\_ is/are objected to.
- 9)  Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 10)  The specification is objected to by the Examiner.
- 11)  The drawing(s) filed on 14 June 2010 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).
- 12)  The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 13)  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
    - a)  All    b)  Some \* c)  None of:
    - 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)**

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br/>           Paper No(s)/Mail Date <u>010511; 092210</u>.</li> </ul> | <ul style="list-style-type: none"> <li>4) <input type="checkbox"/> Interview Summary (PTO-413)<br/>           Paper No(s)/Mail Date. _____.</li> <li>5) <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6) <input type="checkbox"/> Other: _____.</li> </ul> |
|---|--|

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 1, 2, 3, 5, 6, 7, 8, 17, 18, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Brand et al (8,047,472), hereby referred to as Brand.**

**In regard to claim 1**, Brand teaches a method for operating a space launch vehicle (abstract), the method comprising:  
launching the space launch vehicle from earth; positioning a landing structure in a body of water; and landing the space launch vehicle on the landing structure in the body of water (C5:41-42).

**In regards to claim 2**, Brand teaches the method of claim 1 wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land (Fig 5 discloses launch from land based location).

**In regards to claim 3**, Brand teaches the method of claim 1 wherein landing the space launch vehicle includes vertically landing the space launch vehicle on a floating platform in the body of water(C5:40-42 discloses vertical descent and landing on floating platform).

**In regards to claim 5**, Brand teaches the method of claim 1 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation (Fig 5), and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation (C8:42-45).

**In regards to claim 6**, Brand teaches the method of claim 1 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation (Fig 5), and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch (Fig 5 discloses space launch vehicle of Brand reorienting to tail first), wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation while providing thrust from one or more vehicle engines in a tail-first direction (C5:38-40).

**In regards to claim 7**, Brand teaches the method of claim 1, further comprising reusing at least a portion of the space launch vehicle (abstract).

**In regards to claim 8**, Brand teaches the method of claim 1, further comprising: transporting the space launch vehicle on the landing structure to a refurbishment facility (C8:60 discloses landing barge transporting lower stage for refurbishment); refurbishing at least a portion of the space launch vehicle at the refurbishment facility; and reusing at least a portion of the space launch vehicle after refurbishment (abstract).

**In regards to claim 17**, Brand teaches a system for providing access to space, the system comprising: a space launch vehicle; a launch site; means for launching the launch vehicle from the launch site a first time; means for landing at least a portion of the launch vehicle on a structure in a body of water (Fig 5); and means for launching at least a portion of the launch vehicle from the launch site a second time (abstract discloses reusable booster).

**In regards to claim 18**, Brand teaches the system of claim 17 wherein the means for landing include means for vertically landing at least a portion of the space launch vehicle on a floating platform (C5:42).

**In regards to claim 19**, Brand teaches the system of claim 17 wherein the means for launching include means for launching the launch vehicle in a nose-first orientation (Fig 5), wherein the system further comprises means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing (C5:9 discloses rotation occurs during descent of booster), and wherein the means for landing include means for landing in the tail-first orientation (Fig 5 & C5:38 disclose tail down landing).

***Claim Rejections - 35 USC § 103***

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

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 4, 11, 12, 13, 14, 15, 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brand et al in view of Buehler (US 2007/0012820).**

**In regards to claim 4**, Brand teaches the method claim 1 but does not disclose where launching the space launch vehicle includes igniting one or more rocket engines on a booster stage.

Buehler teaches a reusable upper stage for a multistage rocket. Buehler further discloses a lower/booster stage for said rocket powered by rocket engines which are used to propel said rocket into space ([0055]).

It would have been obvious at the time of the invention to one of ordinary skill in the art to use the rocket engines of Buehler in the booster of Brand in order to carry more payload into orbit.

**In regards to claim 11**, Brand teaches a method for transporting a payload to space (abstract), the method comprising: coupling the payload to a booster stage of a rocket (C3:27-32), the booster stage having a forward end portion spaced apart from an aft end portion; positioning a floating platform in a body of water (C5:42); launching the rocket in a nose-first orientation (Fig 5); separating the payload from the booster stage (C3 50-51); after separating, reorienting the booster stage from the nose-first orientation to a tail-first orientation (C5:38 discloses rotation of booster); and landing the booster stage on the floating platform in the tail-first orientation (Fig 5) . Brand however does not disclose igniting one or more rocket engines positioned toward the aft end portion of the booster stage.

Buehler teaches a reusable upper stage for a multistage rocket. Buehler further discloses a lower/booster stage for said rocket powered by rocket engines which are used to propel said rocket into space ([0055]).

It would have been obvious at the time of the invention to one of ordinary skill in the art to use the rocket engines of Buehler in the booster of Brand in order to carry more payload into orbit.

**In regards to claim 12**, Brand teaches the limitations of claim 11 but does not disclose turning off the one or more rocket engines positioned toward the aft end portion of the booster stage before reorienting the booster stage from the nose-first orientation to the tail-first orientation; and after reorienting the booster stage, reigniting the one or more

rocket engines positioned toward the aft end portion of the booster stage to decelerate the booster stage.

Buehler teaches a reusable upper stage for a multistage rocket. Buehler further discloses whereby said upper stage's rocket engines are both shut down ([0023]) and later re-ignited in order to slow decelerate the stage ([0024]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use rocket engines of Buehler in the apparatus of Brand in order to allow for more payload and to be able to use said engines in the vacuum of space.

**In regards to claim 13**, Buehler further discloses a ballistic trajectory after engine shutoff ([0021]) and aerodynamic control surfaces to facilitate from a nose first to tail first orientation ([0025]).

**In regards to claim 14**, Buehler further discloses deploying one or more flared surfaces to facilitate from a nose first to a tail first orientation ([0025]).

**In regards to claim 15**, Buehler further discloses operating one or more propulsive thrusters to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation ([claim 5]).

**In regards to claim 16**, Buehler further discloses turning off the one or more rocket engines after separating the payload from the booster stage ([0023]);



- moving an aerodynamic control surface to at least partially control a flight path toward the platform based on platform positional information received from the platform ([0025]);
- moving the aerodynamic control surface to at least partially reorient from nose-first orientation to a tail-first orientation; and
- after reorienting, reigniting the one or more rocket engines, wherein landing includes performing a powered, vertical landing (abstract).

**Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brand, Buehler, as applied to claims 4, 11 above, and further in view of Drymon (6.176,451).**

**In regards to claim 10**, Brand teaches the limitation of claim 1 and further shows the space launch vehicle includes a payload carried on an upper stage mounted to a booster stage (C3:27-29), but does not show said booster receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information;

Drymon teaches a method comprising a ground control station and an unmanned airborne vehicle that is used to relay data to and from a space vehicle such as a rocket (C1:56-57). Said method further includes guidance and control (C3:6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the data communication method of Drymon in the invention of Brand as said

method is cost effective and may be used over a large geographic expanse that may be covered by a returning spacecraft.

**Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brand in view of Solid Rocket Boosters and Post-Launch Processing, FS-2004-07-012-KSC (Rev. 2006), NASA Facts, National Aeronautics and Space Administration, John F. Kennedy Space Center.**

**In regards to claim 9**, Brand teaches the limitations to claim 1, but does not disclose transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle.

NASA Facts discloses a recovery of a solid rocket booster from a water landing by a recovery ship. The recovery ship tows said booster to booster refurbishment area. Further, booster frustum is lifted by crane onto said recovery ship for transport (pg 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the transferring of said booster frustum to recovery ship for transport to refurbishment area in the invention of Brand to provide for a quicker delivery of booster to refurbishment facility and to allow for landing barge to remain on station for more landings.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VICENTE RODRIGUEZ whose telephone number is (571)272-4798. The examiner can normally be reached on Monday-Thursday 8-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Isam Alsomiri can be reached on 571-272-6970. 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.

/V. R./  
Examiner, Art Unit 3645

/ISAM ALSOMIRI/  
Supervisory Patent Examiner, Art Unit 3645

<b>Notice of References Cited</b>	Application/Control No. 12/815,306	Applicant(s)/Patent Under Reexamination BEZOS ET AL.	
	Examiner VICENTE RODRIGUEZ	Art Unit 3645	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A US-8,047,472	11-2011	Brand et al.	244/158.9
*	B US-2007/0012820	01-2007	Buehler, David	244/158.9
*	C US-6,176,451	01-2001	Drymon, Thomas S.	244/3.14
	D US-			
	E US-			
	F US-			
	G US-			
	H US-			
	I US-			
	J US-			
	K US-			
	L US-			
	M US-			

**FOREIGN PATENT DOCUMENTS**

*	Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N				
	O				
	P				
	Q				
	R				
	S				
	T				

**NON-PATENT DOCUMENTS**

*	Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)			
U	Solid Rocket Boosters and Post-Launch Processing, FS-2004-07-012-KSC (Rev. 2006), NASA Facts, National Aeronautics and Space Administration, John F. Kennedy Space Center.			
V				
W				
X				

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<b>Index of Claims</b> 	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

✓	<b>Rejected</b>
=	<b>Allowed</b>

-	<b>Cancelled</b>
÷	<b>Restricted</b>

N	<b>Non-Elected</b>
I	<b>Interference</b>

A	<b>Appeal</b>
O	<b>Objected</b>

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant			<input type="checkbox"/> CPA			<input type="checkbox"/> T.D.			<input type="checkbox"/> R.1.47		
CLAIM		DATE									
Final	Original	09/20/2012									
	1	✓									
	2	✓									
	3	✓									
	4	✓									
	5	✓									
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	17	✓									
	18	✓									
	19	✓									
	20	✓									

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.R./

PTO/SB/08b (07-09)

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449/PTO				<b>Complete if Known</b>	
				Application Number	12/815,306-Conf. #1105
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)				Filing Date	June 14, 2010
				First Named Inventor	Jeffrey P. Bezos
				Art Unit	3644
				Examiner Name	Not Yet Assigned
				Attorney Docket Number	345638003US2
Sheet	1	of	1		

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-2,807,429	09-24-1957	Hawkins et al.	
		US-3,286,951	11-22-1966	Kendall et al.	
		US-6,176,451	01-23-2001	Drymon	
		US-6,817,580	11-16-2004	Smith	
		US-20070012820-A1	01-18-2007	Buehler	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>7</sup>
		International Search Report and Written Opinion for International Application No. PCT/US2010/038553, mailed December 15, 2010, 10 pages.	

Examiner Signature	/Vicente Rodriguez/	Date Considered	09/20/2012
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with a single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.R./

34563-8003.US02/LEGAL19857910.1

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PTO/SB/08b (07-09)

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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Substitute for form 1449/PTO			<b>Complete if Known</b>	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)			Application Number	12/815,306-Conf. #1105
			Filing Date	June 14, 2010
			First Named Inventor	Jeffrey P. Bezos
			Art Unit	3644
			Examiner Name	Not Yet Assigned
			Attorney Docket Number	345638003US2
Sheet	1	of	1	

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)	MM-DD-YYYY		
		US-12/712,083	02-24-2010	Featherstone	
		US-12/712,156	02-24-2010	Boelitz	
		US-3,711,040	01-16-1973	Carver	
		US-5,568,901	10-29-1996	Stiennon	
		US-6,247,666	06-19-2001	Baker et al.	
		US-6,454,216	09-24-2002	Kiselev et al.	
		US-6,926,576	08-09-2005	Alway et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)	MM-DD-YYYY			
		DE-10058339-A1	06-06-2002	Infineon Technologies Ag		
		EP-1340316-A1	09-03-2003	Infineon Technologies Ag		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>7</sup>
		Hare, John "VTVLs as RTLS Boosters," Selenian Boondocks, <a href="http://selenianboondocks.com/2010/06/vtvl-as-rtls-boosters/">http://selenianboondocks.com/2010/06/vtvl-as-rtls-boosters/</a> , accessed June 30, 2010, 6 pgs.	

Examiner Signature	/Vicente Rodriguez/	Date Considered	09/20/2012
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with an single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /V.R./

34563-8003.US02/LEGAL19188300.1

**EAST Search History**

**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	(12/815306).APP.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2012/09/13 14:58
S2	23	("6926576"   "3286951"   "20070012820"   "6176451"   "3711040"   "2807429"   "6817580"   "6247666"   "6454216"   "5568901").PN.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/13 15:27
S3	281	bezos.in.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/13 15:31
S4	53	S3 and space	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/13 15:31
S5	1	S3 and rocket	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/13 15:32
S6	86	244/158.9.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/18 09:19
S7	12	("3063240"   "3066480"   "3215372"   "5593110"   "5740985"   "6450452"   "6612522"   "6616092"   "6817580").PN. OR ("8047472").URPN.	US- PGPUB; USPAT; USOCR	OR	ON	2012/09/18 09:32
S8	1	"11422554"	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/18 10:30
S9	321	244/158.1.ccls.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/18 10:33
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EAST Search History

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S14	2	"3295790".pn.	US- PGPUB; USPAT; USOCR	OR	ON	2012/09/18: 15:45
S15	7	("3295790").URPN.	USPAT	OR	ON	2012/09/18: 15:48


9/ 25/ 2012 11:41:04 AM

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**EAST Search History****EAST Search History (Prior Art)**

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S40	6	kawkins.in.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/21 09:16
S41	8660	hawkins.in.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/21 09:16
S42	0	S41 and (vertical adj takeoff)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/21 09:16
S43	2	hawkins and (vertical adj takeoff)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/21 09:17
S44	6459	kendall and space	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/21 09:19
S45	3	kendall and (space adj launch)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2012/09/21 09:19
S46	22	("3118636"   "3604667").PN. OR ("4896847").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2012/09/21 09:20
S47	25	"3286951"	US-PGPUB; USPAT; USOCR	OR	ON	2012/09/21 09:45
S48	23044	"3286951" and kendall	US-PGPUB; USPAT; USOCR	OR	ON	2012/09/21 09:45
S49	24	"3286951" and kendall	US-PGPUB; USPAT; USOCR	OR	ON	2012/09/21 09:45
S50	17	("3286951").URPN.	USPAT	OR	ON	2012/09/21 09:59

**9/ 25/ 2012 11:43:31 AM****C:\Users\vrodriquez\Documents\EAST\Workspaces\junk 747 306.wsp**

<b>Search Notes</b>  	<b>Application/Control No.</b> 12815306	<b>Applicant(s)/Patent Under Reexamination</b> BEZOS ET AL.
	<b>Examiner</b> VICENTE RODRIGUEZ	<b>Art Unit</b> 3645

<b>SEARCHED</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>
244	158.9, 158.1	09/18/2012	VR

<b>SEARCH NOTES</b>			
<b>Search Notes</b>		<b>Date</b>	<b>Examiner</b>
inventer name search		09/13/2012	VR
NPL search, NASA technical reports server		09/17/2010	VR

<b>INTERFERENCE SEARCH</b>			
<b>Class</b>	<b>Subclass</b>	<b>Date</b>	<b>Examiner</b>

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UNITED STATES PATENT AND TRADEMARK OFFICE

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Table with 4 columns: APPLICATION NUMBER (12/815,306), FILING OR 371(C) DATE (06/14/2010), FIRST NAMED APPLICANT (Jeffrey P. Bezos), ATTY. DOCKET NO./TITLE (34563.8003US02)

CONFIRMATION NO. 1105

PUBLICATION NOTICE



25096
PERKINS COIE LLP
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

Title:SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

Publication No.US-2011-0017872-A1

Publication Date:01/27/2011

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 Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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.

Substitute for form 1449/PTO				<b>Complete if Known</b>	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)				Application Number	12/815,306-Conf. #1105
				Filing Date	June 14, 2010
				First Named Inventor	Jeffrey P. Bezos
				Art Unit	3644
				Examiner Name	Not Yet Assigned
Sheet	1	of	1	Attorney Docket Number	345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)			
		US-2,807,429	09-24-1957	Hawkins et al.	
		US-3,286,951	11-22-1966	Kendall et al.	
		US-6,176,451	01-23-2001	Drymon	
		US-6,817,580	11-16-2004	Smith	
		US-20070012820-A1	01-18-2007	Buehler	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)				

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>7</sup>

Examiner Signature		Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \*CITE NO.: Those application(s) which are marked with a single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

34563-8003.US02/LEGAL19857910.1

34563-8W3.WOVO  
SEA/PQ

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To: STEPHEN ARNETT  
PERKINS COIE LLP  
P.O. BOX 1247  
SEATTLE, WA 98111-1247

DOCKETED TO CPI  
2-15-11  
4-15-11  
SB

Deadline  
 Follow up  
 Previously  
 Abandoned  
 Transferred  
 Docketed

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL SEARCH REPORT AND  
THE WRITTEN OPINION OF THE INTERNATIONAL  
SEARCHING AUTHORITY, OR THE DECLARATION  
(PCT Rule 44.1)

RECEIVED  
PATENT DOCKETING  
DEC 16 2010  
PERKINS COIE LLP

Date of mailing  
(day/month/year) 15 DEC 2010

Applicant's or agent's file reference 345638003WO	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US2010/038553	International filing date (day/month/year) 14 June 2010
Applicant BEZOS, Jeffrey	

1.  The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

**Filing of amendments and statement under Article 19:**  
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

**Where?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes  
1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2.  The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3.  With regard to any protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90bis.1 and 90bis.3).

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise, the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see [www.wipo.int/pct/en/texts/time\\_limits.html](http://www.wipo.int/pct/en/texts/time_limits.html) and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISAUS Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774
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Form PCT/ISA/220 (July 2010)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 345638003WO	<b>FOR FURTHER ACTION</b>	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2010/038553	International filing date (day/month/year) 14 June 2010	(Earliest) Priority Date (day/month/year) 15 June 2009
Applicant BEZOS, Jeffrey		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of:

- the international application in the language in which it was filed.  
 a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b.  This international search report has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c.  With regard to any nucleotide and/or amino acid sequence disclosed in the international application, see Box No. I.

2.  Certain claims were found unsearchable (see Box No. II).

3.  Unity of invention is lacking (see Box No. III).

4. With regard to the title,

- the text is approved as submitted by the applicant.  
 the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- the text is approved as submitted by the applicant.  
 the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

- a. the figure of the drawings to be published with the abstract is Figure No. 1  
 as suggested by the applicant.  
 as selected by this Authority, because the applicant failed to suggest a figure.  
 as selected by this Authority, because this figure better characterizes the invention.
- b.  none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2010/038553

Box No. IV Text of the abstract (Continuation of Item 5 of the first sheet)

Launch vehicle systems and methods for landing and recovering a booster stage and/or other portions thereof on a platform at sea or on another body of water are disclosed. In one embodiment, a reusable space launch vehicle is launched from a coastal launch site in a trajectory over water. After booster engine cutoff and upper stage separation, the booster stage reenters the earth's atmosphere in a tail-first orientation. The booster engines are then restarted and the booster stage performs a vertical powered landing on the deck of a pre-positioned sea-going platform. In one embodiment, bi-directional aerodynamic control surfaces control the trajectory of the booster stage as it glides through the earth's atmosphere toward the sea-going platform. The sea-going platform can broadcast its real-time position to the booster stage so that the booster stage can compensate for errors in the position of the sea-going platform due to current drift.

Form PCT/ISA/210 (continuation of first sheet (3)) (July 2009)



**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/US2010/038553

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(B) - B64G 1/00 (2010.01) USPC - 244/158.9 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC(B) - B64G 1/00, 1/40, 1/62 (2010.01) USPC - 244/158.1, 158.9, 159.3 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 practicable, search terms used) PatBase		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2007/0012820 A1 (BUEHLER) 18 January 2007 (18.01.2007) entire document	1-20
Y	US 2,807,429 A (HAWKINS Jr et al) 24 September 1957 (24.09.1957) entire document	1-20
Y	US 3,286,951 A (KENDALL) 22 November 1966 (22.11.1966) entire document	8-9
Y	US 6,176,451 B1 (DRYMON) 23 January 2001 (23.01.2001) entire document	10, 16
A	US 6,817,580 B2 (SMITH) 16 November 2004 (16.11.2004) entire document	1-20
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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 application or patent 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 01 December 2010		Date of mailing of the international search report <p align="center"><b>15 DEC 2010</b></p>
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

**PATENT COOPERATION TREATY**

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: STEPHEN ARNETT  
PERKINS COIE LLP  
P.O. BOX 1247  
SEATTLE, WA 98111-1247

**PCT**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing (day/month/year)		<b>15 DEC 2010</b>
Applicant's or agent's file reference <b>345638003WO</b>		<b>FOR FURTHER ACTION</b> See paragraph 2 below
International application No. <b>PCT/US2010/038553</b>	International filing date (day/month/year) <b>14 June 2010</b>	Priority date (day/month/year) <b>15 June 2009</b>
International Patent Classification (IPC) or both national classification and IPC <b>IPC(8) - B64G 1/00 (2010.01)</b> <b>USPC - 244/158.9</b>		
Applicant <b>BEZOS, Jeffrey</b>		

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Date of completion of this opinion  <b>01 December 2010</b>	Authorized officer:  <b>Blaine R. Copenheaver</b>  <small>PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</small>
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Form PCT/ISA/237 (cover sheet) (July 2009)

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US2010/038553

Box No. 1 Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
  - the international application in the language in which it was filed.
  - a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2.  This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - on paper
    - in electronic form
  - b. (time)
    - in the international application as filed
    - together with the international application in electronic form
    - subsequently to this Authority for the purposes of search
4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2010/038553

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Claims	<u>1-20</u>	YES
	Claims	<u>None</u>	NO
Inventive step (IS)	Claims	<u>None</u>	YES
	Claims	<u>1-20</u>	NO
Industrial applicability (IA)	Claims	<u>1-20</u>	YES
	Claims	<u>None</u>	NO

**2. Citations and explanations:**

Claim 1-7, 11-15 and 17-20 lacks an inventive step under PCT Article 33(3) as being obvious over by Buehler modified by Hawkins, Jr. et al. (henceforth Hawkins).

Regarding Claim 1, Buehler discloses a method for operating a space launch vehicle (Fig. 1 and Para. [0055]), the method comprising: launching the space launch vehicle from earth (Fig. 1, Para. [0055] and Cl. 19); and landing the space launch vehicle (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of a method for operating a space launch vehicle comprising positioning a landing structure in a body of water; and landing the space launch vehicle on the landing structure in the body of water. Hawkins, however, teaches of a method for operating a vehicle comprising positioning a landing structure in a body of water (vessel V, Fig. 1); and landing the space launch vehicle on the landing structure in the body of water (vertical landing of A onto V, as represented in Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

Regarding Claim 2, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land (Fig. 1, Para. [0019] and Cl. 20).

Regarding Claim 3, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method wherein landing the space launch vehicle includes vertically landing the space launch vehicle (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of a method comprising landing a vehicle on a floating platform in a body of water. Hawkins, however, teaches of a method comprising landing a vehicle on a floating platform in a body of water (vertical landing of A onto V, as represented in Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

Regarding Claim 4, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method wherein launching the space launch vehicle includes igniting one or more rocket engines on a booster stage (a gas trail is evident in Fig. 1 coming from the nozzle of lower/booster stage rocket 105, which clearly indicated the ignition of a rocket engine to achieve lift-off; also Para. [0023]), and wherein landing the space launch vehicle includes vertically landing the upper stage (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of vertically landing on the landing structure in the body of water and vertically landing a booster stage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow a booster stage to be vertically landed, in the same manner as the vertical landing of the upper stage as per Buehler in Claim 1 above, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art. Hawkins, however, teaches of a method for operating a vehicle comprising landing a space launch vehicle on a landing structure in the body of water (vertical landing of A onto V, as represented in Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

Regarding Claim 5, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method wherein launching the space launch vehicle includes launching the vehicle (100) in a nose-first orientation (Fig. 1, Para. [0055] and Cl. 19), and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch (Fig. 3, Paragraphs [0072]-[0076] and Cl. 20), wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation (Fig. 3, Paragraphs [0074]-[0076] and Cl. 20).

Regarding Claim 6, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method wherein launching the space launch vehicle includes launching the vehicle (100) in a nose-first orientation (Fig. 1, Para. [0055] and Cl. 19), and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch (Fig. 3 and Paragraphs [0072]-[0076]), wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation (Fig. 3, Paragraphs [0074]-[0076] and Cl. 20) while providing thrust (decelerating using rocket thrust when near the Earth, Fig. 3 and Cl. 20) from one or more vehicle engines (propulsion module 200 with engine nozzles, Paragraphs [0059]-[0061]) in a tail-first direction (Fig. 3 and Cl. 20).

Regarding Claim 7, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method further comprising reusing at least a portion of the space launch vehicle (reusable upper-stage, Cl. 1).

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2010/038553

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding Claim 11, Buehler discloses a method for transporting a payload to space (payload launch Fig. 1 and Para. [0033]), the method comprising: coupling the payload (payload compartment 225 with payload 120, Para. [0059], are carried in upper stage 110, Fig. 1) to a booster stage (105) of a rocket (100), the booster stage (105) having a forward end portion spaced apart from an aft end portion (Fig. 1); igniting one or more rocket engines positioned toward the aft end portion of the booster stage (a gas trail is evident in Fig. 1 coming from the nozzle of lower/booster stage rocket 105, which clearly indicated the ignition of a rocket engine to achieve lift-off; also Para. [0023]) and launching the rocket (Fig. 1, Para. [0055] and Cl. 19) toward space in a nose-first orientation (as evident in Fig. 1); separating the payload from the booster stage (Fig. 1 and Para. [0023]); after separating, reorienting the upper stage from the nose-first orientation to a tail-first orientation (Fig. 3, Paragraphs [0072]-[0075] and Cl. 20); and landing the upper stage in the tail-first orientation (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of a method for operating a space launch vehicle wherein the steps of reorienting and landing involves the booster stage; and comprising positioning a landing structure in a body of water, and landing the booster stage on the floating platform. Hawkins, however, teaches of a method for operating a vehicle comprising positioning a landing structure in a body of water (vessel V, Fig. 1); and landing a space launch vehicle on a floating platform (vertical landing of A onto V, as represented in Fig. 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the steps of reorienting and landing to involve a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

Regarding Claim 12, Buehler modified by Hawkins discloses the method of Claim 11. Buehler further teaches of a method further comprising: turning off the one or more rocket engines positioned toward the aft end portion of the upper stage before reorienting the upper stage from the nose-first orientation to the tail-first orientation (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are off; also Cl. 20); and after reorienting the upper stage (Fig. 3), reigniting the one or more rocket engines positioned toward the aft end portion of the upper stage to decelerate the upper stage (part e of Fig. 3, Para. [0075]), wherein landing the upper stage includes performing a powered, vertical landing of the upper stage on the platform (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of a method wherein the steps of turning off, reorienting, reigniting and landing involves the booster stage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the steps of turning off, reorienting, reigniting and landing to involve a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art.

