

US007206630B1

## (12) United States Patent Tarler

#### (54) ELECTRODE PATCH AND WIRELESS PHYSIOLOGICAL MEASUREMENT SYSTEM AND METHOD

(75) Inventor: Matthew David Tarler, Westlake, OH

(US)

(73) Assignee: Cleveland Medical Devices, Inc,

Cleveland, OH (US)

(\*) Notice: Subject to any disclaimer, the term of this

patent is extended or adjusted under 35

U.S.C. 154(b) by 64 days.

(21) Appl. No.: 10/879,666

(22) Filed: Jun. 29, 2004

(51) **Int. Cl.** 

**A61B 5/04** (2006.01) **A61B 5/0452** (2006.01)

(58) Field of Classification Search ....... 600/508–509, 600/545–546, 393–396, 372–373, 382–384, 600/301; 128/903

See application file for complete search history.

#### (56) References Cited

#### U.S. PATENT DOCUMENTS

4,082,087	Α		4/1978	Howson
4,957,109	Α	*	9/1990	Groeger et al 600/391
5,381,798	Α		1/1995	Burrows
5,417,222	Α		5/1995	Dempsey et al.
5,458,124	Α		10/1995	Stanko et al.
5,511,553	A	*	4/1996	Segalowitz 600/508
5,694,940	Α		12/1997	Unger et al.
5,724,984	A		3/1998	Arnold et al.
5,862,803	Α		1/1999	Besson et al.
5,957,854	Α		9/1999	Besson et al.
6,073,046	$\mathbf{A}$		6/2000	Patel et al.

## (10) Patent No.: US 7,206,630 B1

(45) **Date of Patent:** Apr. 17, 2007

6,162,101	A	12/2000	Fischer et al.
6,238,338	B1 *	5/2001	DeLuca et al 600/300
6,289,238	B1	9/2001	Besson et al.
6,363,274	B1	3/2002	Scalisi et al.
6,597,946	B2 *	7/2003	Avrahami et al 604/20
6,643,541	B2 *	11/2003	Mok et al 600/546
6,768,920	B2 *	7/2004	Lange et al 600/545
6,782,283	B2 *	8/2004	Schmidt et al 600/372
6,865,409	B2 *	3/2005	Getsla et al 600/393
6,897,788	B2 *	5/2005	Khair et al 340/870.16
2002/0028991	A1*	3/2002	Thompson 600/372
2002/0099277	A1*	7/2002	Harry et al 600/301
2003/0069510	A1*	4/2003	Semler 600/509
2004/0015058	A1	1/2004	Besson et al.

#### OTHER PUBLICATIONS

Miller, Jodie, Interview with James M. Sweeny, Chairman and CEO, Cardionet, EP Lab Digest, Jul./Aug. 2002, vol. 2, No. 4, pp. 1-4

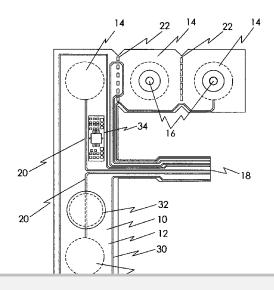
#### (Continued)

Primary Examiner—Robert Pezzuto
Assistant Examiner—Shevon Johnson
(74) Attorney, Agent, or Firm—Brian M. Kolkowski

#### (57) ABSTRACT

A wireless electrode patch and system for measuring the physiological condition of a subject, more particularly to an electrode patch for ECG monitoring, and a method of sensing, analyzing and/or transmitting or relaying a physiological signal. The wireless electrode patch and system is lightweight, compact and reusable. The wireless electrode patch provides a low, power system for extended battery life and use. The wireless electrode patch and system allows for good reliable measurement of physiological signals from the subject. The wireless electrode is simple enough to apply as a single patch but versatile enough to be reconfigured as more than one patch.

#### 18 Claims, 12 Drawing Sheets





#### OTHER PUBLICATIONS

LIFECOR, Inc., Photos of LifeVest. www.lifecor.com.

Editor, Seeing Signs in a New Way, Medical Device and Diagnostic Industry, Jun. 2003.

Agilent Technologies, Telemetry Systems: integrated ccg and spO2, Jun. 5, 2001 5988-3214EN.

Medtronic—New Diagnostic Tool—Reveal Insertable Loop Recorder, www.medtronic.com/reveal/new.html.

Friesen, Gary M., A Comparison of the Noise Sensitivity of Nine QRS Detection Algorithms, IEEE Transactions on Biomedical Engineering, vol. 37, No. 1., Jan. 1990, pp. 85-98.

Trahanias, P.E., An Approach to QRS Complex Detection Using Mathematical Morphology, IEEE Transactions on Biomedical Engineering, vol. 40, No. 2., Feb. 1993, pp. 201-205.

Chu, Chee-Hung Henry, Impulsive Noise Suppression and Background Normalization . . . , IEEE Transactions on Biomedical Engineering, vol. 36, No. 2., Jan. 1989, pp. 262-273.

Ambrose, Mary Lou, ECG Interpretation Made Incredibly Easy, 1997, Springhouse Corporation, Springhouse, Pennsylvania.

Dunn, Marvin I., Lipman-Massie Clinical Electrocardiography, 1951, Year Book Medical Publishers, Inc, Chicago, London, Boca Raton.

El-Sherif, Nabil ed., High Resolution Electrocardiology, 1992, ISBN: 0-87993-3658. Futura Publishing Company, New York.

Lewis, John ed., Put On Your Private Paramedic, www.designnews.com, Jun. 3, 2003.

Simonsen, Michael. Disease monitoring, minimally invasive therapy stimulate market. Cardiovascular Device Update, vol. 8., No. 7, Jul. 2002. pp. 1-16.

\* cited by examiner