Regarding Claim 13, Buehler modified by Hawkins discloses the method of Claim 11. Buehler further teaches of a method further comprising: turning off the one or more rocket engines (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are off; also Cl. 20) and following a ballistic trajectory (Figs. 1&3); and deploying an aerodynamic control surface from the upper stage (moveable aerodynamic surfaces, Cl. 18) to facilitate reorienting the upper stage from the nose-first orientation to a tail-first orientation (Fig. 3); but fails to explicitly teach of a method wherein the steps of turning off and reorienting involves the booster stage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the steps of turning off and reorienting to involve a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art.

Regarding Claim 14, Buehler modified by Hawkins discloses the method of Claim 11. Buehler further teaches of a method further comprising: turning off the one or more rocket engines (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are off; also Cl. 20) and following a ballistic trajectory (Figs. 1&3); and deploying one or more flared control surfaces from the forward end portion of the upper stage (small, moveable aerodynamic surfaces, Para. [0074] and Cl. 18) to facilitate reorienting the upper stage from the nose-first orientation to a tail-first orientation (Fig. 3); but fails to explicitly teach of a method wherein the steps of turning off and reorienting involves the booster stage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the steps of turning off and reorienting, to involve a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art.

Regarding Claim 15, Buehler modified by Hawkins discloses the method of Claim 11. Buehler further teaches of a method further comprising: turning off the one or more rocket engines (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are turned off; also Cl. 20); and operating one or more propulsive thrusters mounted to the upper stage (ignite engine module, Para. [0075] and Cl. 5; also deceleration using rocket thrust, Cl. 20) to facilitate reorienting the upper stage from the nose-first orientation to a tail-first orientation (Fig. 3); but fails to explicitly teach of a method wherein the steps of turning on one or more propulsive thrusters involves thrusters mounted on a booster stage. It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the thrusters being turned on to be mounted to a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art.

Regarding Claim 17, Buehler discloses a system for providing access to space (Fig. 1 and Cl. 1), the system comprising: a space launch vehicle (100/105/110, Fig. 1); a launch site (Fig. 1, Para. [0019] and Cl. 20); means for launching the launch vehicle (Fig. 1, Para. [0055] and Cl. 19) from the launch site a first time (lower stage rocket 105 in Fig. 1 allows rocket 100 to be launched as in Fig. 1); means for landing at least a portion of the launch vehicle (vertical landing, Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); and means for launching at least a portion of the launch vehicle (Cl. 19) from the launch site a second time (vertical landing of upper stage in Fig. 3, provides a reusable upper stage, Claims 1 and 20) and landing the space launch vehicle (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of a system for landing at least a portion of the launch vehicle on a structure in a body of water. Hawkins, however, teaches of a system for landing at least a portion of a launch vehicle on a structure in a body of water (vertical landing of A onto V, as represented in Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US2010/038553

Supplemental Box

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Regarding Claim 18, Buehler modified by Hawkins discloses the system of Claim 17. Buehler further teaches of a system wherein the means for landing include means for vertically landing at least a portion of the space launch vehicle (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); but fails to explicitly teach of a system wherein the vertical landing is on a floating platform. Hawkins, however, teaches of a system wherein the vertical landing of a vehicle is on a floating platform (vertical landing of A onto V, as represented in Fig. 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins with the disclosure of Buehler to enable the soft landing of booster rocket for eventual reuse.

Regarding Claim 19, Buehler modified by Hawkins discloses the system of Claim 17. Buehler further teaches of a system wherein the means for launching include means for launching the launch vehicle in a nose-first orientation (Fig. 1 and Cl. 19), wherein the system further comprises means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing (Fig. 3, Paragraphs [0072]-[0076] and Cl. 20), and wherein the means for landing include means for landing in the tail-first orientation (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20).

Regarding Claim 20, Buehler modified by Hawkins discloses the system of Claim 19. Buehler further teaches of a system wherein the space launch vehicle includes one or more rocket engines (nozzle of rocket engine for lower stage 105 is evident in Fig. 1, and the engine for upper stage 110 is part of propulsion module 200 in Fig. 2b, Para. [0059]), wherein the means for launching include means for igniting the rocket engines (a gas trail is evident in Fig. 1 coming from the nozzle of lower/booster stage rocket 105, which clearly indicated the ignition of a rocket engine to achieve lift-off; also Para. [0023]) and launching the vehicle in a nose-first orientation (Fig. 1 and Cl. 19), and wherein the system further comprises: means for shutting off the rocket engines (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are off; also Cl. 20); means for reorienting the launch vehicle from the nose-first orientation to a tail-first orientation before landing (Fig. 3, Paragraphs [0073]-[0076] and Cl. 20); and means for reigniting one or more of the rocket engines when the launch vehicle is in the tail-first orientation to decelerate the vehicle (Cl. 20), wherein the means for landing include means for landing in the tail-first orientation while the one or more rocket engines are thrusting (decelerating using rocket thrust, Fig. 3, Para. [0075] and Cl. 20).

Claims 8-9 lack an inventive step under PCT Article 33(3) as being obvious over by Buehler modified by Hawkins, Jr. et al. (henceforth Hawkins) and Kendall.

Regarding Claim 8, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method comprising reusing at least a portion of the space launch vehicle after refurbishment (reusable upper-stage, Cl. 1); but fails to explicitly teach of a method comprising: transporting the space launch vehicle on the landing structure to a refurbishment facility; and refurbishing at least a portion of the space launch vehicle at the refurbishment facility. Kendall, however, teaches of method comprising: transporting the space launch vehicle on the landing structure to a refurbishment facility (towing the vehicle to a recovery building or area are reduced if towing is conducted on water, Col. 5, Lns. 30-34); and refurbishing at least a portion of the space launch vehicle at the refurbishment facility (The gas bag 12, heat shield 10 and rocket booster 14 may then be refurbished and re-used, Col. 5, Lns. 39-40). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the retrieval and refurbishment approach of Kendall with the disclosure of Buehler to enable the eventual reuse of the space launch vehicle.

Regarding Claim 9, Buehler modified by Hawkins discloses the method of Claim 1. Buehler fails to explicitly teach of a method further comprising transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle. Hawkins, however, teaches of a method comprising transferring a vehicle while the landing structure remains in the body of water to receive a subsequently launched vehicle (vehicle A in Fig. 1 is capable of taking off from vessel V, after refueling, while vessel V remains water bound to provide a landing platform for another vehicle similar to A). In addition, Kendall teaches of a method further comprising transferring a reusable portion of the space launch vehicle (The gas bag 12, heat shield 10 and rocket booster 14 may then be refurbished and re-used, Col. 5, Lns. 39-40) from the landing structure to a transit vessel (towing the vehicle to a recovery building or area are reduced if towing is conducted on water, Col. 5, Lns. 30-34). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the floating launch and landing platform of Hawkins and the retrieval and refurbishment approach of Kendall with the disclosure of Buehler to enable the eventual reuse of the space launch vehicle.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.  
PCT/US2010/038553

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Claims 10 and 16 lack an inventive step under PCT Article 33(3) as being obvious over by Buehler modified by Hawkins, Jr. et al. (henceforth Hawkins) and Drymon.

Regarding Claim 10, Buehler modified by Hawkins discloses the method of Claim 1. Buehler further teaches of a method wherein the space launch vehicle includes a payload carried on an upper stage (payload compartment 225 in upper stage depicted in Fig. 2a; also Para. [0059]) mounted to a booster stage (two-stage rocket 100, Fig. 1), wherein launching the space launch vehicle from earth (Fig. 1, Para. [0055] and Cl. 19) includes igniting one or more rocket engines on the booster stage (a gas trail is evident in Fig. 1 coming from the nozzle of lower/booster stage rocket 105, which clearly indicated the ignition of a rocket engine to achieve lift-off; also Para. [0023]) to launch the space launch vehicle from a launch site on land in a nose-first orientation (Fig. 1, Para. [0019] and Cl. 19), and wherein the method further comprises: turning off the one or more rocket engines on the upper stage (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are off; also Cl. 20); separating the upper stage (110) from the booster stage (105) at a predetermined altitude (Fig. 1 and Para. [0023]); reorienting the upper stage to a tail-first orientation (Fig. 3, Paragraphs [0072]-[0076] and Cl. 20); and reigniting the one or more rocket engines on the upper stage prior to landing (Para. [0075] and Cl. 20), wherein landing the space launch vehicle includes vertically landing the upper stage on the platform in the tail-first orientation (as evident in Fig. 3) while providing thrust from the reignited one or more rocket engines (Cl. 20); and controlling a trajectory of the booster stage (Fig. 3) as it moves toward the landing platform in the tail-first orientation (control of rocket stag in Fig. 3 is achieved via control system 240 and propulsion module 220, Para. [0059]), corresponding to the guidance and control system in Claims 1, 5 and 9); but fails to explicitly teach of a method wherein landing the space launch vehicle includes landing the space launch vehicle on a mobile landing platform in the body of water; wherein the steps of turning off, reorienting, reigniting and landing involves the booster stage; and receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information. Hawkins, however, teaches of a method wherein landing the space launch vehicle includes landing the space launch vehicle on a mobile landing platform in the body of water (vertical landing of A onto ocean vessel V, as represented in Fig. 1). In addition, Drymon teaches of a method comprising receiving positional information from a landing platform (satellite communication system 33 provides a communication link or relay between the satellite communication system 23 located in the control station 20 and the satellite, not shown, that is in turn used to communicate with the space lift vehicle 50, Col. 4, Lns. 17-21) and controlling a trajectory of a booster stage based on the positional information (Col. 3, Lns. 6-14). It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the steps of turning off, reorienting, reigniting and landing to involve a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the landing on an offshore platform approach of Hawkins and the ground based communication approach of Drymon with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

Regarding Claim 16, Buehler modified by Hawkins discloses the method of Claim 11. Buehler further teaches of a method further comprising: turning off the one or more rocket engines after separating the payload (Fig. 1 depicts the engines of 110 firing after 105 is detached, and then subsequently the engines are off; also Cl. 20) from the booster stage (105, Fig. 1); moving an aerodynamic control surface on the upper stage to at least partially control a flight path of the upper stage toward the platform (small, moveable aerodynamic surfaces, Para. [0074] and Cl. 18); moving the aerodynamic control surface on the upper stage (small, moveable aerodynamic surfaces, Para. [0074] and Cl. 18) to at least partially reorient the upper stage from the nose-first orientation to a tail-first orientation (Fig. 3); and after reorienting the upper stage (Fig. 3, Paragraphs [0072]-[0076] and Cl. 20), reigniting the one or more rocket engines positioned toward the aft end portion of the upper stage (part e of Fig. 3, Para. [0075]; Cl. 20), wherein landing the upper stage includes performing a powered, vertical landing of the upper stage on the platform (vertical landing, Fig. 3, Paragraphs [0075]-[0076] and Cl. 20); but fails to explicitly teach of a method wherein the steps of turning off, reorienting, reigniting and landing involves the booster stage; and moving aerodynamic control surfaces is based on platform positional information received from the platform. Drymon, however, teaches of a method comprising receiving positional information from a landing platform to control flight (satellite communication system 33 provides a communication link or relay between the satellite communication system 23 located in the control station 20 and the satellite, not shown, that is in turn used to communicate with the space lift vehicle 50, Col. 4, Lns. 17-21). It would have been obvious to one of ordinary skill in the art at the time the invention was made to allow the steps of turning off, reorienting, reigniting and landing to involve a booster stage, rather than an upper stage as per Buehler, to enable reuse of a booster stage to reduce the expense of launching a payload into space, since rearranging parts of an invention only involves routine skill in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the ground based communication approach of Drymon with the disclosure of Buehler to enable the soft landing of a booster rocket for eventual reuse.

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	9168582
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Paula Quinanola
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	345638003US2
<b>Receipt Date:</b>	05-JAN-2011
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	14:21:08
<b>Application Type:</b>	Utility under 35 USC 111(a)

### Payment information:

Submitted with Payment	no
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### File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		8003us2IDS.pdf	246820 aa9cf577998a1b8c0a7f46070d7900fc0deb bb33	yes	3



Multipart Description/PDF files in .zip description					
Document Description			Start	End	
Transmittal Letter			1	2	
Information Disclosure Statement (IDS) Filed (SB/08)			3	3	
<b>Warnings:</b>					
<b>Information:</b>					
2	NPL Documents	8003ISR.pdf	641846	no	10
			d22452a9fa79993afa52e4970a1014dc7303ca7		
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<p>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.</p> <p><b><u>New Applications Under 35 U.S.C. 111</u></b>  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.</p> <p><b><u>National Stage of an International Application under 35 U.S.C. 371</u></b>  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.</p> <p><b><u>New International Application Filed with the USPTO as a Receiving Office</u></b>  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.</p>					

Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3644

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT (IDS)**

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

Sir:

Pursuant to 37 CFR 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed before the mailing date of a first Office Action on the merits as far as is known to the undersigned (37 CFR 1.97(b)(3)).

In accordance with 37 CFR 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of non-patent literature in accordance with 37 CFR 1.98(a)(2).

34563-8003.US02/LEGAL19857260.1

This Information Disclosure Statement is not to be construed as a representation that: (i) a search has been made; (ii) additional information that may be material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the cited information is, or is considered to be, material to patentability. In addition, applicant does not admit that any enclosed item of information constitutes prior art to the subject invention and specifically reserves the right to demonstrate that any such reference is not prior art.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR 1.98 and the Examiner is respectfully requested to consider the listed references.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 345638003US2.

Dated: Dec 3, 2011

Respectfully submitted,

By 

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Table with 7 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY.DOCKET.NO, TOT CLAIMS, IND CLAIMS. Row 1: 12/815,306, 06/14/2010, 3644, 527, 345638003US2, 20, 3

CONFIRMATION NO. 1105

CORRECTED FILING RECEIPT

25096
PERKINS COIE LLP
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247



Date Mailed: 10/25/2010

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

Applicant(s)

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Assignment For Published Patent Application

Blue Origin, LLC, Kent, WA

Power of Attorney: The patent practitioners associated with Customer Number 25096

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/218,029 06/17/2009
and claims benefit of 61/187,243 06/15/2009

Foreign Applications

If Required, Foreign Filing License Granted: 06/22/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 12/815,306

Projected Publication Date: 01/27/2011

Non-Publication Request: No

Early Publication Request: No

\*\* SMALL ENTITY \*\*

**Title**

SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

**Preliminary Class**

244

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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.

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**Title 37, Code of Federal Regulations, 5.11 & 5.15**

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Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3644

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

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Examiner: Not Yet Assigned

**REQUEST FOR CORRECTED UPDATED FILING RECEIPT**

Office of Initial Patent Examination's Filing Receipt Corrections  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicant hereby requests that a corrected Filing Receipt be issued in the above-identified patent application. The official Filing Receipt received by Applicant, a copy of which is attached hereto, has an error in the Domestic Priority data as claimed by applicant. Please delete the following priority data as follows:

[and claims benefit of 61/187,268, 06/15/2009]

Applicant additionally requests that all pertinent U.S. Patent and Trademark Office records relating to the subject application be changed to reflect this correction.

34563-8003.US02/LEGAL19398081.1

Application No.: 12/815,306

Docket No.: 345638003US2

Applicant believes no fee is due with this request. However, if a fee is due, please charge our Deposit Account No. 50-0665, under Order No. 345638003US2 from which the undersigned is authorized to draw.

Dated: October 15, 2010

Respectfully submitted,

By 

Stephen E. Arnett

Registration No.: 47,392

PERKINS COIE LLP

P.O. Box 1247

Seattle, Washington 98111-1247

(206) 359-8000

(206) 359-7198 (Fax)

Attorney for Applicant



**REVIEWED**  
By Carrie A. Gibson at 9:16 am, Oct 05, 2010



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
12/815,306	06/14/2010	3644	527	345638003US2	20	3

CONFIRMATION NO. 1105

UPDATED FILING RECEIPT



25096  
PERKINS COIE LLP  
PATENT-SEA  
P.O. BOX 1247  
SEATTLE, WA 98111-1247

Date Mailed: 10/05/2010

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**

**Applicant(s)**

Jeffrey P. Bezos, Greater Seattle, WA;  
Gary Lai, Seattle, WA;  
Sean R. Findlay, Seattle, WA;

**Assignment For Published Patent Application**

Blue Origin, LLC, Kent, WA

**Power of Attorney:** The patent practitioners associated with Customer Number 25096

**Domestic Priority data as claimed by applicant**

This appln claims benefit of 61/218,029 06/17/2009  
and claims benefit of 61/187,243 06/15/2009  
~~and claims benefit of 61/187,268 06/15/2009~~

**Foreign Applications**

**If Required, Foreign Filing License Granted:** 06/22/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/815,306**

**Projected Publication Date:** 01/13/2011

**Non-Publication Request:** No

**Early Publication Request:** No

**\*\* SMALL ENTITY \*\***

**Title**

SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

**Preliminary Class**

244

**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 (1-866-999-4158).

**LICENSE FOR FOREIGN FILING UNDER**

**Title 35, United States Code, Section 184**

**Title 37, Code of Federal Regulations, 5.11 & 5.15**

**GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

page 2 of 3

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	8638761
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Paula Quinanola
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	345638003US2
<b>Receipt Date:</b>	15-OCT-2010
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	17:33:53
<b>Application Type:</b>	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	Request for Corrected Filing Receipt	8003US2RCFR.pdf	168014 <small>9e6c54b529bd0ffe498a0ad21bc1c242edb b7e65</small>	no	4

### Warnings:

### Information:

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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 6 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY.DOCKET.NO, TOT CLAIMS, IND CLAIMS. Row 1: 12/815,306, 06/14/2010, 3644, 527, 345638003US2, 20, 3

CONFIRMATION NO. 1105

UPDATED FILING RECEIPT

25096
PERKINS COIE LLP
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247



Date Mailed: 10/05/2010

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

Applicant(s)

Jeffrey P. Bezos, Greater Seattle, WA;
Gary Lai, Seattle, WA;
Sean R. Findlay, Seattle, WA;

Assignment For Published Patent Application

Blue Origin, LLC, Kent, WA

Power of Attorney: The patent practitioners associated with Customer Number 25096

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and claims benefit of 61/187,243 06/15/2009
and claims benefit of 61/187,268 06/15/2009

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If Required, Foreign Filing License Granted: 06/22/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 12/815,306

Projected Publication Date: 01/13/2011

Non-Publication Request: No

Early Publication Request: No

\*\* SMALL ENTITY \*\*

**Title**

SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

**Preliminary Class**

244

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**LICENSE FOR FOREIGN FILING UNDER**

**Title 35, United States Code, Section 184**

**Title 37, Code of Federal Regulations, 5.11 & 5.15**

**GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

page 2 of 3

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

**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).



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/815,306	06/14/2010	Jeffrey P. Bezos	345638003US2

25096  
PERKINS COIE LLP  
PATENT-SEA  
P.O. BOX 1247  
SEATTLE, WA 98111-1247

**CONFIRMATION NO. 1105**  
**POA ACCEPTANCE LETTER**



Date Mailed: 10/05/2010

**NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY**

This is in response to the Power of Attorney filed 09/22/2010.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/ydemisse/

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



Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

---

In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3644

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

Examiner: Not Yet Assigned

---

**RESPONSE TO NOTICE TO FILE MISSING PARTS OF APPLICATION**

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

Sir:

In response to the Notice to File Missing Parts of Application – Filing Date Granted mailed June 25, 2010, Applicant respectfully submits a Declaration, a Power of Attorney, an Application Data Sheet, the Filing Fee for the Application (as shown on accompanying Fee Transmittal), a Petition for Extension of Time, an Information Disclosure Statement, an Information Disclosure Citation (PTO SB/08), and an Authorization for Extension of Time and Fees.

Please charge our EFT Account No. SEA1PIRM in the amount of \$592.00 covering the fees set forth in 37 CFR 1.17(a)(1), 1.16(f), 1.16(a)(1), 1.16(k), and 1.16(o). The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in

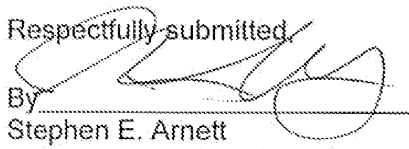
34563-8003.US02/LEGAL19191888.1

Application No.: 12/815,306

Docket No.: 345638003US2

this application by this firm) to our Deposit Account No. 50-0665, under Order No. 345638003US2.

Dated: September 22, 2010

Respectfully submitted,  
  
By \_\_\_\_\_  
Stephen E. Arnett  
Registration No.: 47,392  
PERKINS COIE LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
(206) 359-8000  
(206) 359-7198 (Fax)  
Attorney for Applicant

Effective on 12/03/2004. Fees pursuant to the Consolidated Appropriations Act, 2009 (H.R. 4818). <h2 style="text-align: center;">FEE TRANSMITTAL</h2> <h3 style="text-align: center;">For FY 2009</h3>		<b>Complete if Known</b>	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27		Application Number	12/615,305-Conf. #1105
		Filing Date	June 14, 2010
		First Named Inventor	Jeffrey P. Bazos
		Examiner Name	Not Yet Assigned
		Art Unit	3544
TOTAL AMOUNT OF PAYMENT	(8) 592.00	Attorney Checklist No.	345638003US2

**METHOD OF PAYMENT (check all that apply)**

Check  
  Credit Card  
  Money Order  
  None  
  Other (please identify): EFT Account No. SEA1PIRM

Deposit Account  
 Deposit Account Number: 60-0665  
 Deposit Account Name: Perkins Cole LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

Charge fee(s) indicated below  
  Charge fee(s) indicated below, except for the filing fee

Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17  
  Credit any overpayments

**FEE CALCULATION**

**1. BASIC FILING, SEARCH, AND EXAMINATION FEES**

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	Fee (\$)	Small Entity Fee (\$)	
Utility	330	82	540	270	220	110	462.00
Design	220	110	100	50	140	70	
Plant	220	110	330	165	170	85	
Reissue	330	165	540	270	650	325	
Provisional	220	110	0	0	0	0	

**2. EXCESS CLAIM FEES**

Fee Description	Fee (\$)	Small Entity Fee (\$)
Each claim over 20 (including Reissues)	52	26
Each independent claim over 3 (including Reissues)	220	110
Multiple dependent claims	390	195

Total Claims: 20 - 20 or HP = 20 \* 26 = 520      Fee Paid (\$): 520  
 HP = highest number of total claims paid for, if greater than 20.

Indep. Claims: 3 - 3 or HP = 3 \* 110 = 330      Fee Paid (\$): 330  
 HP = highest number of independent claims paid for, if greater than 3.

**3. APPLICATION SIZE FEE**

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is \$270 (\$135 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).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
<u>21</u>	<u>11</u>	<u>1</u>	<u>135</u>	<u>135</u>

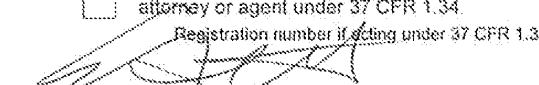
**4. OTHER FEE(S)**

Description	Fee (\$)	Fee Paid (\$)
Non-English Specification	\$130 fee (no small entity discount)	
Other (e.g., late filing surcharge): 2251 Extension for response within first month		65.00
2051 Surcharge-Late filing fee		65.00

**SUBMITTED BY**

Signature:	Registration No. (Attorney/Agent): <u>47,392</u>	Telephone: <u>(208) 359-8000</u>
Name (Print/Type): <u>Stephen E. Arnett</u>	Date: <u>September 22, 2010</u>	

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.

<b>PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)</b> <b>FY 2009</b> <i>(Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).)</i>		Docket Number (Optional) 345638003US2	
Application Number	12/815,305-Conf. #1105	Filed	June 14, 2010
For <b>SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS</b>			
Art Unit	3644	Examiner	Not Yet Assigned
This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.			
The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):			
		Fee	Small Entity Fee
<input checked="" type="checkbox"/>	One month (37 CFR 1.17(a)(1))	\$130	\$65
<input type="checkbox"/>	Two months (37 CFR 1.17(a)(2))	\$490	\$245
<input type="checkbox"/>	Three months (37 CFR 1.17(a)(3))	\$1110	\$555
<input type="checkbox"/>	Four months (37 CFR 1.17(a)(4))	\$1730	\$865
<input type="checkbox"/>	Five months (37 CFR 1.17(a)(5))	\$2350	\$1175
<input checked="" type="checkbox"/>	Applicant claims small entity status. See 37 CFR 1.27.		
<input type="checkbox"/>	A check in the amount of the fee is enclosed.		
<input checked="" type="checkbox"/>	Payment by EFT Account No. SEA1PIRM.		
<input type="checkbox"/>	The Director has already been authorized to charge fees in this application to a Deposit Account.		
<input checked="" type="checkbox"/>	The Director is hereby authorized to charge any deficiency in fees or credit any overpayment to Deposit Account Number <u>50-0665</u> .		
WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.			
I am the	<input type="checkbox"/>	applicant/inventor.	
	<input type="checkbox"/>	assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/95).	
	<input checked="" type="checkbox"/>	attorney or agent of record. Registration Number <u>47,392</u>	
	<input type="checkbox"/>	attorney or agent under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____	
	 _____ Signature		_____ September 22, 2010 Date
	_____ Stephen E. Arnett Typed or printed name		_____ (206) 359-8000 Telephone Number
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representatives are required. Submit multiple forms if more than one signature is required, see below.			
<input checked="" type="checkbox"/>	Total of <u>1</u> forms are submitted.		

**Application Data Sheet**

**Application Information**

Application Type::	Regular
Subject Matter::	Utility
Suggested Group Art Unit::	3644
CD-ROM or CD-R?::	None
Sequence submission?::	None
Computer Readable Form (CRF)?::	No
Title::	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
Attorney Docket Number::	345638003US2
Request for Early Publication?::	No
Request for Non-Publication?::	No
Small Entity?::	Yes
Petition included?::	No
Secrecy Order in Parent Appl.?::	No

**Applicant Information**

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Jeffrey
Middle Name::	P.

34563-8003.US02/LEGAL19191647.1

Page 1

Family Name:: Bezos  
City of Residence:: Greater Seattle  
State or Province of Residence:: WA  
Country of Residence:: US  
Street of mailing address:: 21218 76th Avenue So.  
City of mailing address:: Kent  
State or Province of mailing address:: WA  
Postal or Zip Code of mailing address:: 98032-2442

Applicant Authority Type:: Inventor  
Primary Citizenship Country:: US  
Status:: Full Capacity

Given Name:: Gary  
Family Name:: Lai  
City of Residence:: Seattle  
State or Province of Residence:: WA  
Country of Residence:: US  
Street of mailing address:: 6532 29th Avenue NE  
City of mailing address:: Seattle  
State or Province of mailing address:: WA  
Postal or Zip Code of mailing address:: 98115

Applicant Authority Type:: Inventor

34563-8003.US02/LEGAL19191647.1

Page 2

Primary Citizenship Country:: US  
Status:: Full Capacity  
Given Name:: Sean  
Middle Name:: R.  
Family Name:: Findlay  
City of Residence:: Seattle  
State or Province of Residence:: WA  
Country of Residence:: US  
Street of mailing address:: 5304 50th Avenue S.  
City of mailing address:: Seattle  
State or Province of mailing address:: WA  
Postal or Zip Code of mailing address:: 98118

**Correspondence Information**

Correspondence Customer Number:: 25096

**Representative Information**

Representative Customer Number:: 25096

**Domestic Priority Information**

Application::	Continuity Type::	Parent Application::	Parent Filing Date::
This Application	An application claiming the benefit under 35 USC 119(e)	61/218,029	06/17/2009
This Application	An application claiming the benefit under 35 USC 119(e)	61/187,243	06/15/2009

**Foreign Priority Information**

**Assignee Information**

Assignee name:: Blue Origin, LLC  
Street of mailing address:: 21218 76th Avenue So.  
City of mailing address:: Kent  
State or Province of mailing address:: WA  
Postal or Zip Code of mailing address:: 98032-2442



<b>Declaration for Patent Application English Language Declaration</b>	Attorney Docket No.	345638003US2
	First Named Inventor	Jeffrey P. Bezos
<b>COMPLETE IF KNOWN:</b>		
<input type="checkbox"/> Submitted with initial filing <input checked="" type="checkbox"/> Submitted after initial filing (surcharge required 37 CFR 1.16(e))	Application No.	12/815,306-Conf. #1105
	Filing Date	June 14, 2010
	Art Unit	Not Yet Assigned
	Examiner	Not Yet Assigned

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS**

the specification of which

is attached hereto  
OR  
 was filed on 06/14/2010  
as United States Application No. or PCT International Application No. 12/815,306  
and was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

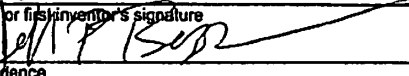
I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the National or PCT International filing date of the continuation-in-part application.


I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT International application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's right certificate(s), or any PCT International application having a filing date before that of the application on which priority is claimed.

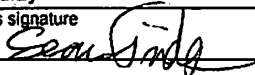
Prior Foreign Application(s)			Priority Not Claimed	Certified Copy Attached	
				YES	NO
_____ (Number)	_____ (Country)	_____ (Filing Date)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Filing Date)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____ (Number)	_____ (Country)	_____ (Filing Date)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>


Additional prior foreign applications are listed on a supplemental data sheet attached hereto.

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 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Jeffrey P. Bezos	
Sole or first inventor's signature 	Date 9/17/2010
Residence Greater Seattle, Washington	
Citizenship US	
Mailing Address  21218 76th Avenue South Kent, Washington 98032-2442	

Full name of second inventor Gary Lai	
Second inventor's signature 	Date 9-7-10
Residence Seattle, Washington	
Citizenship US	
Mailing Address  6532 29th Avenue NE Seattle, Washington 98115	

Full name of third inventor Sean R. Findlay	
Third inventor's signature 	Date 9-7-10
Residence Seattle, Washington	
Citizenship US	
Mailing Address  5304 50th Avenue S. Seattle, Washington 98118	

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(b).			
I hereby appoint:			
<input checked="" type="checkbox"/>	Practitioners associated with the Customer Number:		25098
OR			
<input type="checkbox"/>	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
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 <u>only</u> to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).			
Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:			
<input type="checkbox"/>	The address associated with Customer Number:		
OR			
<input type="checkbox"/>	Firm or Individual Name		
Address			
City		State	Zip
Country		Telephone	Email
Assignee Name and Address: Blue Origin, LLC 21218 76th Avenue So. Kent, Washington 98032-2442			
A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, 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			Date 13 July 2010
Name	Robert Mitman		Telephone 253-437-9300
Title	General Counsel		

**STATEMENT UNDER 37 CFR 3.73(b)**

Applicant/Patent Owner: Jeffrey P. Bezos, Gary Lai, and Sean R. Findlay

Application No./Patent No.: 12/815,306 Filed/Issue Date: June 14, 2010

Titled: SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

Blue Origin, LLC a Limited Liability Company  
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

- 1.  the assignee of the entire right, title, and interest in;
  - 2.  an assignee of less than the entire right, title, and interest in  
(The extent (by percentage) of its ownership interest is \_\_\_\_\_ %); or
  - 3.  an assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)
- the patent application/patent identified above by virtue of either:

A.  An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_ Frame \_\_\_\_\_, or for which a copy thereof is attached.

OR

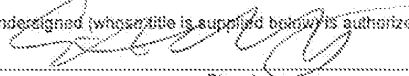
- B.  A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:
  1. From: \_\_\_\_\_ To: \_\_\_\_\_  
The document was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.
  2. From: \_\_\_\_\_ To: \_\_\_\_\_  
The document was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.
  3. From: \_\_\_\_\_ To: \_\_\_\_\_  
The document was recorded in the United States Patent and Trademark Office at Reel \_\_\_\_\_, Frame \_\_\_\_\_, or for which a copy thereof is attached.

Additional documents in the chain of title are listed on a supplemental sheet(s).

As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

  
Signature

September 22, 2010  
Date

Stephen E. Arnelt -- Reg. 47,392  
Printed or Typed Name

Authorized Signer for Assignee  
Title

## **ASSIGNMENT BY INVENTORS**

This Assignment is by Jeffrey P. Bezos; Gary Lai; and Sean R. Findlay (the "Assignors"), having mailing addresses at 21218 76th Avenue So., Kent, Washington 98032-2442; 6532 29th Avenue NE, Seattle, Washington 98115; and 5304 50th Avenue S., Seattle, Washington 98118, respectively. The Assignors have invented one or more certain inventions (the "Invention(s)") described in a Patent application for Letters Patent of the United States entitled SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS (the "Application"), already filed on June 14, 2010, as U.S. Application No. 12/815,306.

Blue Origin, LLC, a Limited Liability Company of Washington having its principal place of business at 21218 76th Avenue So., Kent, Washington 98032-2442 ("Assignee"), desires to acquire the entire right, title and interest in and to the Invention(s) and the Application, and in and to any patents (collectively, "Patents") that may be granted for the Invention(s) in the United States or in any foreign countries.

For valuable consideration, the receipt and sufficiency of which Assignors acknowledge, Assignors hereby sell, assign, and transfer to Assignee, its successors, legal representatives and assigns, the entire right, title and interest in and to: the Invention(s), the Application, and any Patents; any divisions, continuations, and continuations-in-part of the Application and any other application claiming priority rights from the Application; any reissues, reexaminations, or extensions of any and all Patents; the right to file foreign applications directly in the name of Assignee; and the right to claim priority rights deriving from the Application (collectively, the "Rights"). Assignors warrant that Assignors own the Rights, and that the Rights are unencumbered. Assignors also agree to not sign any writing or do any act conflicting with this assignment, and, without further compensation, sign all documents and do such additional acts as Assignee deems necessary or desirable to: perfect Assignee's enjoyment of the Rights; conduct proceedings regarding the Rights, including any litigation or interference proceedings; or perfect or defend title to the Rights. Assignors request the Commissioner of Patents to issue any Patent of the United States that

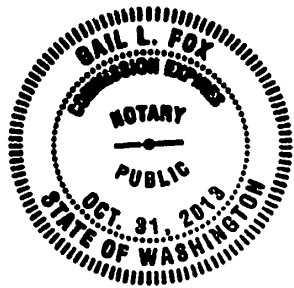
may be issued on the Invention(s) to Assignee. This Assignment may be executed in counterparts.

Jeffrey P. Bezos  
Jeffrey P. Bezos

Date: 9-17-2010

United States of America )  
State of Washington ) ss.:  
County of King )

On this 17<sup>th</sup> day of September, 2010, before me personally came Jeffrey P. Bezos, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.



Gail L. Fox  
Notary Public

*[Handwritten Signature]*

Gary Lai

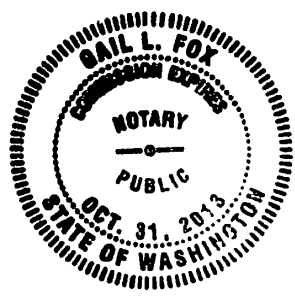
Date: September 7, 2010

United States of America )  
State of Washington ) ss.:  
County of King )

On this 7<sup>th</sup> day of September, 2010, before me personally came Gary Lai, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.

*[Handwritten Signature]*

Notary Public



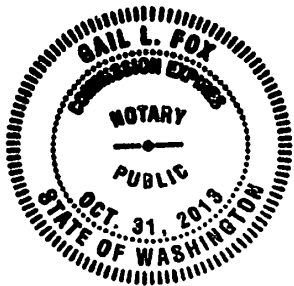
Sean Findlay  
Sean R. Findlay

Date: Sept. 7, 2010

United States of America )  
State of Washington ) ss.:  
County of King )

On this 7<sup>th</sup> day of September, 2010, before me personally came Sean R. Findlay, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.

Gail L. Fox  
Notary Public





Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

---

In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3644

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

---

Examiner: Not Yet Assigned

**INFORMATION DISCLOSURE STATEMENT (IDS)**

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

Sir:

Pursuant to 37 CFR 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of this application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed before the mailing date of a first Office Action on the merits as far as is known to the undersigned (37 CFR 1.97(b)(3)).

In accordance with 37 CFR 1.98(a)(2)(ii), Applicant has not submitted copies of U.S. patents and U.S. patent applications. Applicant submits herewith copies of foreign patents and non-patent literature in accordance with 37 CFR 1.98(a)(2).

34563-8003.US02/LEGAL19188011.1

This Information Disclosure Statement is not to be construed as a representation that: (i) a search has been made; (ii) additional information that may be material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the cited information is, or is considered to be, material to patentability. In addition, applicant does not admit that any enclosed item of information constitutes prior art to the subject invention and specifically reserves the right to demonstrate that any such reference is not prior art.

It is submitted that the Information Disclosure Statement is in compliance with 37 CFR 1.98 and the Examiner is respectfully requested to consider the listed references.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 50-0665, under Order No. 345638003US2.

Dated: September 22, 2010

Respectfully submitted,

By 

Stephen E. Arnett

Registration No.: 47,392

PERKINS COIE LLP

P.O. Box 1247

Seattle, Washington 98111-1247

(206) 359-8000

(206) 359-7198 (Fax)

Attorney for Applicant

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.

Substitute for form 1449/PTO  <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b>  (Use as many sheets as necessary)			<b>Complete if Known</b>		
			Application Number	12/815,306-Conf. #1105	
			Filing Date	June 14, 2010	
			First Named Inventor	Jeffrey P. Bezos	
			Art Unit	3644	
			Examiner Name	Not Yet Assigned	
Sheet	1	of	1	Attorney Docket Number	345638003US2

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code <sup>2</sup> (if known)	MM-DD-YYYY		
		US-12/712,083	02-24-2010	Featherstone	
		US-12/712,156	02-24-2010	Boelitz	
		US-3,711,040	01-16-1973	Carver	
		US-5,568,901	10-29-1996	Stiennon	
		US-6,247,666	06-19-2001	Baker et al.	
		US-6,454,216	09-24-2002	Kiselev et al.	
		US-6,926,576	08-09-2005	Alway et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document	Publication Date	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T <sup>6</sup>
		Country Code <sup>3</sup> -Number <sup>4</sup> -Kind Code <sup>5</sup> (if known)	MM-DD-YYYY			
		DE-10058339-A1	06-06-2002	Infineon Technologies Ag		
		EP-1340316-A1	09-03-2003	Infineon Technologies Ag		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No. <sup>1</sup>	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, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
		Hare, John "VTVLs as RTLS Boosters," Selenian Boondocks, <a href="http://selenianboondocks.com/2010/06/vtvl-as-rtls-boosters/">http://selenianboondocks.com/2010/06/vtvl-as-rtls-boosters/</a> , accessed June 30, 2010, 6 pgs.	

Examiner Signature		Date Considered	
-----------------------	--	--------------------	--

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. \* CITE NO.: Those application(s) which are marked with a single asterisk (\*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. <sup>1</sup> Applicant's unique citation designation number (optional). <sup>2</sup> See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. <sup>3</sup> Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>4</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>5</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>6</sup> Applicant is to place a check mark here if English language Translation is attached.

Docket No.: 345638003US2  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

---

In re Patent Application of:  
Bezos et al.

Application No.: 12/815,306

Confirmation No.: 1105

Filed: June 14, 2010

Art Unit: 3644

For: SEA LANDING OF SPACE LAUNCH  
VEHICLES AND ASSOCIATED SYSTEMS  
AND METHODS

---

Examiner: Not Yet Assigned

**AUTHORIZATION FOR: EXTENSIONS OF TIME UNDER 37 C.F.R. § 1.136(A)(3)**  
**AND FEES UNDER 37 C.F.R. § 1.17**

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

Sir:

With respect to the above-identified application, the Commissioner is authorized to treat any concurrent or future reply requiring a petition for an extension of time under 37 C.F.R. § 1.136(a)(3) for its timely submission as incorporating a petition therefor for the appropriate length of time.

34563-8003.US02/LEGAL19188268.1

Application No.: 12/815,306

Docket No.: 345638003US2

The Commissioner is also authorized to charge any extension of time fees or other fees that may be required under 37 C.F.R. § 1.17 for any paper filed concurrently herewith or in the future, or credit any overpayment, to Deposit Account No. 50-0665.

Dated: September 22, 2010

Respectfully submitted,

By 

Stephen E. Arnett

Registration No.: 47,392

PERKINS COIE LLP

P.O. Box 1247

Seattle, Washington 98111-1247

(206) 359-8000

(206) 359-7198 (Fax)

Attorney for Applicant

## Electronic Patent Application Fee Transmittal

<b>Application Number:</b>	12815306			
<b>Filing Date:</b>	14-Jun-2010			
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS			
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos			
<b>Filer:</b>	John M. Wechkin/Stephanie Olson			
<b>Attorney Docket Number:</b>	345638003US2			
Filed as Small Entity				
<b>Utility under 35 USC 111(a) Filing Fees</b>				
<b>Description</b>	<b>Fee Code</b>	<b>Quantity</b>	<b>Amount</b>	<b>Sub-Total in USD(\$)</b>
<b>Basic Filing:</b>				
Utility filing Fee (Electronic filing)	4011	1	82	82
Utility Search Fee	2111	1	270	270
Utility Examination Fee	2311	1	110	110
<b>Pages:</b>				
<b>Claims:</b>				
<b>Miscellaneous-Filing:</b>				
Late filing fee for oath or declaration	2051	1	65	65
<b>Petition:</b>				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
<b>Patent-Appeals-and-Interference:</b>				
<b>Post-Allowance-and-Post-Issuance:</b>				
<b>Extension-of-Time:</b>				
Extension - 1 month with \$0 paid	2251	1	65	65
<b>Miscellaneous:</b>				
<b>Total in USD (\$)</b>				<b>592</b>

<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	8476242
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Stephanie Olson
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	345638003US2
<b>Receipt Date:</b>	22-SEP-2010
<b>Filing Date:</b>	14-JUN-2010
<b>Time Stamp:</b>	17:15:27
<b>Application Type:</b>	Utility under 35 USC 111(a)

**Payment information:**

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$ 592
RAM confirmation Number	3604
Deposit Account	
Authorized User	

**File Listing:**

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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1		2010_09_22_ResptoMP.pdf	1383673 aae3d60710db2a04161040814d6e902065864436	yes	21
<b>Multipart Description/PDF files in .zip description</b>					
		<b>Document Description</b>	<b>Start</b>	<b>End</b>	
		Applicant Response to Pre-Exam Formalities Notice	1	2	
		Fee Worksheet (PTO-875)	3	3	
		Extension of Time	4	4	
		Application Data Sheet	5	8	
		Oath or Declaration filed	9	10	
		Power of Attorney	11	11	
		Assignee showing of ownership per 37 CFR 3.73(b).	12	16	
		Transmittal Letter	17	18	
		Information Disclosure Statement (IDS) Filed (SB/08)	19	19	
		Authorization for Extension of Time all replies	20	21	
<b>Warnings:</b>					
<b>Information:</b>					
2	Fee Worksheet (PTO-875)	fee-info.pdf	38986 7b77c2531bc6106fe6f35d1a60e14dcbee4ca90c	no	2
<b>Warnings:</b>					
<b>Information:</b>					
<b>Total Files Size (in bytes):</b>			1422659		

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.

## BULK ACOUSTIC WAVE FILTER

**Publication number:** DE10058339 (A1)

**Publication date:** 2002-06-06

**Inventor(s):** AIGNER ROBERT [DE]; MARKSTEINER STEPHAN [DE];  
NESSLER WINFRIED [DE]; ELBRECHT LUEDER [DE] +

**Applicant(s):** INFINEON TECHNOLOGIES AG [DE] +

**Classification:**

- **International:** H03H9/02; H03H9/58; H03H9/60; H03H9/00; H03H9/02;  
(IPC1-7): H03H3/02; H03H9/25; H03H9/64

- **European:** H03H9/02B; H03H9/58F2S; H03H9/60L

**Application number:** DE20001058339 20001124

**Priority number(s):** DE20001058339 20001124

**Also published as:**

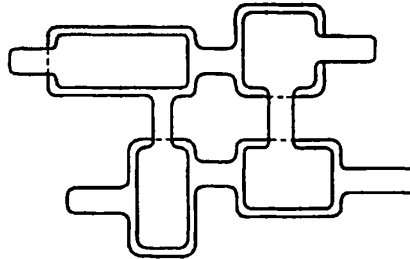
WO0243243 (A1)  
US2003227356 (A1)  
US6909340 (B2)  
EP1340316 (A1)  
EP1340316 (B1)

**Cited documents:**

DE3140719 (C2)  
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**Abstract of DE 10058339 (A1)**

The invention relates to bulk acoustic wave filters comprising at least two bulk acoustic wave resonators, each of these comprising at least one first electrode, a piezoelectric layer and a second electrode. At least two of the bulk acoustic wave resonators have effective resonator surfaces which differ in their surface form and/or surface content. The inventive design of the bulk acoustic wave resonators enables optimal suppression of interference modes without influencing the impedance level of the filter.



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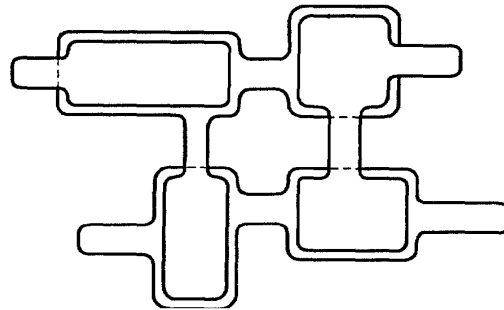
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**Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen**

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54 Bulk-Acoustic-Wave-Filter

57 Beschrieben werden Bulk-Acoustic-Wave-Filter mit wenigstens zwei Bulk-Acoustic-Wave-Resonatoren, wobei jeder Bulk-Acoustic-Wave-Resonator wenigstens eine erste Elektrode, eine piezoelektrische Schicht und eine zweite Elektrode umfasst. Wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren weisen effektive Resonatorflächen auf, die sich in Flächenform und/oder Flächeninhalt unterscheiden. Durch die beschriebene Gestaltung der Bulk-Acoustic-Wave-Resonatoren lassen sich Störmoden optimal unterdrücken, ohne dass dabei das Impedanzniveau des Filters beeinflusst wird.



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[0001] Die Erfindung betrifft Bulk-Acoustic-Wave-Filter.  
 [0002] Elektrische Filter, die aus Bulk-Acoustic-Wave-Resonatoren oder Stacked-Crystal-Filter aufgebaut sind, werden üblicherweise als Bulk-Acoustic-Wave-Filter bezeichnet.

[0003] Bulk-Acoustic-Wave-Resonatoren bestehen typischerweise aus zwei Elektroden und einer piezoelektrischen Schicht, die zwischen den beiden Elektroden angeordnet ist. Ein solcher Stapel aus Elektrode 1/Piezoschicht/Elektrode 2 wird auf einem Träger angeordnet, der die akustische Welle reflektiert (M. Kenneth, G. R. Kline, K. T. McCarron, High-Q Microwave Acoustic Resonators and Filters, IEEE Transactions on Microwave Theory and Techniques, Vol. 41, No. 12, 1993).

[0004] Die Fig. 1 zeigt einen Querschnitt durch einen Bulk-Acoustic-Wave-Resonator. Grundsätzlich wäre die Verwendung einer Konfiguration ausschließlich bestehend aus Elektrode 1/Piezoschicht 3/Elektrode 2 erstrebenswert. Allerdings weist eine solche Anordnung eine zu geringe Stabilität auf. Daher wird die Anordnung auf ein Substrat 4 aufgebracht, was aber mit dem Nachteil verbunden ist, dass die Schallwellen in das Substrat 4 eindringen und dadurch Störungen verursacht werden. Das Substrat 4 sollte also neben einer mechanischen Trägerfunktion gleichzeitig eine möglichst gute akustische Isolation bereitstellen. Die Fig. 1 zeigt einen akustischen Spiegel, der aus einem Substrat 4 und einer Abfolge von zwei low-Z- 5 und zwei high-Z- 6 Schichten besteht.

[0005] Stacked-Crystal-Filter bestehen im allgemeinen aus zwei piezoelektrischen Schichten und drei Elektroden. Diese insgesamt fünf Elemente bilden eine Sandwich-Struktur, wobei jeweils eine piezoelektrische Schicht zwischen zwei Elektroden angeordnet ist. Die mittlere der drei Elektroden wird dabei in der Regel als Erdungselektrode verwendet.

[0006] Die Fig. 2 zeigt einen Querschnitt durch einen Stacked-Crystal-Filter. Der Stacked-Crystal-Filter besteht aus einem Substrat 7, einer Membran 8, einer ersten, unteren Elektrode 9, einer ersten, unteren piezoelektrischen Schicht 10, einer zweiten, oberen piezoelektrischen Schicht 11, einer zweiten, mittleren Elektrode 12 und einer dritten, oberen Elektrode 13. Die mittlere Elektrode 12 ist über einem Teil der unteren piezoelektrischen Schicht 10 und der Membran 8 angeordnet, die obere piezoelektrische Schicht 11 ist über Teilen der mittleren Elektrode 12 und der unteren piezoelektrischen Schicht 10 angeordnet und die dritte, obere Elektrode 13 ist über der oberen piezoelektrischen Schicht 11 angeordnet. Die zweite Elektrode 12 dient als Erdungselektrode. Das Substrat 7 weist einen Hohlraum 14 auf, der dazu dient, die akustischen Schwingungen der piezoelektrischen Schichten zu reflektieren.

[0007] Die Reflexion der akustischen Schwingungen wird somit entweder mit Hilfe eines akustischen Spiegels oder mit Hilfe eines Hohlraums erreicht. Ein akustischer Spiegel wurde oben im Zusammenhang mit einem Bulk-Acoustic-Wave-Resonator beschrieben, während die Reflexion der akustischen Schwingungen durch einen Hohlraum für einen Stacked-Crystal-Filter gezeigt wurde. Selbstverständlich ist aber auch die umgekehrte Kombination möglich, also ein Bulk-Acoustic-Wave-Resonator mit einem Hohlraum im Substrat genauso wie ein Stacked-Crystal-Filter mit einem akustischen Spiegel.

[0008] Die piezoelektrischen Schichten sind in der Regel aus Aluminiumnitrid aufgebaut. Als Material für die Elektroden werden häufig Aluminium, Aluminium-enthaltende Legierungen, Wolfram, Molybdän oder Platin verwendet.

Als Substratmaterial kann z. B. Silizium, Galliumarsenid, Glas oder eine Folie verwendet werden.

[0009] Wie oben bereits erläutert weist jeder Bulk-Acoustic-Wave-Resonator oder Stacked-Crystal-Filter wenigstens zwei Elektroden auf. Die Fig. 3 zeigt eine Aufsicht auf zwei übereinander gelagerte Elektroden, nämlich eine untere Elektrode 15 und eine obere Elektrode 16. Die beiden Elektroden können jede beliebige geometrische Form aufweisen. Als "effektive Resonatorfläche" wird im Rahmen der vorliegenden Erfindung die Fläche der Elektroden bezeichnet, die sich bei einer Projektion der beiden Elektroden in eine Ebene als der überlappende Bereich der Elektroden ergibt. Die effektive Resonatorfläche der Elektroden 15 und 16 ist in Fig. 3 schraffiert dargestellt. Aufgrund der grundsätzlich beliebigen Form der Elektroden 15 und 16 ergibt sich für die effektive Resonatorfläche eine beliebig geformte ebene Fläche.

[0010] Jeder Bulk-Acoustic-Wave-Resonator weist somit eine bestimmte effektive Resonatorfläche auf, die durch ihre geometrische Form und durch ihren Flächeninhalt gekennzeichnet ist. Zwei Bulk-Acoustic-Wave-Resonatoren mit unterschiedlicher effektiver Resonatorfläche können sich also grundsätzlich in der Flächenform der effektiven Resonatorfläche und/oder im Flächeninhalt der effektiven Resonatorfläche unterscheiden.

[0011] Ein Bulk-Acoustic-Wave-Filter setzt sich aus einer Mehrzahl von parallel bzw. in Reihe geschalteten Bulk-Acoustic-Wave-Resonatoren oder Stacked-Crystal-Filter zusammen. Im folgenden wird der Begriff "Bulk-Acoustic-Wave-Resonator" synonym für die beiden, in den Fig. 1 und 2 gezeigten, Vorrichtungen, nämlich Bulk-Acoustic-Wave-Resonator und Stacked-Crystal-Filter, gebraucht.

[0012] Das Design der Bulk-Acoustic-Wave-Filter wird in der Regel derart gestaltet, dass die in Serie geschalteten Resonatoren eine serielle Resonanz aufweisen, deren Frequenz möglichst genau der gewünschten Frequenz des Filters entspricht, während entsprechend die parallel geschalteten Resonatoren eine parallele Resonanz aufweisen, deren Frequenz ebenfalls möglichst genau der gewünschten Frequenz des Filters entspricht.

[0013] Eine besondere Problematik bei der Verwendung von Bulk-Acoustic-Wave-Filtern stellen die Störmoden der Bulk-Acoustic-Wave-Resonatoren, aus denen die Filter aufgebaut sind, dar. Diese Störmoden führen zu Störspitzen in der elektrischen Impedanzkurve der Bulk-Acoustic-Wave-Resonatoren, die sich in weiterer Folge auch auf den Durchlassbereich der Filter nachteilig auswirkt. Vor allem wird das Stehwellenverhältnis verschlechtert bzw. die Phasenkurve der Filter verzerrt, wodurch z. B. in Receiver-Frontends die Bedingung konstanter Gruppenlaufzeit innerhalb eines Sendekanals verletzt wird.

[0014] Aus dem Stand der Technik sind verschiedene Ansätze bekannt, mit denen eine Unterdrückung der Störmoden versucht wird. Die US 5,903,087 offenbart Bulk-Acoustic-Wave-Resonatoren, deren Elektroden an den Rändern nicht geglättet sind, sondern vielmehr in Form eines Zufallsmusters angeraute Ränder aufweisen, wobei die Rauigkeit ungefähr die Dimension der Wellenlängen der Störmoden aufweist. Die Störmoden werden dadurch unterdrückt und sind in der Impedanzkurve weniger sichtbar. Allerdings treten bei diesem Verfahren starke Energieverluste auf, die sich auf die Güte der Hauptresonanzen auswirken.

[0015] Der vorliegenden Erfindung liegt daher die Aufgabe zugrunde, Bulk-Acoustic-Wave-Filter zur Verfügung zu stellen, bei denen die Störmoden gedämpft werden, aber gleichzeitig die Nutzresonanz nur unwesentlich oder überhaupt nicht beeinflusst wird.

[0016] Diese Aufgabe wird durch den Bulk-Acoustic-

Wave-Filter gemäß unabhängigem Patentanspruch 1 gelöst. Weitere vorteilhafte Ausführungsformen, Ausgestaltungen und Aspekte der vorliegenden Erfindung ergeben sich aus den abhängigen Patentansprüchen, der Beschreibung und den beiliegenden Zeichnungen.

[0017] Der erfindungsgemäße Bulk-Acoustic-Wave-Filter umfasst wenigstens zwei Bulk-Acoustic-Wave-Resonatoren, wobei jeder Bulk-Acoustic-Wave-Resonator wenigstens eine erste Elektrode, eine piezoelektrische Schicht und eine zweite Elektrode umfasst. Wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren weisen effektive Resonatorflächen auf, die sich in Flächenform und/oder Flächeninhalt unterscheiden. Durch diese Gestaltung der Bulk-Acoustic-Wave-Resonatoren lassen sich Störmoden optimal unterdrücken, ohne dass dabei das Impedanzniveau des Filter beeinflusst wird.

[0018] Da jeder Resonator andere Störmodenfrequenzen aufweist, kommt es durch die Verschaltung im Filter zu einem Mittelungseffekt. Dadurch macht sich die einzelne Störmode im Filterresponse im Vergleich zu den aus dem Stand der Technik bekannten Bulk-Acoustic-Wave-Filtern mit Resonatoren gleicher Fläche nicht so stark bemerkbar. Allerdings beeinflussen unterschiedliche Flächeninhalte der effektiven Resonatorflächen auch das Impedanzniveau der Resonatoren. Sie sind daher durch Impedanzanpassbedingungen im Filter in einem gewissen Rahmen festgelegt.

[0019] Sämtliche Ausführungsformen der vorliegenden Erfindung beruhen also darauf, dass nicht versucht wird, den einzelnen Bulk-Acoustic-Wave-Resonator störmodenfrei zu machen, was technisch schwierig ist und möglicherweise Resonator-Performance kostet, sondern darauf, dass erst mit der Verschaltung im Filter eine Verwaschung von vielen Störmoden bei unterschiedlichen Frequenzen eintritt und damit die Transmissionsfunktion des Filters den erwünschten glatten Verlauf erhält.

[0020] Gemäß einer bevorzugten Ausführungsform der vorliegenden Erfindung weisen alle Bulk-Acoustic-Wave-Resonatoren des Bulk-Acoustic-Wave-Filters effektive Resonatorflächen auf, die sich in Flächenform und/oder Flächeninhalt unterscheiden.

[0021] Dadurch können Störmoden noch stärker unterdrückt werden. Gemäß einer bevorzugten Ausführungsform der vorliegenden Erfindung weisen wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine effektive Resonatorfläche mit unterschiedlichem Aspektverhältnis auf. Das Aspektverhältnis beeinflusst die Lage der Störmoden in ähnlicher Weise wie sie durch den Flächeninhalt der effektiven Resonatorflächen der Bulk-Acoustic-Wave-Resonatoren beeinflusst wird, verändert aber das Impedanzniveau nicht. Die Störmoden werden somit wirkungsvoll unterdrückt, wobei gleichzeitig die Nutzresonanz unverändert bleibt.

[0022] Besonders bevorzugt wird eine Ausführungsform, bei der alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Aspekt-Verhältnissen aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

[0023] Ebenfalls bevorzugt wird eine Ausführungsform der vorliegenden Erfindung gemäß der wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit einer nicht-rechtwinkligen Form aufweisen. Unter einer nicht-rechtwinkligen Form der effektiven Resonatorfläche eines Bulk-Acoustic-Wave-Resonators wird eine Form verstanden, bei der die Winkel zwischen den Begrenzungslinien der effektiven Resonatorfläche ungleich 90° sind. Durch diese Ausgestaltung der Resonatoren gelingt eine gute Unterdrückung der Störmoden.

[0024] Besonders bevorzugt wird eine Ausführungsform, bei der alle Bulk-Acoustic-Wave-Resonatoren effektive Re-

sonatorflächen mit einer nicht-rechtwinkligen Form aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

[0025] Beste Resultate lassen sich mit Bulk-Acoustic-Wave-Filtern erzielen, bei denen wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichem Flächeninhalt und gleichzeitig unterschiedlichem Aspektverhältnis aufweisen. Durch passende Wahl des Flächeninhalts der effektiven Resonatorfläche und gleichzeitige Variation des Aspektverhältnisses der effektiven Resonatorfläche lassen sich sowohl Impedanzanpassungsbedingungen erfüllen als auch Störmoden optimal unterdrücken.

[0026] Eine weitere Verbesserung wird mit Ausführungsformen erzielt, bei denen alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Flächeninhalten und unterschiedlichen Aspektverhältnissen aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

[0027] Ebenfalls bevorzugt werden Bulk-Acoustic-Wave-Filter, wobei wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine effektive Resonatorfläche mit unterschiedlichem Aspektverhältnis und gleichzeitig nicht-rechtwinkliger Form aufweisen.

[0028] Besonders bevorzugt werden Ausführungsformen, bei denen alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Aspektverhältnissen und nicht-rechtwinkliger Form aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

[0029] Besonders bevorzugt werden Ausführungsformen der vorliegenden Erfindung, gemäß denen wenigstens zwei Bulk-Acoustic-Wave-Resonatoren eines Bulk-Acoustic-Wave-Filters eine effektive Resonatorfläche mit unterschiedlichem Flächeninhalt, unterschiedlichen Aspektverhältnis und nicht-rechtwinkliger Form aufweisen.

[0030] Ebenfalls besonders bevorzugt werden Ausführungsformen, bei denen alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Flächeninhalten, unterschiedlichen Aspektverhältnissen und nicht-rechtwinkliger Form aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

[0031] Besonders gute Störmodenunterdrückung wird erreicht, wenn das Aspektverhältnis der effektiven Resonatorflächen der erfindungsgemäßen Bulk-Acoustic-Wave-Resonatoren zwischen 1 : 1 und 1 : 5 liegt, insbesondere zwischen 1 : 1.5 und 1 : 3.

[0032] Weisen die effektiven Resonatorflächen der Bulk-Acoustic-Wave-Resonatoren unterschiedlichen Flächeninhalt auf, so wird bevorzugt, dass sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 5% voneinander unterscheidet, insbesondere um wenigstens 10%. Ganz besonders bevorzugt wird, dass sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 20% voneinander unterscheidet, insbesondere um wenigstens 50%.

[0033] Die Bulk-Acoustic-Wave-Filter werden durch Verschaltung von Bulk-Acoustic-Wave-Resonatoren hergestellt. Das Prinzip, den Flächeninhalt der effektiven Resonatorfläche, das Aspektverhältnis der effektiven Resonatorfläche und/oder den Winkel zwischen den Begrenzungslinien der effektiven Resonatorflächen zu variieren, um Störmoden im Filterresponse zu unterdrücken, lässt sich auf jede Filtertopologie anwenden. Gemäß besonders bevorzugten Ausführungsformen der vorliegenden Erfindung erfolgt die Verschaltung in Form eines 1/2-stufigen Leiterfilters, in Form eines 2-stufigen Leiterfilters, in Form eines 2/2-stufigen Leiterfilters, in Form eines 3-stufigen Leiterfilters oder in Form eines 3/2-stufigen Leiterfilters, wobei 3, 4, 5, 6 oder 7 Bulk-Acoustic-Wave-Resonatoren verschaltet werden.

[0034] Ebenfalls bevorzugt wird die Verschaltung der Bulk-Acoustic-Wave-Resonatoren zu einem Bulk-Acoustic-Wave-Filter in Form eines 1-stufigen balanced Filters, in Form eines 2-stufigen balanced Filters oder in Form eines 3-stufigen balanced Filters. Es werden in diesem Fall 4, 8 oder 12 Bulk-Acoustic-Wave-Resonatoren verschaltet.

[0035] Die Erfindung wird nachfolgend anhand der Fig. 1 bis 8 näher dargestellt. Es zeigen:

[0036] Fig. 1 einen aus dem Stand der Technik bekannten Bulk-Acoustic-Wave-Resonator;

[0037] Fig. 2 einen aus dem Stand der Technik bekannten Stacked-Crystal-Filter;

[0038] Fig. 3 zwei übereinandergelagerte Elektroden und deren effektive Resonatorfläche;

[0039] Fig. 4 einen aus dem Stand der Technik bekannten 2-stufigen Leiterfilter;

[0040] Fig. 5 einen erfindungsgemäßen 2-stufigen Leiterfilter aufgebaut aus Bulk-Acoustic-Wave-Resonatoren mit unterschiedlichem Flächeninhalt der effektiven Resonatorflächen;

[0041] Fig. 6 einen erfindungsgemäßen 2-stufigen Leiterfilter aufgebaut aus Bulk-Acoustic-Wave-Resonatoren mit unterschiedlichem Aspektverhältnis der effektiven Resonatorflächen;

[0042] Fig. 7 Auftragung (schematisch) des Streuparameters von Eingang zu Ausgang ( $S_{12}$ ) gegen die Frequenz für einen 3-stufigen Leiterfilter mit 6 identischen quadratischen Einzelresonatoren (Stand der Technik);

[0043] Fig. 8 Auftragung (schematisch) des Streuparameters von Eingang zu Ausgang ( $S_{12}$ ) gegen die Frequenz für einen 3-stufigen Leiterfilter mit 6 Einzelresonatoren mit unterschiedlichen Aspektverhältnissen der effektiven Resonatorflächen (Erfindung).

[0044] Fig. 4 zeigt einen aus dem Stand der Technik bekannten 2-stufigen Leiterfilter mit 4 gleich großen quadratischen Bulk-Acoustic-Wave-Resonatoren, die eine identische effektive Resonatorfläche aufweisen. Die Störmoden jedes Einzelresonators treten an den gleichen Frequenzstellen auf und sind entsprechend im elektrischen Response des Filters zu finden.

[0045] Fig. 5 zeigt einen 2-stufigen Leiterfilter mit 4 Bulk-Acoustic-Wave-Resonatoren mit effektiven Resonatorflächen, die unterschiedliche Flächeninhalte aufweisen. Jeder Resonator hat unterschiedliche Störmodenfrequenzen. Durch die Verschaltung im Filter kommt es zu einem Mitleitungseffekt, wodurch sich die einzelnen Störmode im Filterresponse im Vergleich zu der in Fig. 4 gezeigten Ausführungsform des Standes der Technik nicht so stark bemerkbar macht.

[0046] Fig. 6 zeigt einen 2-stufigen Leiterfilter mit 4 Bulk-Acoustic-Wave-Resonatoren mit effektiven Resonatorflächen, die zwar gleichen Flächeninhalt, aber unterschiedliche Aspektverhältnisse aufweisen. Das Aspektverhältnis beeinflusst die Lage der Störmoden in ähnlicher Weise wie bei der in Fig. 5 gezeigten Ausführungsform, wobei aber gleichzeitig das Impedanzniveau des Filters unverändert bleibt.

[0047] Die Fig. 7 und 8 zeigen jeweils eine schematische Auftragung des Streuparameters von Eingang zu Ausgang  $S_{12}$  in logarithmischer Skala gegen die Frequenz für einen 3-stufigen Leiterfilter mit 6 Einzelresonatoren. Zur Bestimmung von  $S_{12}$  wurde in bekannter Weise durch einen Frequenzanalysator die Streumatrix des Leiterfilters ermittelt.

[0048] In der Fig. 7 ist die Kennlinie eines aus dem Stand der Technik bekannten Leiterfilters, der aus 6 gleichen quadratischen Einzelresonatoren mit identischen effektiven Resonatorflächen besteht, dargestellt. Die Kennlinie zeigt ein "Rauschen" im Passband, das von spurious modes der Einzelresonatoren verursacht ist.

[0049] In der Fig. 8 ist die Kennlinie eines Leiterfilters gemäß der vorliegenden Erfindung dargestellt, der die gleiche Topologie aufweist wie der Leiterfilter, dessen Kennlinie in Fig. 7 dargestellt ist, allerdings weisen die effektiven Resonatorflächen der 6 Einzelresonatoren unterschiedliche Aspektverhältnisse auf. Das Rauschen im Passband mittelt sich aus der Kurve heraus, da die spurious modes der Einzelresonatoren an verschiedenen Frequenzpunkten auftreten.

[0050] Ähnliche Ergebnisse liefert ein Vergleich von einerseits Filtern mit Einzelresonatoren mit quadratischen effektiven Resonatorflächen und andererseits Filtern, bei denen die effektiven Resonatorflächen der Einzelresonatoren nicht rechteckige Form aufweisen (Winkel zwischen den Begrenzungslinien der effektiven Resonatorflächen der Einzelresonatoren ungleich  $90^\circ$ ). Hier wird ein deutlich geringeres Rauschen im Passband für den Filter festgestellt, dessen Einzelresonatoren effektive Resonatorflächen mit nicht-rechteckiger Form aufweisen.

#### Patentansprüche

1. Bulk-Acoustic-Wave-Filter umfassend wenigstens zwei Bulk-Acoustic-Wave-Resonatoren, wobei jeder Bulk-Acoustic-Wave-Resonator wenigstens eine erste Elektrode, eine piezoelektrische Schicht und eine zweite Elektrode umfasst, **dadurch gekennzeichnet**, dass wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen aufweisen, die sich in Flächenform und/oder Flächeninhalt unterscheiden.
2. Bulk-Acoustic-Wave-Filter nach Anspruch 1, dadurch gekennzeichnet, dass alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen aufweisen, die sich in Flächenform und/oder Flächeninhalt unterscheiden.
3. Bulk-Acoustic-Wave-Filter nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass die effektiven Resonatorflächen von wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren ein unterschiedliches Aspektverhältnis aufweisen.
4. Bulk-Acoustic-Wave-Filter nach Anspruch 3, dadurch gekennzeichnet, dass die effektiven Resonatorflächen aller Bulk-Acoustic-Wave-Resonatoren unterschiedliche Aspektverhältnisse aufweisen.
5. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die effektiven Resonatorflächen von wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine nicht-rechteckige Form aufweisen.
6. Bulk-Acoustic-Wave-Filter nach Anspruch 5, dadurch gekennzeichnet, dass die effektiven Resonatorflächen aller Bulk-Acoustic-Wave-Resonatoren eine nicht-rechteckige Form aufweisen.
7. Bulk-Acoustic-Wave-Filter nach einem der Ansprüche 3 bis 6, dadurch gekennzeichnet, dass das Aspekt-Verhältnis der effektiven Resonatorflächen zwischen 1 : 1 und 1 : 5 liegt.
8. Bulk-Acoustic-Wave-Filter nach Anspruch 7, dadurch gekennzeichnet, dass das Aspekt-Verhältnis der effektiven Resonatorflächen zwischen 1 : 1.5 und 1 : 3 liegt.
9. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 5% voneinander unterscheidet, insbesondere um wenigstens 10%.
10. Bulk-Acoustic-Wave-Filter Anspruch 9, dadurch gekennzeichnet, dass sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 20% voneinander

der unterscheidet, insbesondere um wenigstens 50%.

11. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Bulk-Acoustic-Wave-Resonatoren in Form eines 1½-stufigen Leiterfilters, in Form eines 2-stufigen Leiterfilters, in Form eines 2½-stufigen Leiterfilters, in Form eines 3-stufigen Leiterfilters oder in Form eines 3½-stufigen Leiterfilters verschaltet sind.

12. Bulk-Acoustic-Wave-Filter nach einem der Ansprüche 1 bis 10, dadurch gekennzeichnet, dass die Bulk-Acoustic-Wave-Resonatoren in Form eines 1-stufigen balanced Filters, in Form eines 2-stufigen balanced Filters oder in Form eines 3-stufigen balanced Filters verschaltet sind.

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Hierzu 4 Seite(n) Zeichnungen

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- Leerseite -

**FIG 1**

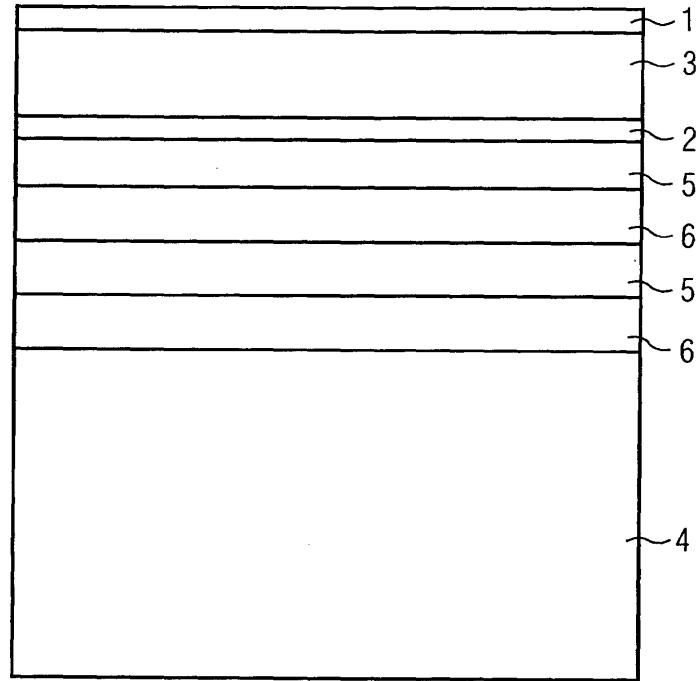


FIG 2

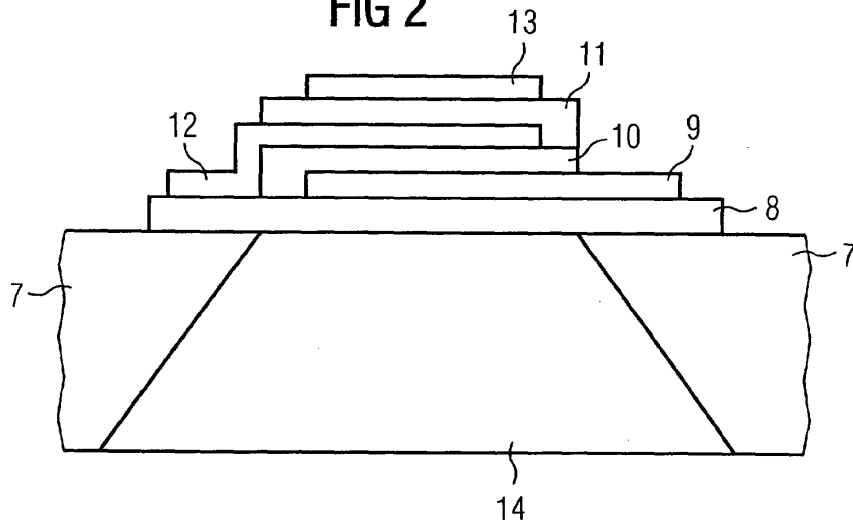
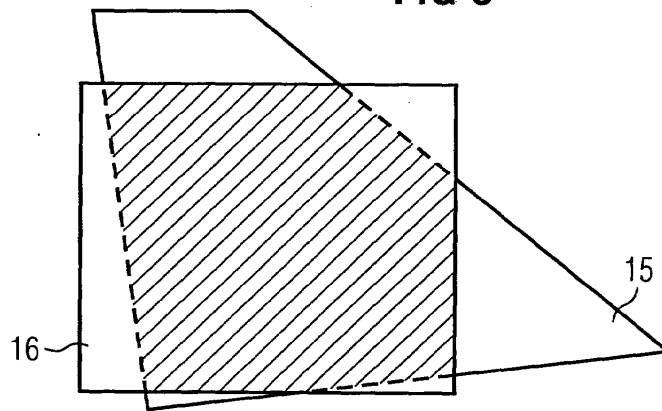
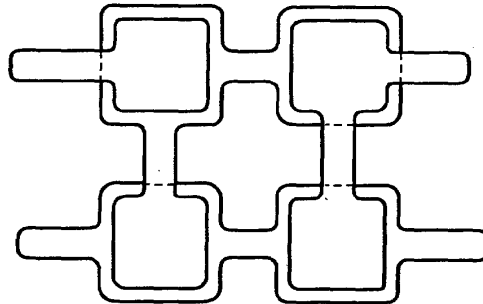


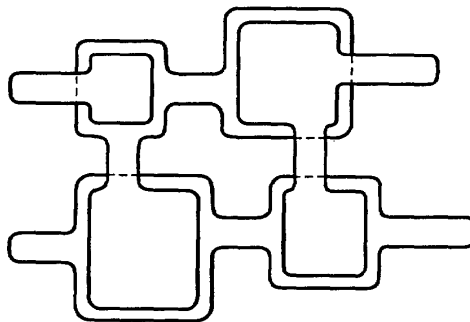
FIG 3



**FIG 4**



**FIG 5**



**FIG 6**

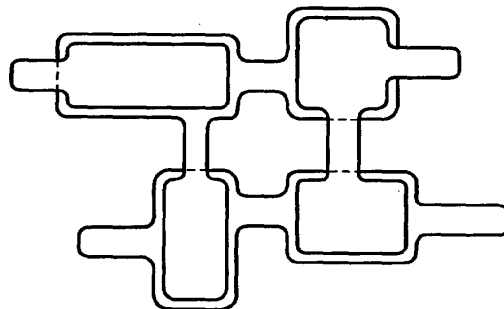


FIG 7

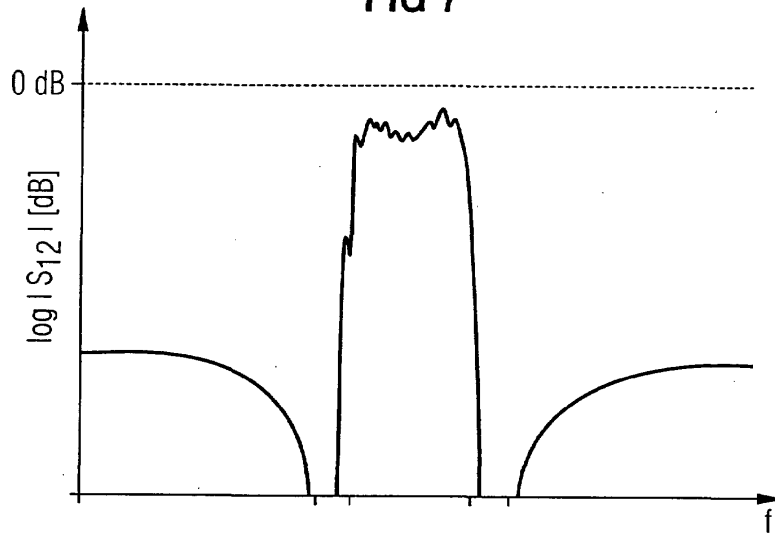
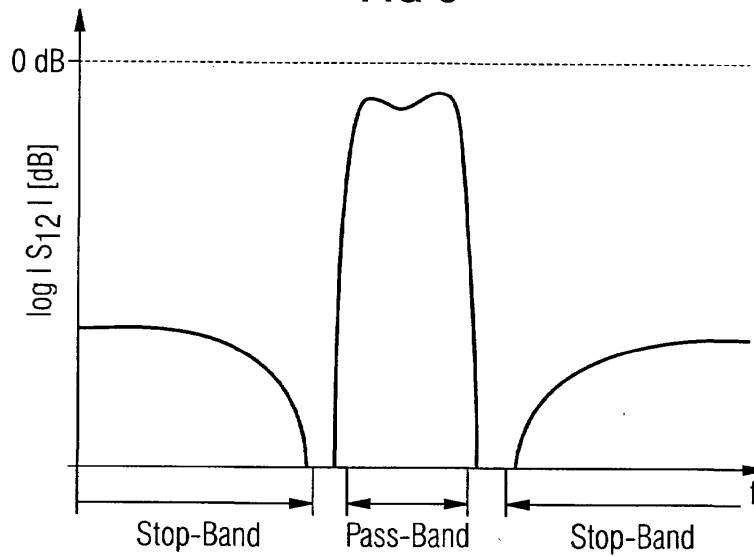


FIG 8



## BULK ACOUSTIC WAVE FILTER

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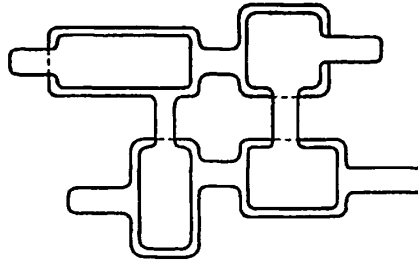
US5572173 (A)

US4317093 (A)

Abstract not available for EP 1340316 (B1)

Abstract of corresponding document: **WO 0243243 (A1)**

The invention relates to bulk acoustic wave filters comprising at least two bulk acoustic wave resonators, each of these comprising at least one first electrode, a piezoelectric layer and a second electrode. At least two of the bulk acoustic wave resonators have effective resonator surfaces which differ in their surface form and/or surface content. The inventive design of the bulk acoustic wave resonators enables optimal suppression of interference modes without influencing the impedance level of the filter.



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(11) **EP 1 340 316 B1**

(12) **EUROPÄISCHE PATENTSCHRIFT**

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- (22) Anmeldetag: **06.11.2001**
- (87) Internationale Veröffentlichungsnummer: **WO 2002/043243 (30.05.2002 Gazette 2002/22)**

(54) **BULK-ACOUSTIC-WAVE-FILTER**  
BULK ACOUSTIC WAVE FILTER  
FILTRE D'ONDES ACOUSTIQUES EN VOLUME

- |  |   |
|--|---|
| <p>(84) Benannte Vertragsstaaten:<br/><b>DE FR IT</b></p> <p>(30) Priorität: <b>24.11.2000 DE 10058339</b></p> <p>(43) Veröffentlichungstag der Anmeldung:<br/><b>03.09.2003 Patentblatt 2003/36</b></p> <p>(73) Patentinhaber: <b>Infineon Technologies AG<br/>81669 München (DE)</b></p> <p>(72) Erfinder:<br/>• <b>AIGNER, Robert<br/>81675 München (DE)</b><br/>• <b>MARKSTEINER, Stephan<br/>85640 Putzbrunn (DE)</b></p> | <p>• <b>NESSLER, Winfried<br/>81739 München (DE)</b><br/>• <b>ELBRECHT, Lüder<br/>81825 München (DE)</b></p> <p>(74) Vertreter: <b>Ginzel, Christian<br/>Zimmermann &amp; Partner,<br/>Postfach 33 09 20<br/>80069 München (DE)</b></p> <p>(56) Entgegenhaltungen:<br/><b>EP-A- 0 880 227 EP-A- 1 170 862</b><br/><b>US-A- 4 317 093 US-A- 5 572 173</b><br/><b>US-A- 5 939 957</b></p> |
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**EP 1 340 316 B1**

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## Beschreibung

**[0001]** Die Erfindung betrifft Bulk-Acoustic-Wave-Filter.

**[0002]** Elektrische Filter, die aus Bulk-Acoustic-Wave-Resonatoren oder Stacked-Crystal-Filter aufgebaut sind, werden üblicherweise als Bulk-Acoustic-Wave-Filter bezeichnet.

**[0003]** Bulk-Acoustic-Wave-Resonatoren bestehen typischerweise aus zwei Elektroden und einer piezoelektrischen Schicht, die zwischen den beiden Elektroden angeordnet ist. Ein solcher Stapel aus Elektrode 1 / Piezoschicht / Elektrode 2 wird auf einem Träger angeordnet, der die akustische Welle reflektiert (M. Kenneth, G. R. Kline, K. T. McCarron, High-Q Microwave Acoustic Resonators and Filters, IEEE Transactions on Microwave Theory and Techniques, Vol. 41, No. 12, 1993).

**[0004]** Die Fig. 1 zeigt einen Querschnitt durch einen Bulk-Acoustic-Wave-Resonator. Grundsätzlich wäre die Verwendung einer Konfiguration ausschließlich bestehend aus Elektrode 1 / Piezoschicht 3 / Elektrode 2 erstrebenswert. Allerdings weist eine solche Anordnung eine zu geringe Stabilität auf. Daher wird die Anordnung auf ein Substrat 4 aufgebracht, was aber mit dem Nachteil verbunden ist, dass die Schallwellen in das Substrat 4 eindringen und dadurch Störungen verursacht werden. Das Substrat 4 sollte also neben einer mechanischen Trägerfunktion gleichzeitig eine möglichst gute akustische Isolation bereitstellen. Die Figur 1 zeigt einen akustischen Spiegel, der aus einem Substrat 4 und einer Abfolge von zwei low-Z- 5 und zwei high-Z- 6 Schichten besteht.

**[0005]** Stacked-Crystal-Filter bestehen im allgemeinen aus zwei piezoelektrischen Schichten und drei Elektroden. Diese insgesamt fünf Elemente bilden eine Sandwich-Struktur, wobei jeweils eine piezoelektrische Schicht zwischen zwei Elektroden angeordnet ist. Die mittlere der drei Elektroden wird dabei in der Regel als Erdungselektrode verwendet.

**[0006]** Die Figur 2 zeigt einen Querschnitt durch einen Stacked-Crystal-Filter. Der Stacked-Crystal-Filter besteht aus einem Substrat 7, einer Membran 8, einer ersten, unteren Elektrode 9, einer ersten, unteren piezoelektrischen Schicht 10, einer zweiten, oberen piezoelektrischen Schicht 11, einer zweiten, mittleren Elektrode 12 und einer dritten, oberen Elektrode 13. Die mittlere Elektrode 12 ist über einem Teil der unteren piezoelektrischen Schicht 10 und der Membran 8 angeordnet, die obere piezoelektrische Schicht 11 ist über Teilen der mittleren Elektrode 12 und der unteren piezoelektrischen Schicht 10 angeordnet und die dritte, obere Elektrode 13 ist über der oberen piezoelektrischen Schicht 11 angeordnet. Die zweite Elektrode 12 dient als Erdungselektrode. Das Substrat 7 weist einen Hohlraum 14 auf, der dazu dient, die akustischen Schwingungen der piezoelektrischen Schichten zu reflektieren.

**[0007]** Die Reflexion der akustischen Schwingungen wird somit entweder mit Hilfe eines akustischen Spiegels

oder mit Hilfe eines Hohlraums erreicht. Ein akustischer Spiegel wurde oben im Zusammenhang mit einem Bulk-Acoustic-Wave-Resonator beschrieben, während die Reflexion der akustischen Schwingungen durch einen Hohlraum für einen Stacked-Crystal-Filter gezeigt wurde. Selbstverständlich ist aber auch die umgekehrte Kombination möglich, also ein Bulk-Acoustic-Wave-Resonator mit einem Hohlraum im Substrat genauso wie ein Stacked-Crystal-Filter mit einem akustischen Spiegel.

**[0008]** Die piezoelektrischen Schichten sind in der Regel aus Aluminiumnitrid aufgebaut. Als Material für die Elektroden werden häufig Aluminium, Aluminium-enthaltende Legierungen, Wolfram, Molybdän oder Platin verwendet. Als Substratmaterial kann z.B. Silizium, Galliumarsenid, Glas oder eine Folie verwendet werden.

**[0009]** Wie oben bereits erläutert weist jeder Bulk-Acoustic-Wave-Resonator oder Stacked-Crystal-Filter wenigstens zwei Elektroden auf. Die Figur 3 zeigt eine Aufsicht auf zwei übereinander gelagerte Elektroden, nämlich eine untere Elektrode 15 und eine obere Elektrode 16. Die beiden Elektroden können jede beliebige geometrische Form aufweisen. Als "effektive Resonatorfläche" wird im Rahmen der vorliegenden Erfindung die Fläche der Elektroden bezeichnet, die sich bei einer Projektion der beiden Elektroden in eine Ebene als der überlappende Bereich der Elektroden ergibt. Die effektive Resonatorfläche der Elektroden 15 und 16 ist in Fig. 3 schraffiert dargestellt. Aufgrund der grundsätzlich beliebigen Form der Elektroden 15 und 16 ergibt sich für die effektive Resonatorfläche eine beliebig geformte ebene Fläche.

**[0010]** Jeder Bulk-Acoustic-Wave-Resonator weist somit eine bestimmte effektive Resonatorfläche auf, die durch ihre geometrische Form und durch ihren Flächeninhalt gekennzeichnet ist. Zwei Bulk-Acoustic-Wave-Resonatoren mit unterschiedlicher effektiver Resonatorfläche können sich also grundsätzlich in der Flächenform der effektiven Resonatorfläche und/oder im Flächeninhalt der effektiven Resonatorfläche unterscheiden.

**[0011]** Ein Bulk-Acoustic-Wave-Filter setzt sich aus einer Mehrzahl von parallel bzw. in Reihe geschalteten Bulk-Acoustic-Wave-Resonatoren oder Stacked-Crystal-Filter zusammen. Im folgenden wird der Begriff "Bulk-Acoustic-Wave-Resonator" synonym für die beiden, in den Figuren 1 und 2 gezeigten, Vorrichtungen, nämlich Bulk-Acoustic-Wave-Resonator und Stacked-Crystal-Filter, gebraucht.

**[0012]** Das Design der Bulk-Acoustic-Wave-Filter wird in der Regel derart gestaltet, dass die in Serie geschalteten Resonatoren eine serielle Resonanz aufweisen, deren Frequenz möglichst genau der gewünschten Frequenz des Filters entspricht, während entsprechend die parallel geschalteten Resonatoren eine parallele Resonanz aufweisen, deren Frequenz ebenfalls möglichst genau der gewünschten Frequenz des Filters entspricht.

**[0013]** Eine besondere Problematik bei der Verwendung von Bulk-Acoustic-Wave-Filtern stellen die Störmo-



den der Bulk-Acoustic-Wave-Resonatoren, aus denen die Filter aufgebaut sind, dar. Diese Störmoden führen zu Störspitzen in der elektrischen Impedanzkurve der Bulk-Acoustic-Wave-Resonatoren, die sich in weiterer Folge auch auf den Durchlassbereich der Filter nachteilig auswirkt. Vor allem wird das Stehwellenverhältnis verschlechtert bzw. die Phasenkurve der Filter verzerrt, wodurch z.B. in Receiver-Frontends die Bedingung konstanter Gruppenlaufzeit innerhalb eines Sendekanals verletzt wird.

**[0014]** Aus dem Stand der Technik sind verschiedene Ansätze bekannt, mit denen eine Unterdrückung der Störmoden versucht wird. Die US 5,903,087 offenbart Bulk-Acoustic-Wave-Resonatoren, deren Elektroden an den Rändern nicht geglättet sind, sondern vielmehr in Form eines Zufallsmusters angeraute Ränder aufweisen, wobei die Rauigkeit ungefähr die Dimension der Wellenlängen der Störmoden aufweist. Die Störmoden werden dadurch unterdrückt und sind in der Impedanzkurve weniger sichtbar. Allerdings treten bei diesem Verfahren starke Energieverluste auf, die sich auf die Güte der Hauptresonanzen auswirken.

**[0015]** Die EP 1 170 862 beschreibt ein Bulk-Acoustic-Wave-Filter in einer Leiteranordnung, bei dem mehrere kreisförmige Bulk-Acoustic-Wave-Resonatoren unterschiedlicher Resonatorfläche verwendet werden.

**[0016]** Die EP 0 880 227 beschreibt ein Bulk-Acoustic-Wave-Filter in einer Leiteranordnung, bei dem mehrere quadratische Bulk-Acoustic-Wave-Resonatoren unterschiedlicher Resonatorfläche verwendet werden.

**[0017]** Die US 5,939,957 beschreibt ein Bulk-Acoustic-Wave-Filter in einer Leiteranordnung, bei dem mehrere rechteckige Bulk-Acoustic-Wave-Resonatoren unterschiedlicher Resonatorfläche verwendet werden.

**[0018]** Der vorliegenden Erfindung liegt daher die Aufgabe zugrunde, Bulk-Acoustic-Wave-Filter zur Verfügung zu stellen, bei denen die Störmoden gedämpft werden, aber gleichzeitig die Nutzresonanz nur unwesentlich oder überhaupt nicht beeinflusst wird.

**[0019]** Diese Aufgabe wird durch den Bulk-Acoustic-Wave-Filter gemäß unabhängigen Patentanspruch 1 gelöst. Weitere vorteilhafte Ausführungsformen, Ausgestaltungen und Aspekte der vorliegenden Erfindung ergeben sich aus den abhängigen Patentansprüchen, der Beschreibung und den beiliegenden Zeichnungen.

**[0020]** Der erfindungsgemäße Bulk-Acoustic-Wave-Filter umfasst wenigstens zwei Bulk-Acoustic-Wave-Resonatoren, wobei jeder Bulk-Acoustic-Wave-Resonator wenigstens eine erste Elektrode, eine piezoelektrische Schicht und eine zweite Elektrode umfasst. Wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren weisen effektive Resonatorflächen auf, die sich in Flächenform und/oder Flächeninhalt unterscheiden. Durch diese Gestaltung der Bulk-Acoustic-Wave-Resonatoren lassen sich Störmoden optimal unterdrücken, ohne dass dabei das Impedanzniveau des Filter beeinflusst wird.

**[0021]** Da jeder Resonator andere Störmodenfrequenzen aufweist, kommt es durch die Verschaltung im

Filter zu einem Mittelungseffekt. Dadurch macht sich die einzelne Störmode im Filterresponse im Vergleich zu den aus dem Stand der Technik bekannten Bulk-Acoustic-Wave-Filtern mit Resonatoren gleicher Fläche nicht so stark bemerkbar. Allerdings beeinflussen unterschiedliche Flächeninhalte der effektiven Resonatorflächen auch das Impedanzniveau der Resonatoren. Sie sind daher durch Impedanzanpassbedingungen im Filter in einem gewissen Rahmen festgelegt.

**[0022]** Sämtliche Ausführungsformen der vorliegenden Erfindung beruhen also darauf, dass nicht versucht wird, den einzelnen Bulk-Acoustic-Wave-Resonator störmodenfrei zu machen, was technisch schwierig ist und möglicherweise Resonator-Performance kostet, sondern darauf, dass erst mit der Verschaltung im Filter eine Verwaschung von vielen Störmoden bei unterschiedlichen Frequenzen eintritt und damit die Transmissionsfunktion des Filters den erwünschten glatten Verlauf erhält.

**[0023]** Gemäß einer bevorzugten Ausführungsform der vorliegenden Erfindung weisen alle Bulk-Acoustic-Wave-Resonatoren des Bulk-Acoustic-Wave-Filters effektive Resonatorflächen auf, die sich in Flächenform und/oder Flächeninhalt unterscheiden. Dadurch können Störmoden noch stärker unterdrückt werden.

**[0024]** Gemäß einer bevorzugten Ausführungsform der vorliegenden Erfindung weisen wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine effektive Resonatorfläche mit unterschiedlichem Aspektverhältnis auf.

Das Aspektverhältnis beeinflusst die Lage der Störmoden in ähnlicher Weise wie sie durch den Flächeninhalt der effektiven Resonatorflächen der Bulk-Acoustic-Wave-Resonatoren beeinflusst wird, verändert aber das Impedanzniveau nicht. Die Störmoden werden somit wirkungsvoll unterdrückt, wobei gleichzeitig die Nutzresonanz unverändert bleibt.

**[0025]** Besonders bevorzugt wird eine Ausführungsform, bei der alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Aspekt-Verhältnissen aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

**[0026]** Ebenfalls bevorzugt wird eine Ausführungsform der vorliegenden Erfindung gemäß der wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit einer nicht-rechtwinkligen Form aufweisen. Unter einer nicht-rechtwinkligen Form der effektiven Resonatorfläche eines Bulk-Acoustic-Wave-Resonators wird eine Form verstanden, bei der die Winkel zwischen den Begrenzungslinien der effektiven Resonatorfläche ungleich 90° sind. Durch diese Ausgestaltung der Resonatoren gelingt eine gute Unterdrückung der Störmoden.

**[0027]** Besonders bevorzugt wird eine Ausführungsform, bei der alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit einer nicht-rechtwinkligen Form aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

**[0028]** Beste Resultate lassen sich mit Bulk-Acoustic-

Wave-Filtern erzielen, bei denen wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichem Flächeninhalt und gleichzeitig unterschiedlichem Aspektverhältnis aufweisen. Durch passende Wahl des Flächeninhalts der effektiven Resonatorfläche und gleichzeitige Variation des Aspektverhältnisses der effektiven Resonatorfläche lassen sich sowohl Impedanzanpassungsbedingungen erfüllen als auch Störmoden optimal unterdrücken.

**[0029]** Eine weitere Verbesserung wird mit Ausführungsformen erzielt, bei denen alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Flächeninhalten und unterschiedlichen Aspektverhältnissen aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

**[0030]** Ebenfalls bevorzugt werden Bulk-Acoustic-Wave-Filter, wobei wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine effektive Resonatorfläche mit unterschiedlichem Aspektverhältnis und gleichzeitig nicht-rechtwinkliger Form aufweisen.

**[0031]** Besonders bevorzugt werden Ausführungsformen, bei denen alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Aspektverhältnissen und nicht-rechtwinkliger Form aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

**[0032]** Besonders bevorzugt werden Ausführungsformen der vorliegenden Erfindung, gemäß denen wenigstens zwei Bulk-Acoustic-Wave-Resonatoren eines Bulk-Acoustic-Wave-Filters eine effektive Resonatorfläche mit unterschiedlichem Flächeninhalt, unterschiedlichen Aspektverhältnis und nicht-rechtwinkliger Form aufweisen.

**[0033]** Ebenfalls besonders bevorzugt werden Ausführungsformen, bei denen alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen mit unterschiedlichen Flächeninhalten, unterschiedlichen Aspektverhältnissen und nicht-rechtwinkliger Form aufweisen. Dadurch können Störmoden noch stärker unterdrückt werden.

**[0034]** Besonders gute Störmodenunterdrückung wird erreicht, wenn das Aspektverhältnis der effektiven Resonatorflächen der erfindungsgemäßen Bulk-Acoustic-Wave-Resonatoren zwischen 1:1 und 1:5 liegt, insbesondere zwischen 1:1.5 und 1:3.

**[0035]** Weisen die effektiven Resonatorflächen der Bulk-Acoustic-Wave-Resonatoren unterschiedlichen Flächeninhalt auf, so wird bevorzugt, dass sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 5 % voneinander unterscheidet, insbesondere um wenigstens 10 %. Ganz besonders bevorzugt wird, dass sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 20 % voneinander unterscheidet, insbesondere um wenigstens 50 %.

**[0036]** Die Bulk-Acoustic-Wave-Filter werden durch Verschaltung von Bulk-Acoustic-Wave-Resonatoren hergestellt. Das Prinzip, den Flächeninhalt der effektiven Resonatorfläche, das Aspektverhältnis der effektiven

Resonatorfläche und/oder den Winkel zwischen den Begrenzungsflächen der effektiven Resonatorflächen zu variieren, um Störmoden im Filterresponse zu unterdrücken, lässt sich auf jede Filtertopologie anwenden. Gemäß besonders bevorzugten Ausführungsformen der vorliegenden Erfindung erfolgt die Verschaltung in Form eines 1½-stufigen Leiterfilters, in Form eines 2-stufigen Leiterfilters, in Form eines 2½-stufigen Leiterfilters, in Form eines 3-stufigen Leiterfilters oder in Form eines 3½-stufigen Leiterfilters, wobei 3, 4, 5, 6 oder 7 Bulk-Acoustic-Wave-Resonatoren verschaltet werden.

**[0037]** Ebenfalls bevorzugt wird die Verschaltung der Bulk-Acoustic-Wave-Resonatoren zu einem Bulk-Acoustic-Wave-Filter in Form eines 1-stufigen balanced Filters, in Form eines 2-stufigen balanced Filters oder in Form eines 3-stufigen balanced Filters. Es werden in diesem Fall 4, 8 oder 12 Bulk-Acoustic-Wave-Resonatoren verschaltet.

**[0038]** Die Erfindung wird nachfolgend anhand der Figuren 1 bis 8 näher dargestellt. Es zeigen:

Fig. 1 einen aus dem Stand der Technik bekannten Bulk-Acoustic-Wave-Resonator;

Fig. 2 einen aus dem Stand der Technik bekannten Stacked-Crystal-Filter;

Fig. 3 zwei übereinandergelagerte Elektroden und deren effektive Resonatorfläche;

Fig. 4 einen aus dem Stand der Technik bekannten 2-stufigen Leiterfilter;

Fig. 5 einen erfindungsgemäßen 2-stufigen Leiterfilter aufgebaut aus Bulk-Acoustic-Wave-Resonatoren mit unterschiedlichem Flächeninhalt der effektiven Resonatorflächen;

Fig. 6 einen erfindungsgemäßen 2-stufigen Leiterfilter aufgebaut aus Bulk-Acoustic-Wave-Resonatoren mit unterschiedlichem Aspektverhältnis der effektiven Resonatorflächen;

Fig. 7 Auftragung (schematisch) des Streuparameters von Eingang zu Ausgang ( $S_{12}$ ) gegen die Frequenz für einen 3-stufigen Leiterfilter mit 6 identischen quadratischen Einzelresonatoren (Stand der Technik);

Fig. 8 Auftragung (schematisch) des Streuparameters von Eingang zu Ausgang ( $S_{12}$ ) gegen die Frequenz für einen 3-stufigen Leiterfilter mit 6 Einzelresonatoren mit unterschiedlichen Aspektverhältnissen der effektiven Resonatorflächen (Erfindung).

**[0039]** Fig. 4 zeigt einen aus dem Stand der Technik bekannten 2-stufigen Leiterfilter mit 4 gleich großen qua-

dratischen Bulk-Acoustic-Wave-Resonatoren, die eine identische effektive Resonatorfläche aufweisen. Die Störmoden jedes Einzelresonators treten an den gleichen Frequenzstellen auf und sind entsprechend im elektrischen Response des Filters zu finden.

**[0040]** Fig. 5 zeigt einen 2-stufigen Leiterfilter mit 4 Bulk-Acoustic-Wave-Resonatoren mit effektiven Resonatorflächen, die unterschiedliche Flächeninhalte aufweisen. Jeder Resonator hat unterschiedliche Störmodenfrequenzen. Durch die Verschaltung im Filter kommt es zu einem Mittelungseffekt, wodurch sich die einzelne Störmode im Filterresponse im Vergleich zu der in Fig. 4 gezeigten Ausführungsform des Standes der Technik nicht so stark bemerkbar macht.

**[0041]** Fig. 6 zeigt einen 2-stufigen Leiterfilter mit 4 Bulk-Acoustic-Wave-Resonatoren mit effektiven Resonatorflächen, die zwar gleichen Flächeninhalt, aber unterschiedliche Aspektverhältnisse aufweisen. Das Aspektverhältnis beeinflusst die Lage der Störmoden in ähnlicher Weise wie bei der in Fig. 5 gezeigten Ausführungsform, wobei aber gleichzeitig das Impedanzniveau des Filters unverändert bleibt.

**[0042]** Die Figuren 7 und 8 zeigen jeweils eine schematische Auftragung des Streuparameters von Eingang zu Ausgang  $S_{12}$  in logarithmischer Skala gegen die Frequenz für einen 3-stufigen Leiterfilter mit 6 Einzelresonatoren. Zur Bestimmung von  $S_{12}$  wurde in bekannter Weise durch einen Frequenzanalysator die Streumatrix des Leiterfilters ermittelt.

**[0043]** In der Fig. 7 ist die Kennlinie eines aus dem Stand der Technik bekannten Leiterfilters, der aus 6 gleichen quadratischen Einzelresonatoren mit identischen effektiven Resonatorflächen besteht, dargestellt. Die Kennlinie zeigt ein "Rauschen" im Passband, das von spurious modes der Einzelresonatoren verursacht ist.

**[0044]** In der Fig. 8 ist die Kennlinie eines Leiterfilters gemäß der vorliegenden Erfindung dargestellt, der die gleiche Topologie aufweist wie der Leiterfilter, dessen Kennlinie in Fig. 7 dargestellt ist, allerdings weisen die effektiven Resonatorflächen der 6 Einzelresonatoren unterschiedliche Aspektverhältnisse auf. Das Rauschen im Passband mittelt sich aus der Kurve heraus, da die spurious modes der Einzelresonatoren an verschiedenen Frequenzpunkten auftreten.

**[0045]** Ähnliche Ergebnisse liefert ein Vergleich von einerseits Filtern mit Einzelresonatoren mit quadratischen effektiven Resonatorflächen und andererseits Filtern, bei denen die effektiven Resonatorflächen der Einzelresonatoren nicht rechteckige Form aufweisen (Winkel zwischen den Begrenzungslinien der effektiven Resonatorflächen der Einzelresonatoren ungleich  $90^\circ$ ). Hier wird ein deutlich geringeres Rauschen im Passband für den Filter festgestellt, dessen Einzelresonatoren effektive Resonatorflächen mit nicht-rechteckiger Form aufweisen.

#### Patentansprüche

#### Patentansprüche für folgende(n) Vertragsstaat(en): IT

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1. Bulk-Acoustic-Wave-Filter umfassend wenigstens zwei Bulk-Acoustic-Wave-Resonatoren, wobei jeder Bulk-Acoustic-Wave-Resonator wenigstens eine erste Elektrode (2; 9), eine piezoelektrische Schicht (3; 10, 11) und eine zweite Elektrode (1; 12, 13) umfasst, wobei die erste Elektrode (2; 9) auf einem Substrat (4; 7) angeordnet ist,

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**dadurch gekennzeichnet, dass**

wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen aufweisen, die sich in Flächenform und/oder Flächeninhalt unterscheiden, wobei die effektiven Resonatorflächen, die sich jeweils bei einer Projektion der beiden Elektroden (15, 16) eines Bulk-Acoustic-Wave Resonators in eine Ebene als der überlappende Bereich der Elektroden ergeben, von wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine nicht-rechteckige Form aufweisen.

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2. Bulk-Acoustic-Wave-Filter nach Anspruch 1, **dadurch gekennzeichnet, dass** alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen aufweisen, die sich in Flächenform und/oder Flächeninhalt unterscheiden.

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3. Bulk-Acoustic-Wave-Filter nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die effektiven Resonatorflächen von wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren ein unterschiedliches Aspektverhältnis aufweisen.

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4. Bulk-Acoustic-Wave-Filter nach Anspruch 3, **dadurch gekennzeichnet, dass** die effektiven Resonatorflächen aller Bulk-Acoustic-Wave-Resonatoren unterschiedliche Aspektverhältnisse aufweisen.

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5. Bulk-Acoustic-Wave-Filter nach Anspruch 1, **dadurch gekennzeichnet, dass** die effektiven Resonatorflächen aller Bulk-Acoustic-Wave-Resonatoren eine nicht-rechteckige Form aufweisen.

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6. Bulk-Acoustic-Wave-Filter nach einem der Ansprüche 3 bis 5, **dadurch gekennzeichnet, dass** das Aspekt-Verhältnis der effektiven Resonatorflächen zwischen 1:1 und 1:5 liegt.

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7. Bulk-Acoustic-Wave-Filter nach Anspruch 6, **dadurch gekennzeichnet, dass** das Aspekt-Verhältnis der effektiven Resonatorflächen zwischen 1:1.5 und 1:3 liegt.

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8. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, dass**  
sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 5 % voneinander unterscheidet, insbesondere um wenigstens 10 %.
9. Bulk-Acoustic-Wave-Filter Anspruch 8,  
**dadurch gekennzeichnet, dass**  
sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 20 % voneinander unterscheidet, insbesondere um wenigstens 50 %.
10. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, dass**  
die Bulk-Acoustic-Wave-Resonatoren in Form eines 1½-stufigen Leiterfilters, in Form eines 2-stufigen Leiterfilters, in Form eines 2½-stufigen Leiterfilters, in Form eines 3-stufigen Leiterfilters oder in Form eines 3½-stufigen Leiterfilters verschaltet sind.
11. Bulk-Acoustic-Wave-Filter nach einem der Ansprüche 1 bis 9,  
**dadurch gekennzeichnet, dass**  
die Bulk-Acoustic-Wave-Resonatoren in Form eines 1-stufigen balanced Filters, in Form eines 2-stufigen balanced Filters oder in Form eines 3-stufigen balanced Filters verschaltet sind.

**Patentansprüche für folgende(n) Vertragsstaat(en):  
DE, FR**

1. Bulk-Acoustic-Wave-Filter umfassend wenigstens zwei Bulk-Acoustic-Wave-Resonatoren, wobei jeder Bulk-Acoustic-Wave-Resonator wenigstens eine erste Elektrode (2; 9), eine piezoelektrische Schicht (3; 10, 11) und eine zweite Elektrode (1; 12, 13) umfasst, wobei die erste Elektrode (2; 9) auf einem Substrat (4; 7) angeordnet ist,  
**dadurch gekennzeichnet, dass**  
wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen aufweisen, die sich in Flächenform und Flächeninhalt unterscheiden, wobei die effektiven Resonatorflächen, die sich jeweils bei einer Projektion der beiden Elektroden (15, 16) eines Bulk-Acoustic-Wave Resonators in eine Ebene als der überlappende Bereich der Elektroden ergeben, von wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren eine nicht-rechtwinklige Form aufweisen.
2. Bulk-Acoustic-Wave-Filter nach Anspruch 1,  
**dadurch gekennzeichnet, dass**  
alle Bulk-Acoustic-Wave-Resonatoren effektive Resonatorflächen aufweisen, die sich in Flächenform und/oder Flächeninhalt unterscheiden.
3. Bulk-Acoustic-Wave-Filter nach Anspruch 1 oder 2,  
**dadurch gekennzeichnet, dass**  
die effektiven Resonatorflächen von wenigstens zwei der Bulk-Acoustic-Wave-Resonatoren ein unterschiedliches Aspektverhältnis aufweisen.
4. Bulk-Acoustic-Wave-Filter nach Anspruch 3,  
**dadurch gekennzeichnet, dass**  
die effektiven Resonatorflächen aller Bulk-Acoustic-Wave-Resonatoren unterschiedliche Aspektverhältnisse aufweisen.
5. Bulk-Acoustic-Wave-Filter nach Anspruch 1,  
**dadurch gekennzeichnet, dass**  
die effektiven Resonatorflächen aller Bulk-Acoustic-Wave-Resonatoren eine nicht-rechtwinklige Form aufweisen.
6. Bulk-Acoustic-Wave-Filter nach einem der Ansprüche 3 bis 5,  
**dadurch gekennzeichnet, dass**  
das Aspekt-Verhältnis der effektiven Resonatorflächen zwischen 1:1 und 1:5 liegt.
7. Bulk-Acoustic-Wave-Filter nach Anspruch 6,  
**dadurch gekennzeichnet, dass**  
das Aspekt-Verhältnis der effektiven Resonatorflächen zwischen 1:1.5 und 1:3 liegt.
8. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, dass**  
sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 5 % voneinander unterscheidet, insbesondere um wenigstens 10 %.
9. Bulk-Acoustic-Wave-Filter Anspruch 8,  
**dadurch gekennzeichnet, dass**  
sich der Flächeninhalt der effektiven Resonatorflächen um wenigstens 20 % voneinander unterscheidet, insbesondere um wenigstens 50 %.
10. Bulk-Acoustic-Wave-Filter nach einem der vorhergehenden Ansprüche,  
**dadurch gekennzeichnet, dass**  
die Bulk-Acoustic-Wave-Resonatoren in Form eines 1½-stufigen Leiterfilters, in Form eines 2-stufigen Leiterfilters, in Form eines 2½-stufigen Leiterfilters, in Form eines 3-stufigen Leiterfilters oder in Form eines 3½-stufigen Leiterfilters verschaltet sind.
11. Bulk-Acoustic-Wave-Filter nach einem der Ansprüche 1 bis 9,  
**dadurch gekennzeichnet, dass**  
die Bulk-Acoustic-Wave-Resonatoren in Form eines 1-stufigen balanced Filters, in Form eines 2-stufigen balanced Filters oder in Form eines 3-stufigen balanced Filters verschaltet sind.

**Claims****Claims for the following Contracting State(s): IT**

1. Bulk acoustic wave filter having at least two bulk acoustic wave resonators, with each bulk acoustic wave resonator having at least one first electrode (2; 9), one piezo-electric layer (3, 10, 11) and one second electrode (1; 12, 13), with the first electrode (2; 9) being arranged on a substrate (4; 7)  
**characterized in that**  
at least two of the bulk acoustic wave resonators have effective resonator surfaces, which differ in the surface shape and/or surface content, the effective resonator surfaces which in each case results as the overlapping area when the two electrodes (15, 16) of one bulk acoustic wave resonator are projected onto one plane, of at least two of the bulk acoustic wave resonators having a nonrectangular shape.
2. Bulk acoustic wave filter according to Claim 1,  
**characterized in that**  
all the bulk acoustic wave resonators have effective resonator surfaces which differ in the surface shape and/or surface content.
3. Bulk acoustic wave filter according to Claim 1 or 2,  
**characterized in that**  
the effective resonator surfaces of at least two of the bulk acoustic wave resonators have a different aspect ratio.
4. Bulk acoustic wave filter according to Claim 3,  
**characterized in that**  
the effective resonator surfaces of all the bulk acoustic wave resonators have different aspect ratios.
5. Bulk acoustic wave filter according to Claim 1,  
**characterized in that**  
the effective resonator surfaces of all the bulk acoustic wave resonators have a nonrectangular shape.
6. Bulk acoustic wave filter according to one of Claims 3 to 5,  
**characterized in that**  
the aspect ratio of the effective resonator surfaces is between 1:1 and 1:5.
7. Bulk acoustic wave filter according to Claim 6,  
**characterized in that**  
the aspect ratio of the effective resonator surfaces is between 1:1.5 and 1:3.
8. Bulk acoustic wave filter according to one of the preceding claims,  
**characterized in that**  
the surface contents of effective resonator surfaces

differ from one another by at least 5%, in particular by at least 10%.

9. Bulk acoustic wave filter according to Claim 8,  
**characterized in that**  
the surface contents of the effective resonator surfaces differ from one another by at least 20%, in particular by at least 50%.
10. Bulk acoustic wave filter according to one of the preceding claims,  
**characterized in that**  
the bulk acoustic wave resonators are connected in the form of a one and a half-stage conductor filter, in the form of a two-stage conductor filter, in the form of a two and a half-stage conductor filter, in the form of a three-stage conductor filter or in the form of a three and a half-stage conductor filter.
11. Bulk acoustic wave filter according to one of Claims 1 to 9,  
**characterized in that**  
the bulk acoustic wave resonators are connected in the form of a one-stage balanced filter, in the form of a two-stage balanced filter, or in the form of a three-stage balanced filter.

**Claims for the following Contracting State(s): DE, FR**

1. Bulk acoustic wave filter having at least two bulk acoustic wave resonators, with each bulk acoustic wave resonator having at least one first electrode (2; 9), one piezo-electric layer (3, 10, 11) and one second electrode (1; 12, 13), the first electrode (2; 9) being arranged on a substrate (4; 7)  
**characterized in that**  
at least two of the bulk acoustic wave resonators have effective resonator surfaces, which differ in the surface shape and surface content, the effective resonator surfaces, which result in each case in the case of a projection of the two electrodes (15, 16) of a bulk acoustic wave resonator into a plane as the overlapping region of the electrodes, of at least two of the bulk acoustic wave resonators having a nonrectangular shape.
2. Bulk acoustic wave filter according to Claim 1,  
**characterized in that**  
all the bulk acoustic wave resonators have effective resonator surfaces which differ in the surface shape and/or surface content.
3. Bulk acoustic wave filter according to Claim 1 or 2,  
**characterized in that**  
the effective resonator surfaces of at least two of the bulk acoustic wave resonators have a different aspect ratio.

4. Bulk acoustic wave filter according to Claim 3,  
**characterized in that**  
the effective resonator surfaces of all the bulk acoustic wave resonators have different aspect ratios.
5. Bulk acoustic wave filter according to Claim 1,  
**characterized in that**  
the effective resonator surfaces of all the bulk acoustic wave resonators have a nonrectangular shape.
6. Bulk acoustic wave filter according to one of Claims 3 to 5,  
**characterized in that**  
the aspect ratio of the effective resonator surfaces is between 1:1 and 1:5.
7. Bulk acoustic wave filter according to Claim 6,  
**characterized in that**  
the aspect ratio of the effective resonator surfaces is between 1:1.5 and 1:3.
8. Bulk acoustic wave filter according to one of the preceding claims,  
**characterized in that**  
the surface contents of effective resonator surfaces differ from one another by at least 5%, in particular by at least 10%.
9. Bulk acoustic wave filter according to Claim 8,  
**characterized in that**  
the surface contents of the effective resonator surfaces differ from one another by at least 20%, in particular by at least 50%.
10. Bulk acoustic wave filter according to one of the preceding claims,  
**characterized in that**  
the bulk acoustic wave resonators are connected in the form of a one and a half-stage conductor filter, in the form of a two and a half-stage conductor filter, in the form of a three-stage conductor filter or in the form of a three and a half-stage conductor filter.
11. Bulk acoustic wave filter according to one of Claims 1 to 9,  
**characterized in that**  
the bulk acoustic wave resonators are connected in the form of a one-stage balanced filter, in the form of a two-stage balanced filter, or in the form of a three-stage balanced filter

#### Revendications

#### Revendications pour l'(les) Etat(s) contractant(s)

#### suivant(s): IT

1. Filtre d'onde acoustique en volume comprenant au moins deux résonateurs d'onde acoustique en volume chaque résonateur d'onde acoustique en volume comprenant au moins une première électrode (2 ; 9) une couche (3 ; 10 , 11) piézo-électrique et une deuxième électrode (1 ; 12 , 13), la première électrode (2 ; 9) étant disposée sur un substrat (4 ; 7)  
**caractérisé en ce que**  
au moins deux des résonateurs d'onde acoustique en volume ont des surfaces efficaces de résonateur qui se distinguent par la forme de la surface et/ ou par le contenu de la surface, les surfaces efficaces de résonateur qui se présentent respectivement, dans une projection des deux électrodes (15 ; 16) d'un résonateur d'onde acoustique en volume, dans un plan sous la forme de la partie à chevauchement des électrodes, d'au moins deux des résonateurs à onde acoustique en volume ayant une forme qui n'est pas à angle droit.
2. Filtre d'onde acoustique en volume suivant la revendication 1,  
**caractérisé en ce que,**  
tous les résonateurs d'onde acoustique en volume ont des surfaces efficaces de résonateur qui se distinguent par la forme de la surface et / ou le contenu de la surface.
3. Filtre d'onde acoustique en volume suivant la revendication 1 ou 2, **caractérisé en ce que** les surfaces efficaces de résonateur d'au moins deux des résonateurs d'onde acoustique en volume ont un rapport d'aspect différent.
4. Filtre d'onde acoustique en volume suivant la revendication 3, **caractérisé en ce** toutes les surfaces efficaces de résonateur de tous les résonateurs d'onde acoustique en volume ont des rapports d'aspect différents.
5. Filtre d'onde acoustique en volume suivant la revendication 1, **caractérisé en ce** les surfaces efficaces de résonateur de tous les résonateurs d'onde acoustique en volume ont une forme qui n'est pas à angle droit.
6. Filtre d'onde acoustique en volume suivant la revendication 3 à 5, **caractérisé en ce** le rapport d'aspect des surfaces efficaces de résonateur est compris entre 1 : 1 et 1 : 5.
7. Filtre d'onde acoustique en volume suivant la revendication 6, **caractérisé en ce** le rapport d'aspect des surfaces efficaces de résonateur est compris entre 1 : 1,5 et 1 : 3.

8. Filtre d'onde acoustique en volume suivant l'une des revendications précédentes, **caractérisé en ce que** les contenus des surfaces efficaces de résonateur se distinguent entre eux d'au moins 5 %, notamment d'au moins 10 %.
9. Filtre d'onde acoustique en volume suivant la revendication 8, **caractérisé en ce que** les contenus des surfaces efficaces de résonateur se distinguent entre eux d'au moins 20 %, notamment d'au moins 50 %.
10. Filtre d'onde acoustique en volume suivant les revendications précédentes, **caractérisé en ce que** les résonateurs d'onde acoustique en volume sont câblés sous la forme d'un filtre à conducteur à 1 étage  $\frac{1}{2}$ , sous la forme d'un filtre à conducteur à deux étages, sous la forme d'un filtre à conducteur à 2 étages  $\frac{1}{2}$ , sous la forme d'un filtre à conducteur à 3 étages ou sous la forme d'un filtre à conducteur à 3 étages  $\frac{1}{2}$ .
11. Filtre d'onde acoustique en volume suivant les revendications 1 à 9, **caractérisé en ce que** les résonateurs d'onde acoustique en volume sont câblés sous la forme de filtres équilibrés à 1 étage, sous la forme de filtres équilibrés à 2 étages ou sous la forme de filtres équilibrés à 3 étages.

**Revendications pour l'(les) Etat(s) contractant(s) suivant(s): DE, FR**

1. Filtre d'onde acoustique en volume comprenant au moins deux résonateurs d'onde acoustique en volume chaque résonateur d'onde acoustique en volume comprenant au moins une première électrode (2 ; 9) une couche (3 ; 10, 11) piézo-électrique et une deuxième électrode (1 ; 12, 13), la première électrode (2 ; 9) étant disposée sur un substrat (4 ; 7) **caractérisé en ce que** au moins deux des résonateurs d'onde acoustique en volume ont des surfaces efficaces de résonateur qui se distinguent par la forme de la surface et par le contenu de la surface, les surfaces efficaces de résonateur qui se présentent respectivement, dans une projection des deux électrodes (15 ; 16) d'un résonateur d'onde acoustique en volume, dans un plan sous la forme de la partie à chevauchement des électrodes, d'au moins deux des résonateurs à onde acoustique en volume ayant une forme qui n'est pas à angle droit.
2. Filtre d'onde acoustique en volume suivant la revendication 1, **caractérisé en ce que**, tous les résonateurs d'onde acoustique en volume ont des surfaces efficaces de résonateur qui se dis-

tinguent par la forme de la surface et / ou le contenu de la surface.

3. Filtre d'onde acoustique en volume suivant la revendication 1 ou 2, **caractérisé en ce que** les surfaces efficaces de résonateur d'au moins deux des résonateurs d'onde acoustique en volume ont un rapport d'aspect différent.
4. Filtre d'onde acoustique en volume suivant la revendication 3, **caractérisé en ce que** toutes les surfaces efficaces de résonateur de tous les résonateurs d'onde acoustique en volume ont des rapports d'aspect différents.
5. Filtre d'onde acoustique en volume suivant la revendication 1, **caractérisé en ce que** les surfaces efficaces de résonateur de tous les résonateurs d'onde acoustique en volume ont une forme qui n'est pas à angle droit.
6. Filtre d'onde acoustique en volume suivant la revendication 3 à 5, **caractérisé en ce que** le rapport d'aspect des surfaces efficaces de résonateur est compris entre 1 : 1 et 1 : 5.
7. Filtre d'onde acoustique en volume suivant la revendication 6, **caractérisé en ce que** le rapport d'aspect des surfaces efficaces de résonateur est compris entre 1 : 1,5 et 1 : 3.
8. Filtre d'onde acoustique en volume suivant l'une des revendications précédentes, **caractérisé en ce que** les contenus des surfaces efficaces de résonateur se distinguent entre eux d'au moins 5 %, notamment d'au moins 10 %.
9. Filtre d'onde acoustique en volume suivant la revendication 8, **caractérisé en ce que** les contenus des surfaces efficaces de résonateur se distinguent entre eux d'au moins 20 %, notamment d'au moins 50 %.
10. Filtre d'onde acoustique en volume suivant les revendications précédentes, **caractérisé en ce que** les résonateurs d'onde acoustique en volume sont câblés sous la forme d'un filtre à conducteur à 1 étage  $\frac{1}{2}$ , sous la forme d'un filtre à conducteur à deux étages, sous la forme d'un filtre à conducteur à 2 étages  $\frac{1}{2}$ , sous la forme d'un filtre à conducteur à 3 étages ou sous la forme d'un filtre à conducteur à 3 étages  $\frac{1}{2}$ .
11. Filtre d'onde acoustique en volume suivant les revendications 1 à 9, **caractérisé en ce que** les résonateurs d'onde acoustique en volume sont câblés sous la forme de filtres équilibrés à 1 étage, sous la forme de filtres équilibrés à 2 étages ou sous la forme

de filtres équilibrés à 3 étages.

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FIG 1

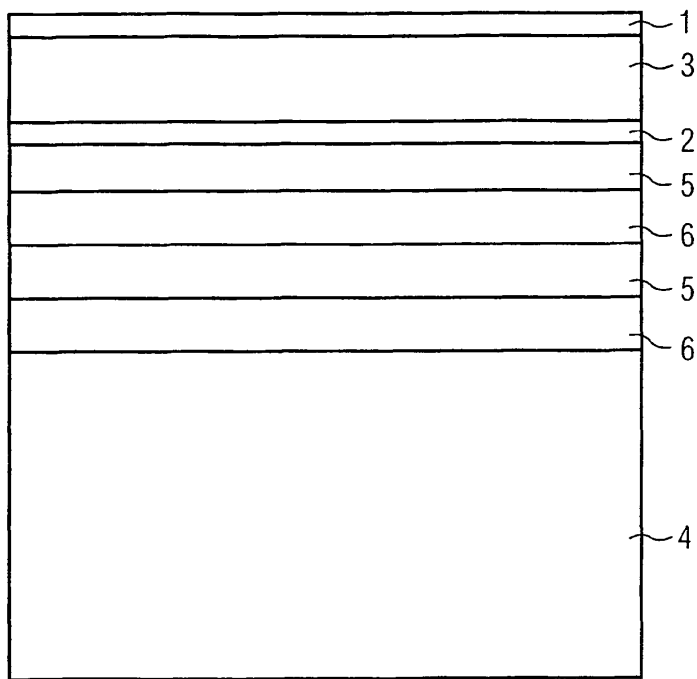


FIG 2

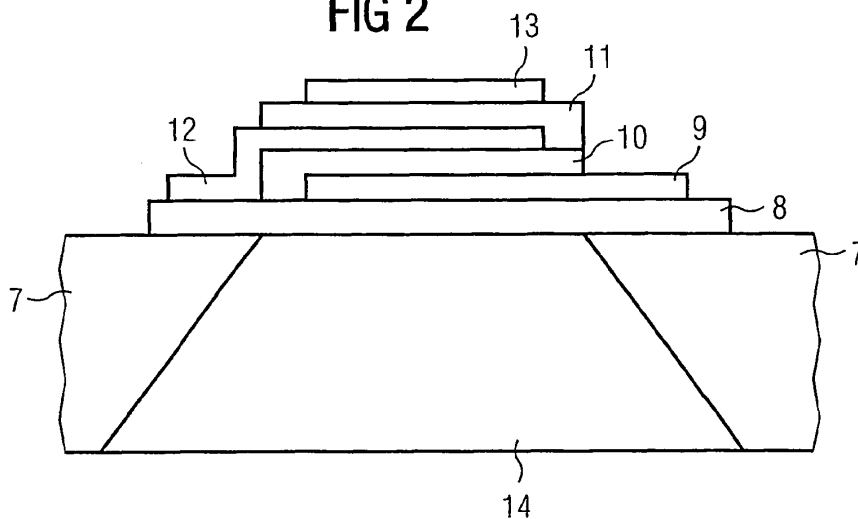


FIG 3

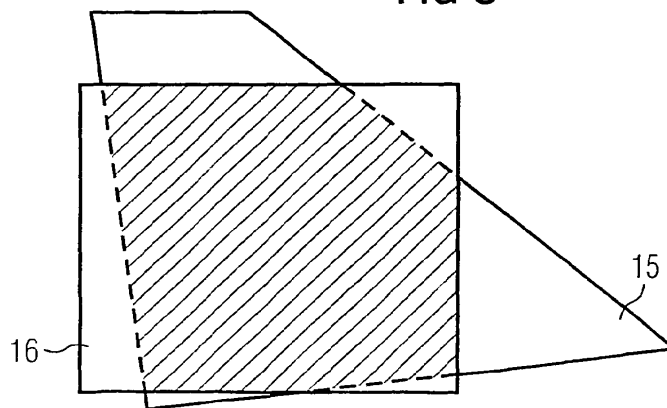


FIG 4

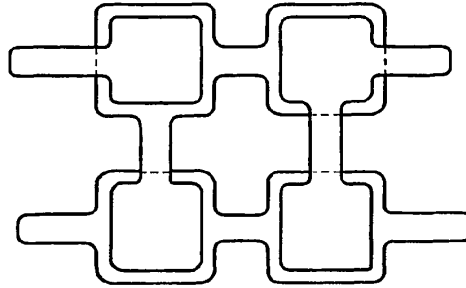


FIG 5

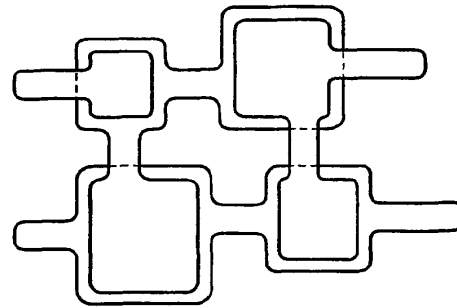


FIG 6

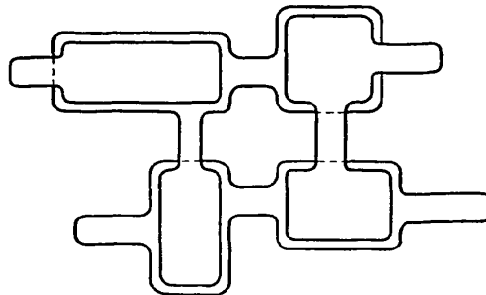


FIG 7

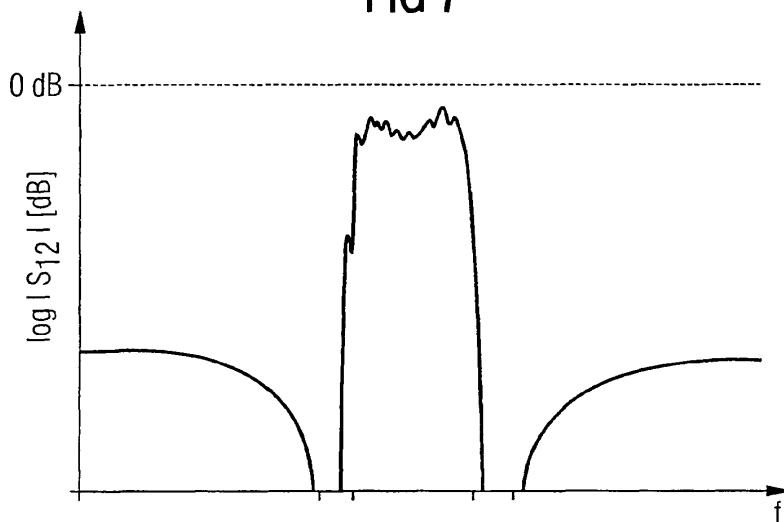
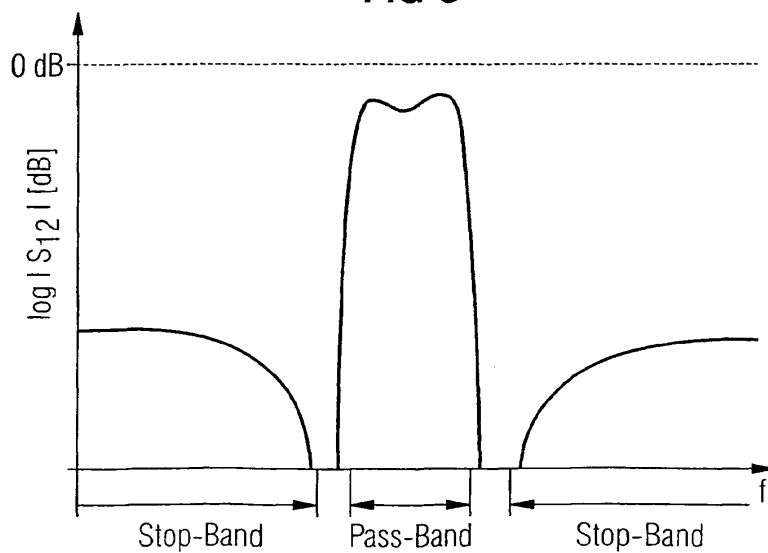


FIG 8



<b>Electronic Acknowledgement Receipt</b>	
<b>EFS ID:</b>	8476309
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	John M. Wechkin/Stephanie Olson
<b>Filer Authorized By:</b>	John M. Wechkin
<b>Attorney Docket Number:</b>	345638003US2
<b>Receipt Date:</b>	22-SEP-2010
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<b>Time Stamp:</b>	17:19:06
<b>Application Type:</b>	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	Foreign Reference	DE10058339.PDF	514382 <small>8238690d14388a9c4e26c5199ffc748caf758e6</small>	no	11

**Warnings:**

**Information:**

2	Foreign Reference	EP1340316.PDF	750664 36ae3d00a4c38d2d0af63abd520bce1d6593e9c3	no	15
<b>Warnings:</b>					
<b>Information:</b>					
3	Foreign Reference	VTVLs.PDF	282502 3d47ab97d2d1f7e8a7c9cd70a690c069c154aa36	no	6
<b>Warnings:</b>					
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<b>Total Files Size (in bytes):</b>				1547548	
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Table with 4 columns: APPLICATION NUMBER (12/815,306), FILING OR 371(C) DATE (06/14/2010), FIRST NAMED APPLICANT (Jeffrey P. Bezos), ATTY. DOCKET NO./TITLE (345638003US2)

25096
PERKINS COIE LLP
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247

CONFIRMATION NO. 1105
FORMALITIES LETTER



Date Mailed: 06/25/2010

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given TWO MONTHS from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing. Applicant must submit \$82 to complete the basic filing fee for a small entity.
The oath or declaration is missing. A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this notice.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is \$527 for a small entity

- \$82 Statutory basic filing fee.
\$65 Surcharge.
The application search fee has not been paid. Applicant must submit \$270 to complete the search fee.
The application examination fee has not been paid. Applicant must submit \$110 to complete the examination fee for a small entity in compliance with 37 CFR 1.27.

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Table with 6 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY.DOCKET.NO, TOT CLAIMS, IND CLAIMS. Row 1: 12/815,306, 06/14/2010, 3644, 0.00, 345638003US2, 20, 3

CONFIRMATION NO. 1105

FILING RECEIPT

25096
PERKINS COIE LLP
PATENT-SEA
P.O. BOX 1247
SEATTLE, WA 98111-1247



Date Mailed: 06/25/2010

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

Applicant(s)

Jeffrey P. Bezos, Residence Not Provided;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/218,029 06/17/2009
and claims benefit of 61/187,243 06/15/2009
and claims benefit of 61/187,268 06/15/2009

Foreign Applications

If Required, Foreign Filing License Granted: 06/22/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 12/815,306

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

\*\* SMALL ENTITY \*\*

**Title**

SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS

**Preliminary Class**

244

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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 (1-866-999-4158).

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page 2 of 3

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<b>UTILITY PATENT APPLICATION TRANSMITTAL</b>  <small>(ONLY FOR NEW NONPROVISIONAL APPLICATIONS UNDER 37 CFR 1.53(B))</small>	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;"><i>Attorney Docket No.</i></td> <td>345638003US2</td> </tr> <tr> <td><i>First Inventor</i></td> <td>Jeffrey P. Bezos</td> </tr> <tr> <td><i>Title</i></td> <td>SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS</td> </tr> <tr> <td><i>Express Mail Label No.</i></td> <td></td> </tr> </table>	<i>Attorney Docket No.</i>	345638003US2	<i>First Inventor</i>	Jeffrey P. Bezos	<i>Title</i>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS	<i>Express Mail Label No.</i>	
<i>Attorney Docket No.</i>	345638003US2								
<i>First Inventor</i>	Jeffrey P. Bezos								
<i>Title</i>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS								
<i>Express Mail Label No.</i>									
<p style="text-align: center;"><b>APPLICATION ELEMENTS</b> <small>See MPEP chapter 600 concerning utility patent application contents.</small></p> <p>1. <input type="checkbox"/> <b>Fee Transmittal Form</b> (e.g., PTO/SB/17)</p> <p>2. <input checked="" type="checkbox"/> <b>Applicant claims small entity status.</b> <small>See 37 CFR 1.27.</small></p> <p>3. <input checked="" type="checkbox"/> <b>Specification</b> [Total Pages <u>19</u>] <small>Both the claims and abstract must start on a new page (For information on the preferred arrangement, see MPEP 608.01(a))</small></p> <p>4. <input checked="" type="checkbox"/> <b>Drawing(s)</b> (35 U.S.C. 113) [Total Sheets <u>2</u>]</p> <p>5. <b>Oath or Declaration</b> [Total Sheets _____]</p> <p style="margin-left: 20px;">a. <input type="checkbox"/> Newly executed (original or copy)</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> A copy from a prior application (37 CFR 1.63(d)) <small>(for continuation/divisional with Box 18 completed)</small></p> <p style="margin-left: 20px;">i. <input type="checkbox"/> <b>DELETION OF INVENTOR(S)</b> <small>Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.65(e)(2) and 1.33(b).</small></p> <p>6. <input type="checkbox"/> <b>Application Data Sheet.</b> See 37 CFR 1.76</p> <p>7. <input type="checkbox"/> <b>CD-ROM or CD-R</b> in duplicate, large table or Computer Program (<i>Appendix</i>)</p> <p style="margin-left: 20px;"><input type="checkbox"/> Landscape Table on CD</p> <p>8. <b>Nucleotide and/or Amino Acid Sequence Submission</b> <small>(if applicable, items a. - c. are required)</small></p> <p style="margin-left: 20px;">a. <input type="checkbox"/> Computer Readable Form (CRF)</p> <p style="margin-left: 20px;">b. <b>Specification Sequence Listing on:</b></p> <p style="margin-left: 40px;">i. <input type="checkbox"/> CD-ROM or CD-R (2 copies); or    ii. <input type="checkbox"/> Paper</p> <p style="margin-left: 20px;">c. <input type="checkbox"/> Statements verifying identity of above copies</p> <p>18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:</p> <p style="margin-left: 20px;"><input type="checkbox"/> Continuation    <input type="checkbox"/> Divisional    <input type="checkbox"/> Continuation-in-part (CIP)    of prior application No.: _____</p> <p style="margin-left: 20px;">Prior application information: Examiner _____ Art Unit: _____</p>	<p style="text-align: center;"><b>ADDRESS TO:</b> Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450</p> <p style="text-align: center;"><b>ACCOMPANYING APPLICATION PARTS</b></p> <p>9. <input type="checkbox"/> <b>Assignment Papers</b> (cover sheet &amp; document(s))</p> <p style="margin-left: 20px;">Name of Assignee _____</p> <p>10. <input type="checkbox"/> <b>37 CFR 3.73(b) Statement</b> <input type="checkbox"/> <b>Power of Attorney</b> <small>(when there is an assignee)</small></p> <p>11. <input type="checkbox"/> <b>English Translation Document</b> (if applicable)</p> <p>12. <input type="checkbox"/> <b>Information Disclosure Statement</b> (PTO/SB/08 or PTO-1449) <input type="checkbox"/> Copies of citations attached</p> <p>13. <input type="checkbox"/> <b>Preliminary Amendment</b></p> <p>14. <input type="checkbox"/> <b>Return Receipt Postcard</b> (MPEP 503) <small>(Should be specifically itemized)</small></p> <p>15. <input type="checkbox"/> <b>Certified Copy of Priority Document(s)</b> <small>(if foreign priority is claimed)</small></p> <p>16. <input type="checkbox"/> <b>Nonpublication Request</b> under 35 U.S.C.122 (b)(2)(B)(i). <small>Applicant must attach form PTO/SB/35 or equivalent.</small></p> <p>17. <input type="checkbox"/> <b>Other:</b> _____</p>								
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Signature: 	Date: June 14, 2010								
Name (Print/Type): Stephen E. Arnett	Registration No. (Attorney/Agent): 47,392								

34563-8003 US02/LEGAL18518881.1

SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED  
SYSTEMS AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS INCORPORATED BY  
REFERENCE

**[0001]** The present application claims priority to U.S. Provisional Patent Application No. 61/218,029, filed June 17, 2009 and titled "SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS, INCLUDING EN ROUTE VEHICLE REFURBISHMENT," and U.S. Provisional Patent Application No. 61/187,243, filed June 15, 2009 and titled "SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS," both of which are incorporated herein in their entireties by reference.

**[0002]** The present application incorporates the subject matter of the following patent applications in their entireties by reference: U.S. Provisional Patent Application No. 61/155,115, filed February 24, 2009 and titled "ROCKETS WITH DEPLOYABLE FLARE SURFACES, AND ASSOCIATED SYSTEMS AND METHODS;" U.S. Non-provisional Patent Application No. 12/712,156, filed February 24, 2010 and titled "LAUNCH VEHICLES WITH FIXED AND DEPLOYABLE DECELERATION SURFACES, AND/OR SHAPED FUEL TANKS, AND ASSOCIATED SYSTEMS AND METHODS;" U.S. Provisional Patent Application No. 61/187,268, filed June 15, 2009 and titled "BIDIRECTIONAL CONTROL SURFACES FOR USE WITH HIGH SPEED VEHICLES, AND ASSOCIATED SYSTEMS AND METHODS;" and U.S. Non-provisional Patent Application No. 12/712,083, filed February 24, 2010 and titled "BIDIRECTIONAL CONTROL SURFACES FOR USE WITH HIGH SPEED VEHICLES, AND ASSOCIATED SYSTEMS AND METHODS."

34563-8003.US02/LEGAL18334748.1

## TECHNICAL FIELD

**[0003]** The present disclosure relates generally to space launch vehicles and, more particularly, to systems and methods for landing space launch vehicles at sea, and/or refurbishing such vehicles en route from a landing site.

## BACKGROUND

**[0004]** Rocket powered launch vehicles have been used for many years to carry human and non-human payloads into space. Rockets delivered the first humans to the moon, and have launched many satellites into earth orbit, unmanned space probes, and supplies and personnel to the orbiting international space station.

**[0005]** Despite the rapid advances in manned and unmanned space flight, delivering astronauts, satellites, and other payloads to space continues to be an expensive proposition. One reason for this is that most conventional launch vehicles are only used once, and hence are referred to as "expendable launch vehicles" or "ELVs." The advantages of reusable launch vehicles (RLVs) include the potential of providing low cost access to space.

**[0006]** Although NASA's space shuttle is largely reusable, reconditioning the reusable components is a costly and time consuming process that requires extensive ground based infrastructure. Moreover, the additional shuttle systems required for reentry and landing reduce the payload capability of the shuttle. As commercial pressures increase, the need remains for lower-cost access to space for both human and non-human payloads.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** Figure 1 is a schematic diagram illustrating a mission profile of a space launch vehicle that lands on a sea-going platform in accordance with an embodiment of the disclosure.

**[0008]** Figure 2 is a flow diagram illustrating a routine for launching a space launch vehicle from a land-based or other launch site and landing the space launch vehicle on a sea-going platform in accordance with an embodiment of the disclosure.

## DETAILED DESCRIPTION

**[0009]** Certain aspects of the present disclosure are directed generally to vertical powered landings of reusable launch vehicles on sea-going platforms, and associated systems and methods. Other aspects of the disclosure relate to refurbishing reusable launch vehicles en route from a sea-based or other landing site. Certain details are set forth in the following description and in Figures 1 and 2 to provide a thorough understanding of various embodiments of the disclosure. Those of ordinary skill in the relevant art will appreciate, however, that other embodiments having different configurations, arrangements, and/or components may be practiced without several of the details described below. In particular, other embodiments of the disclosure may include additional elements, or may lack one or more of the elements or features described below with reference to Figures 1 and 2. Moreover, several details describing structures and processes that are well-known and often associated with space launch vehicles and launching and landing space launch vehicles are not set forth in the following description to avoid unnecessarily obscuring the various embodiments of the disclosure.

**[0010]** In the Figures, identical reference numbers identify identical or at least generally similar elements. To facilitate the discussion of any particular element, the most significant digit or digits of any reference number refers to the Figure in which that element is first introduced. For example, element 110 is first introduced and discussed with reference to Figure 1.

**[0011]** Space launch vehicles are typically launched from coastal launch sites along flight corridors that take them out and over the ocean for much of their trajectory. This trajectory avoids exposing the public to the potential risks associated with rocket overflight, and results in the booster stage falling into the water. Water landings, however, make reuse of the booster stage costly and difficult for a number of reasons. For example, sea water can be very corrosive to rocket components. Moreover, many of the rocket components get very hot during use, and quenching these hot components in cold sea water can result in cracking and other forms of damage. Recovery and reuse of solid rocket stages after water landings with a parachute is feasible because a solid rocket

motor is little more than an empty casing after firing. Liquid-fueled rocket stages, however, are considerably more complex. As a result, few, if any liquid-fueled rocket stages have been reused after water landings.

**[0012]** Concepts exist for landing a booster stage on land. These concepts include landing the booster stage horizontally, like an airplane, or vertically, under its own power or by parachute or other means. All of these approaches, however, limit operational flexibility because they require a ground landing site for every launch azimuth and potential downrange landing area.

**[0013]** Other concepts have been proposed in which the booster stage restarts its rocket engines after separation from the upper stage(s), and then flies back to the launch site. Once at the launch site, the booster stage would either execute a horizontal landing on a runway or a vertical landing by power or other means, such as a parachute. Both of these approaches, however, reduce the payload capability to orbit because they require the rocket to carry a substantial load of propellant to perform the fly-back maneuver.

**[0014]** Figure 1 is a schematic diagram illustrating a flight profile of a reusable launch vehicle that performs a vertical powered landing on a sea-going platform in accordance with an embodiment of the disclosure. In the illustrated embodiment, a multi-stage orbital launch vehicle 100 includes a first or booster stage 110 and a second or upper stage 130. The booster stage 110 can include an interstage structure comprising deployable aerodynamic surfaces 120 positioned toward a forward end 114, and one or more rocket engines 116 positioned toward an aft end 112. The rocket engines 116 can include, for example, liquid-fueled rocket engines such as liquid oxygen/hydrogen engines, liquid oxygen/kerosene or RP-1 engines, etc. In other embodiments, the rocket engines 116 can include solid propellants. As described in greater detail below, the aft end 112 of the booster stage 110 can also include a plurality of moveable control surfaces 118 (identified individually as control surfaces 118a, 118b, etc.) for controlling both ascent and descent trajectories of the booster stage 110.

**[0015]** Although the upper stage 130 is stacked on top of the booster stage 110 in the illustrated embodiment, in other embodiments the launch vehicle 100 and variations



thereof can have other configurations without departing from the spirit or scope of the present disclosure. For example, in one embodiment the upper stage 130 and the booster stage 110 can be positioned side-by-side and attached to each other during ascent with a suitable separation system. In another embodiment, the two or more booster stages 110 or variations thereof can be positioned around the upper stage 130 in a "strap-on" type configuration. Accordingly, the present disclosure is not limited to the particular launch vehicle configuration illustrated in Figure 1.

**[0016]** In the illustrated embodiment, the launch vehicle 100 takes off from a coastal or other land-based launch site 140 and then turns out over an ocean 102. In one aspect of this embodiment, the sea-going platform 150 can include a broadcast station 152 for communicating its position to the launch vehicle 100 in real-time. This information allows the launch vehicle 100 and/or the booster stage 110 to continuously check and/or adjust its flight path to target the platform 150. If the platform 150 is a freely-drifting craft, the platform 150 can also include a platform position predictor (e.g., a suitable processing device, memory, and associated computer-executable instructions) that automatically predicts a future position of the platform 150 based on various existing conditions such as the strength and direction of the marine current, the strength and direction of the wind, the present rate and direction of drift, etc. For example, the platform position predictor can be configured to predict the position of the platform at the expected time of launch vehicle touchdown. Moreover, the broadcast station 152 can transmit this information to the launch vehicle 100 and/or the booster stage 110 in real-time, so that the launch vehicle 100 and/or the booster stage 110 can utilize this information to adjust its flight path and better target the landing location. After high-altitude booster engine cutoff (BECO), the booster stage 110 separates from the upper stage 130 and continues along a ballistic trajectory. Upper stage engine or engines 132 (e.g., liquid-fueled engines) can then ignite and propel the upper stage 130 into a higher trajectory 134 for orbital insertion or other destinations. As the booster stage 110 reenters the earth's atmosphere, it reorients so that the aft end 112 is pointing in the direction of motion and glides toward the sea-going landing platform 150. In another embodiment, the booster stage 110 can reenter the atmosphere nose-first, and then reorient to a tail-first orientation just prior to landing. In

yet another embodiment, landing rockets and/or a suitable landing gear structure can be mounted on the forward end 114 of the booster stage 110 so that the booster stage 110 can reenter the atmosphere nose-first, and land in a nose-down orientation.

**[0017]** Depending on the particular launch trajectory, the sea-going platform 150 may be located a hundred or more miles downrange from the coastal launch site 140. As the booster stage 110 descends toward the sea-going platform 150, the booster stage 110 can adjust its glide path to target the platform 150 based on platform positional data received from the broadcast station 152. In addition or alternatively, the sea-going platform 150 can include a submerged or partially submerged propulsion system (having, e.g., propellers or other propulsive devices) to hold the platform 150 in a predetermined position or move the platform 150 as needed to adjust for drift and/or changes in booster trajectory. One or more boats with cables can also be used to hold the platform 150 in position or move the platform 150 as needed to adjust for drift and/or changes in booster trajectory.

**[0018]** As the booster stage 110 descends toward the sea-going platform 150, the booster stage 110 can control its glide path using the aerodynamic control surfaces 118 positioned on the aft end 112, and/or the deployable control surfaces 120 positioned toward the forward end 114. In one aspect of this embodiment, the deployable control surfaces 114 can include aerodynamic surfaces that flare or deploy outwardly in the form of, e.g., a shuttlecock to create aerodynamic drag aft of the center of gravity (CG) of the booster stage 110 that helps to stabilize the booster stage 110 in a tail-first orientation. In another aspect of this embodiment, the moveable aerodynamic control surfaces 118 positioned toward the aft end 112 of the booster 110 can include bidirectional control surfaces that can control the attitude and/or trajectory of the booster stage 110 during both ascent when the vehicle 100 is moving in the forward direction and descent when the booster stage 110 is moving in the aft direction toward the sea-going platform 150. Accordingly, in one aspect of this embodiment the aerodynamic control surfaces 118 are bidirectional, supersonic control surfaces. In still further embodiments, a suitable parachute system can be deployed from, e.g., the forward end 114 of the booster stage

110 to reduce and/or otherwise control the rate of descent during all or a portion of the descent.

**[0019]** After the booster stage 110 has descended to a suitable position above the platform 150 (e.g., in some embodiments from about 100,000 feet to about 1,000 feet, or in other embodiments from about 10,000 feet to about 3,000 feet), it restarts the booster engines 116 to slow its descent. The booster stage 110 then performs a vertical, powered landing on the platform 150 at low speed. For example, the booster stage 110 can slow from a rate of descent of about 60 feet per second to about 1 foot per second or less, and can touch down on the landing platform 150 using gimbaling of the booster engines 116 and/or attitude control thrusters to control the attitude and/or position of the booster stage 110 during touch down. In one embodiment, the booster stage 110 can touch down on a suitable shock-absorbing landing gear. In other embodiments, other landing means can be employed to suitably land the booster stage 110 on the sea-going platform 150 in accordance with the present disclosure.

**[0020]** In another embodiment, one or more jet engines (not shown) can be suitably attached to the aft end 112 or other portion of the booster stage 110 to perform all or a portion of the vertical landing maneuvers. The jet engines can be started during booster stage descent, and can be used in combination with, or in place of, restarting the booster engines 116. Jet engines may be more fuel efficient than the booster engines 116 and, as a result, may provide more hover time and better control of the booster stage 110 during landing on the platform 150. In one embodiment, the jet engines can be used in combination with a suitable parachute system that deploys and decelerates the booster stage 110 before the jet engines are started.

**[0021]** In one embodiment, the sea-going platform 150 can be a free-floating, ocean-going barge with a suitable deck configured for landing and transporting the booster stage 110. In other embodiments, the platform 150 can be part of a more complex vessel, such as a semi-submersible platform having underwater thrusters to minimize or at least reduce deck motion and hold a fixed or relatively fixed position. In the barge embodiment, the sea-going platform 150 can be towed back to the coastal launch site 140 or other port after landing for reconditioning and/or refurbishment for reuse. In one embodiment, the

sea-going platform 150 can be towed by a tug or other suitable vessel. In other embodiments, the sea-going platform 150 can include its own propulsion system to transport the booster stage 110 back to the launch site 140 or other port.

**[0022]** There are a number of advantages associated with the embodiments of the present disclosure described above with reference to Figure 1. For example, recovering the booster stage 110 by landing on a sea-going platform reduces the costs associated with launching multi-stage orbital vehicles. Moreover, by performing a vertical powered landing, the booster stage is recovered in a way that minimizes or at least reduces the amount of reconditioning necessary for reuse. In addition, embodiments of the disclosure described above can improve operational flexibility of orbital launch vehicles because the ocean-going platform 150 can be moved to a different area of the ocean as the mission launch azimuth and/or downrange landing locations change. Moreover, the ocean-going platform 150 can even be moved to other parts of the world to support launches from other sites (e.g., other coastal launch sites). In addition to launching from coastal launch sites, the launch vehicle 100 can also be launched from sea on an ocean-going platform or vessel and then landed down range on the ocean-going platform 150. Such embodiments may be advantageous for equatorial launches from sea-based platforms to increase payload capability. Alternatively, in other embodiments the launch vehicle 100 can be launched from an ocean-going platform, and then the booster 110 can be recovered by performing a powered, vertical landing on land.

**[0023]** The embodiments of the disclosure described above can also increase the payload capability of the launch vehicle 100 by allowing the booster stage 110 to fly the most efficient, or at least a very efficient trajectory as it reenters the atmosphere and travels toward the platform 150. The payload capability is increased because no propellant needs to be retained by the booster stage 110 for flyback to a land-based landing site. Moreover, the sea-going platform 150 can be positioned in whatever location the booster stage 110 is predetermined to land after separation of the upper stage 130. The embodiments disclosed herein can also reduce or eliminate the public safety concerns associated with reversing the flight trajectory of the booster stage 110 for land-based landings.

**[0024]** The embodiments of the disclosure described above also solve the problem of how to transport the booster stage 110 back to either the coastal launch site 140 or other land-based reconditioning facility. More specifically, booster stages of launch vehicles are typically very large and, as a result, transporting them fully assembled can present significant logistical challenges and costs. If a booster stage were to land downrange on land, the problem of transporting the booster stage back to either the launch site or other reconditioning site would have to be solved, and land-based travel of something as large as a booster stage is logistically and financially challenging. In contrast, ocean transport is a cost-effective means of transporting large cargo, such as booster stages, long distances. The sea-going platform 150 of the present disclosure can be towed back to a harbor near the launch site and offloaded for reconditioning and reuse relatively inexpensively.

**[0025]** Although Figure 1 describes an embodiment of the disclosure in the context of recovering a booster stage, the present disclosure can also be applied to recovery of an orbital reentry vehicle with precision, vertical powered landing capability. One advantage of this approach is that it would allow the sea-going platform 150 to be positioned in any ocean area or other body of water (e.g., a sound, lake, etc.) suitable for landing a reentering vehicle. Moreover, multiple sea-going platforms could be placed around the world at predetermined locations to provide contingency landing zones if needed for an aborted mission.

**[0026]** Figure 2 illustrates a flow routine 200 of a method for launching and landing a space launch vehicle, e.g., an orbital vehicle, in accordance with an embodiment of the disclosure. In one aspect of this embodiment, the routine 200 can be implemented by the launch vehicle 100 described above with reference to Figure 1. In other embodiments, the routine 200 or portions thereof can be employed by other types of launch vehicles, including orbital launch vehicles, non-orbital launch vehicles, deep-space and inter-planetary vehicles, etc.

**[0027]** In block 202, the routine starts with booster engine ignition and liftoff from a launch site (e.g., a land-based launch site, such as a coastal launch site). As described above, in other embodiments the mission can begin with liftoff from a sea-based launch pad such as a floating platform, barge, ship or other vessel. In block 204, booster engine

cutoff occurs at a predetermined altitude. In block 206, the upper stage separates from the booster stage and the upper stage engine or engines are started.

**[0028]** In block 208, the booster stage reorients as it follows its ballistic trajectory after upper stage separation. More particularly, the booster stage reorients so that it is traveling in a tail-first direction. In one embodiment, the reorientation of the booster stage can be accomplished using deployable aerodynamic surfaces (e.g., flared surfaces) which extend outwardly from the forward end of the booster stage to create drag aft of the CG of the booster stage. In other embodiments, thrusters (e.g., rocket thrusters, such as hydrazine thrusters) can be employed in addition to or instead of aerodynamic control surfaces to reorient the booster stage. For example, if reorientation of the booster stage occurs in space where aerodynamic control surfaces are ineffectual, then thrusters can be employed to reorient the booster stage.

**[0029]** In block 210, aerodynamic drag and/or control surfaces are deployed prior to or during reentry of the vehicle into the earth's atmosphere. In block 212, the booster stage reenters the atmosphere and establishes contact with a sea-going landing platform. Alternatively, the vehicle can establish contact with the sea-going landing platform before reentry, or it can be in constant contact with the sea-going platform during the entire flight. In block 214, the booster stage glides or otherwise follows a ballistic trajectory toward the sea-going landing platform.

**[0030]** In decision block 216, the routine determines if the glide path of the booster stage needs to be adjusted to properly position the booster stage over the sea-going platform. If not, the routine proceeds to block 220 and the booster stage continues gliding toward the sea-going platform. If glide path adjustment is needed, the routine proceeds to block 218 and moves the aerodynamic control surfaces to change the glide path of the booster stage. Alternatively, or in addition to changing the glide path of the booster stage, the routine can also adjust the position of the landing platform using, e.g., propulsion systems associated with the landing platform or by towing the platform.

**[0031]** After adjusting the glide path and/or the position of the landing platform, the routine proceeds to decision block 222 to determine if the booster stage is suitably

positioned over the landing platform to prepare for the final stage of landing. If not, the routine returns to decision block 216 and repeats. Once the vehicle is in a suitable position over the landing platform to prepare for final landing procedures, the routine proceeds to block 224 and reignites the booster engines. In block 226, the vehicle performs a vertical powered landing on the sea-going platform, and the flight portion of the routine ends.

**[0032]** In one embodiment, however, the routine 200 can continue in block 228 by moving the platform and the booster stage back to the launch site or other port for reconditioning and reuse. In block 230, the booster stage is reconditioned as needed and installed on a new launch vehicle. From block 230, the routine returns to block 202 and repeats for the new vehicle.

**[0033]** In a particular embodiment, the sea-going platform can be positioned in a manner that improves and/or optimizes the second stage separation of the launch vehicle, e.g., both the azimuth and distance from the launch pad. For example, in at least some instances, the ability to move the sea-going platform can broaden the range of available locations at which the launch booster separates from the rest of the vehicle because the landing site of the booster is not so tightly constrained. The ability to control the trajectory of the booster's descent can further broaden the range of available landing sites.

**[0034]** In any of the foregoing embodiments, once the launch vehicle lands, the overall process can include additional steps to facilitate quickly returning the launch vehicle to service. For example, the launch vehicle can be transferred from a relatively slow-moving sea-going platform to a faster surface ship so as to reduce the time in transit back to the launch site. In addition to or in lieu of the transfer, the reusable launch vehicle can be refurbished while it is in transit from the landing site to the launch site. Aspects of both features are described further below in the context of a launch vehicle recovered at sea. In other embodiments, particular aspects of these features (e.g., refurbishing the launch vehicle en route from the landing site) may be applied to other recovery arrangements, including land-based recovery.

**[0035]** In a particular embodiment, the launch vehicle (e.g., a first stage reusable booster system or RBS) is immediately and/or autonomously put into a safe state after landing on the sea-going landing platform and before the processing crew approach the vehicle. Autonomous safety activities can include venting the propellant tanks and pressurant bottles and retracting any aerodynamic surfaces. The vehicle can then be transferred to a separate, smaller ship for faster return to a coastal launch site or transfer site. In another embodiment, the vehicle can be secured to the deck of the landing platform, and the platform can be towed or moved under its own propulsion back to a coastal launch site or a transfer site. In either case, the vehicle can be moved via a sea crane (or other suitable device) to secure the vehicle, whether in a vertical or a horizontal position for ocean transportation, and offloaded onto a truck at the dock for return to a vehicle processing facility at the launch site.

**[0036]** While en route and at the vehicle processing facility, the launch vehicle can be processed for the next launch. Turnaround activities that typically occur prior to each launch may include maintenance items (if any), cleaning, recharging gaseous presurrant bottles, recharging electrical batteries, refurbishing thermal protection system materials as needed, and/or functionally testing pneumatic, avionics and hydraulic subsystems. While en route or at the vehicle processing facility, the vehicle can be mated to an expendable upper stage, which can be pre-integrated with the payload and payload fairing. In other cases, the launch vehicle can be mated directly to a payload module. At periodic intervals, major maintenance activities such as engine overhaul can also be performed.

**[0037]** During the foregoing processing activities, if the overall system includes a single sea-going platform and it is used to transport the vehicle back to the coastal launch site, then the platform can be repositioned at the landing zone after offloading the vehicle, ready to land a second vehicle while the first vehicle is in transit back to the launch site. If the overall system includes two sea-going platforms, then one sea-going platform can remain in the landing zone between flights while the other returns to the coast. In still another embodiment, the system can include two launch vehicles, one sea-going landing platform, and a separate vessel that transports the vehicle from the platform to the launch site, which also allows one landing platform to remain in the landing zone between flights.



The separate vessel can include a sea-going vessel or an airborne vessel in particular embodiments.

**[0038]** In any of the foregoing embodiments, any suitable aspect of the refurbishment process can be conducted while the vehicle is in transit, provided, for example, that the process may be successfully carried out in a marine environment, and is properly sequenced with subsequent processes.

**[0039]** From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the spirit and scope of the various embodiments of the invention. For example, although various embodiments of the present disclosure have been described above in the context of landing a launch vehicle at sea, in other embodiments the systems and methods described herein can be used to land a launch vehicle on other bodies of water including, for example, a lake, a gulf, ocean, sound, or possibly even a large river. Further, while various advantages associated with certain embodiments of the disclosure have been described above in the context of those embodiments, other embodiments may also exhibit such advantages, and not all embodiments need necessarily exhibit such advantages to fall within the scope of the invention. Accordingly, the invention is not limited, except as by the appended claims.

## CLAIMS

I/We claim:

- [c1] 1. A method for operating a space launch vehicle, the method comprising:  
launching the space launch vehicle from earth;  
positioning a landing structure in a body of water; and  
landing the space launch vehicle on the landing structure in the body of water.
- [c2] 2. The method of claim 1 wherein launching the space launch vehicle from earth includes launching the space launch vehicle from a launch site on land.
- [c3] 3. The method of claim 1 wherein landing the space launch vehicle includes vertically landing the space launch vehicle on a floating platform in the body of water.
- [c4] 4. The method claim 1 wherein launching the space launch vehicle includes igniting one or more rocket engines on a booster stage, and wherein landing the space launch vehicle includes vertically landing the booster stage on the landing structure in the body of water.
- [c5] 5. The method of claim 1 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch, wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation.
- [c6] 6. The method of claim 1 wherein launching the space launch vehicle includes launching the vehicle in a nose-first orientation, and wherein the method further comprises reorienting the space launch vehicle to a tail-first orientation after launch,

wherein landing the space launch vehicle includes vertically landing the space launch vehicle on the landing structure in the tail-first orientation while providing thrust from one or more vehicle engines in a tail-first direction.

[c7] 7. The method of claim 1, further comprising reusing at least a portion of the space launch vehicle.

[c8] 8. The method of claim 1, further comprising:  
transporting the space launch vehicle on the landing structure to a refurbishment facility;  
refurbishing at least a portion of the space launch vehicle at the refurbishment facility; and  
reusing at least a portion of the space launch vehicle after refurbishment.

[c9] 9. The method of claim 1, further comprising transferring a reusable portion of the space launch vehicle from the landing structure to a transit vessel while the landing structure remains in the body of water to receive a subsequently launched vehicle.

[c10] 10. The method of claim 1 wherein the space launch vehicle includes a payload carried on an upper stage mounted to a booster stage, wherein launching the space launch vehicle from earth includes igniting one or more rocket engines on the booster stage to launch the space launch vehicle from a launch site on land in a nose-first orientation, wherein landing the space launch vehicle includes landing the space launch vehicle on a mobile landing platform in the body of water, and wherein the method further comprises:

turning off the one or more rocket engines on the booster stage;  
separating the upper stage from the booster stage at a predetermined altitude;  
reorienting the booster stage to a tail-first orientation;  
receiving positional information from the landing platform and controlling a trajectory of the booster stage as it moves toward the landing platform in the tail-first orientation based on the positional information; and

reigniting the one or more rocket engines on the booster stage prior to landing, wherein landing the space launch vehicle includes vertically landing the booster stage on the platform in the tail-first orientation while providing thrust from the reignited one or more rocket engines.

[c11] 11. A method for transporting a payload to space, the method comprising: coupling the payload to a booster stage of a rocket, the booster stage having a forward end portion spaced apart from an aft end portion; positioning a floating platform in a body of water; igniting one or more rocket engines positioned toward the aft end portion of the booster stage and launching the rocket toward space in a nose-first orientation; separating the payload from the booster stage; after separating, reorienting the booster stage from the nose-first orientation to a tail-first orientation; and landing the booster stage on the floating platform in the tail-first orientation.

[c12] 12. The method of claim 11, further comprising: turning off the one or more rocket engines positioned toward the aft end portion of the booster stage before reorienting the booster stage from the nose-first orientation to the tail-first orientation; and after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage to decelerate the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

[c13] 13. The method of claim 11, further comprising: turning off the one or more rocket engines and following a ballistic trajectory; and

deploying an aerodynamic control surface from the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

[c14] 14. The method of claim 11, further comprising:  
turning off the one or more rocket engines and following a ballistic trajectory;  
and  
deploying one or more flared control surfaces from the forward end portion of the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

[c15] 15. The method of claim 11, further comprising:  
turning off the one or more rocket engines; and  
operating one or more propulsive thrusters mounted to the booster stage to facilitate reorienting the booster stage from the nose-first orientation to a tail-first orientation.

[c16] 16. The method of claim 11, further comprising:  
turning off the one or more rocket engines after separating the payload from the booster stage;  
moving an aerodynamic control surface on the booster stage to at least partially control a flight path of the booster stage toward the platform based on platform positional information received from the platform;  
moving the aerodynamic control surface on the booster stage to at least partially reorient the booster stage from the nose-first orientation to a tail-first orientation; and  
after reorienting the booster stage, reigniting the one or more rocket engines positioned toward the aft end portion of the booster stage, wherein landing the booster stage includes performing a powered, vertical landing of the booster stage on the platform.

[c17] 17. A system for providing access to space, the system comprising:  
a space launch vehicle;  
a launch site;  
means for launching the launch vehicle from the launch site a first time;  
means for landing at least a portion of the launch vehicle on a structure in a  
body of water; and  
means for launching at least a portion of the launch vehicle from the launch  
site a second time.

[c18] 18. The system of claim 17 wherein the means for landing include means  
for vertically landing at least a portion of the space launch vehicle on a floating platform.

[c19] 19. The system of claim 17 wherein the means for launching include means  
for launching the launch vehicle in a nose-first orientation, wherein the system further  
comprises means for reorienting the launch vehicle from the nose-first orientation to a tail-  
first orientation before landing, and wherein the means for landing include means for  
landing in the tail-first orientation.

[c20] 20. The system of claim 19 wherein the space launch vehicle includes one  
or more rocket engines, wherein the means for launching include means for igniting the  
rocket engines and launching the vehicle in a nose-first orientation, and wherein the  
system further comprises:

means for shutting off the rocket engines;  
means for reorienting the launch vehicle from the nose-first orientation to a  
tail-first orientation before landing; and  
means for reigniting one or more of the rocket engines when the launch  
vehicle is in the tail-first orientation to decelerate the vehicle, wherein  
the means for landing include means for landing in the tail-first  
orientation while the one or more rocket engines are thrusting.

SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED  
SYSTEMS AND METHODS

ABSTRACT OF THE DISCLOSURE

Launch vehicle systems and methods for landing and recovering a booster stage and/or other portions thereof on a platform at sea or on another body of water are disclosed. In one embodiment, a reusable space launch vehicle is launched from a coastal launch site in a trajectory over water. After booster engine cutoff and upper stage separation, the booster stage reenters the earth's atmosphere in a tail-first orientation. The booster engines are then restarted and the booster stage performs a vertical powered landing on the deck of a pre-positioned sea-going platform. In one embodiment, bi-directional aerodynamic control surfaces control the trajectory of the booster stage as it glides through the earth's atmosphere toward the sea-going platform. The sea-going platform can broadcast its real-time position to the booster stage so that the booster stage can compensate for errors in the position of the sea-going platform due to current drift and/or other factors. After landing, the sea-going platform can be towed by, e.g., a tug, or it can use its own propulsion system, to transport the booster stage back to the coastal launch site or other site for reconditioning and reuse. In another embodiment, the booster stage can be transferred to another vessel for transport. In still further embodiments, the booster can be refurbished while in transit from a sea-based or other landing site.

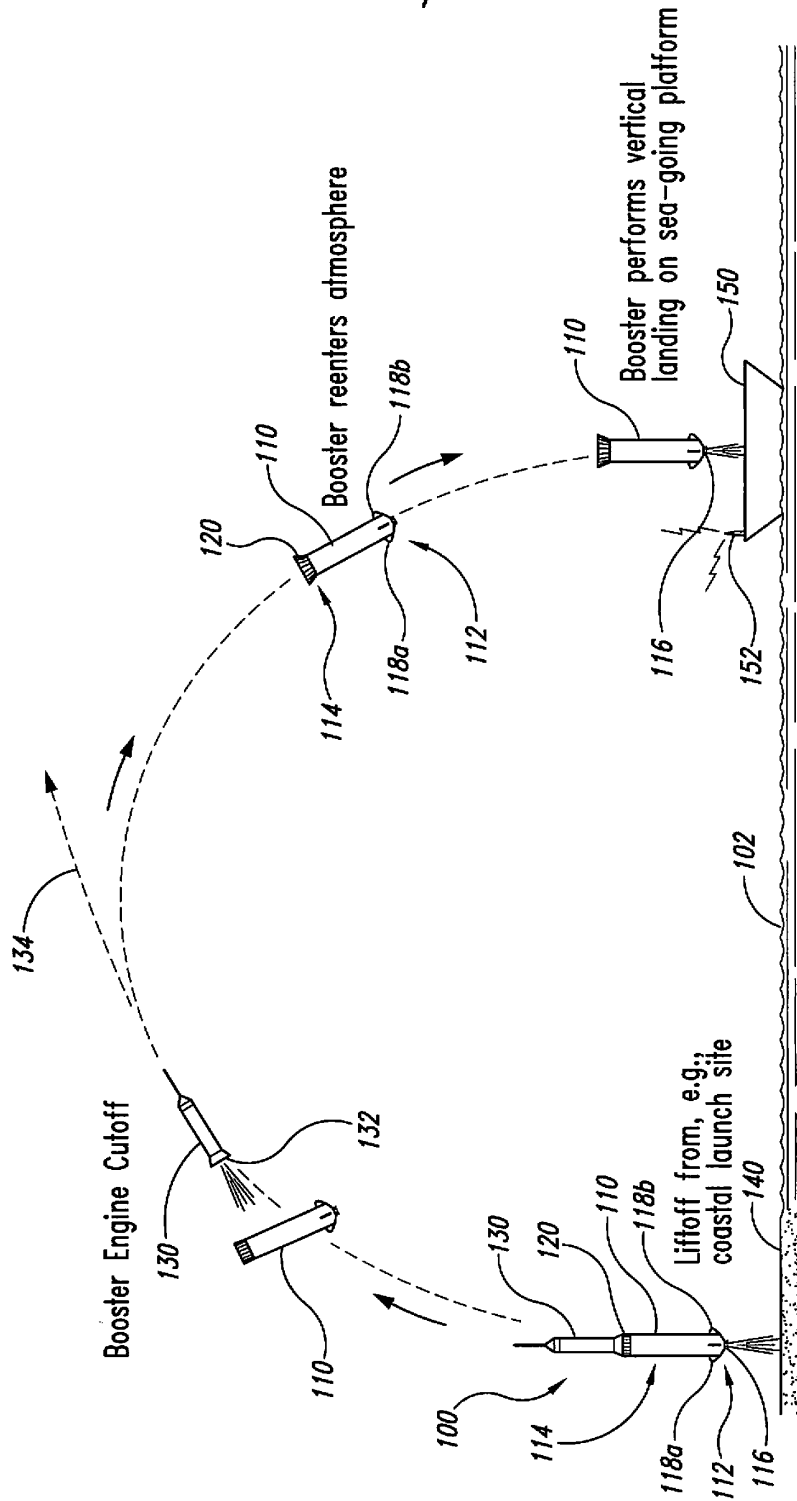


Fig. 1



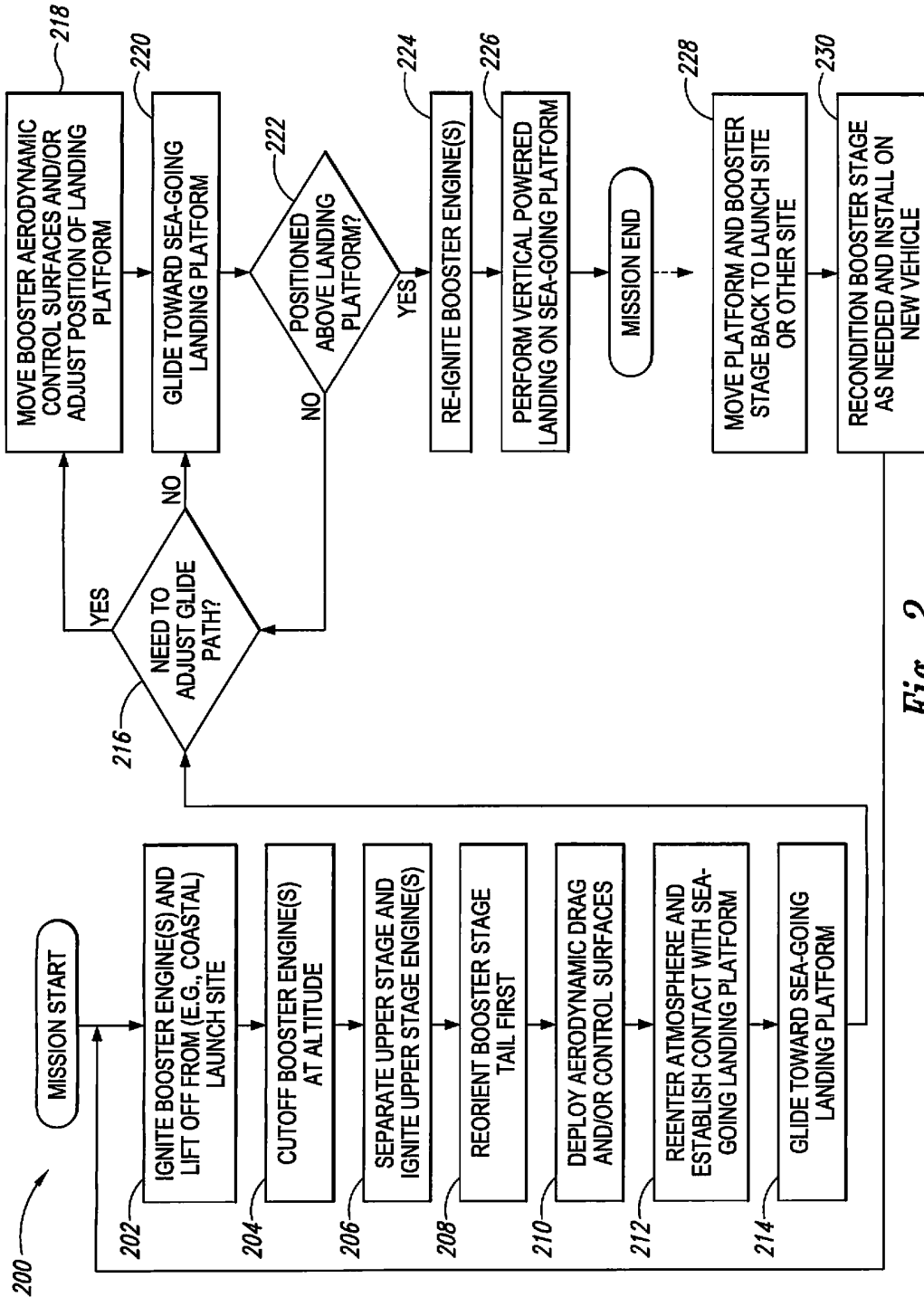


Fig. 2

## Electronic Acknowledgement Receipt

<b>EFS ID:</b>	7811406
<b>Application Number:</b>	12815306
<b>International Application Number:</b>	
<b>Confirmation Number:</b>	1105
<b>Title of Invention:</b>	SEA LANDING OF SPACE LAUNCH VEHICLES AND ASSOCIATED SYSTEMS AND METHODS
<b>First Named Inventor/Applicant Name:</b>	Jeffrey P. Bezos
<b>Customer Number:</b>	25096
<b>Filer:</b>	Paul T Parker/Emily Ferguson
<b>Filer Authorized By:</b>	Paul T Parker
<b>Attorney Docket Number:</b>	345638003US2
<b>Receipt Date:</b>	14-JUN-2010
<b>Filing Date:</b>	
<b>Time Stamp:</b>	20:02:39
<b>Application Type:</b>	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		345638003US2_Application.pdf	1700277 46f5493224ea68aace0b38ee75d3bd43556ada2	yes	22

<b>Multipart Description/PDF files in .zip description</b>		
<b>Document Description</b>	<b>Start</b>	<b>End</b>
Transmittal of New Application	1	1
Specification	2	14
Claims	15	19
Abstract	20	20
Drawings-only black and white line drawings	21	22

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Date: 06/14/10

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number <b>12/815,306</b>					
<b>APPLICATION AS FILED – PART I</b>				SMALL ENTITY		OR		OTHER THAN SMALL ENTITY	
(Column 1)		(Column 2)							
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	RATE (\$)	FEE (\$)	
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	<b>82</b>	N/A		N/A		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	<b>270</b>	N/A		N/A		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	<b>110</b>	N/A		N/A		
TOTAL CLAIMS (37 CFR 1.16(i))	<b>20</b>	minus 20 =	x\$26		OR	x\$52			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	<b>3</b>	minus 3 = *	x\$110		OR	x\$220			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$270 (\$135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR				OR				
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			195		OR	390			
			<b>TOTAL</b>	<b>462</b>	OR	<b>TOTAL</b>			
* If the difference in column 1 is less than zero, enter "0" in column 2.									
<b>APPLICATION AS AMENDED – PART II</b>				SMALL ENTITY		OR		OTHER THAN SMALL ENTITY	
(Column 1)		(Column 2)							
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	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))			N/A		OR	N/A		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE		
(Column 1)		(Column 2)							
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)	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))			N/A		OR	N/A		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			TOTAL ADD'T FEE		OR	TOTAL ADD'T 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.									

This collection of information is required by 37 CFR 1.16. 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, 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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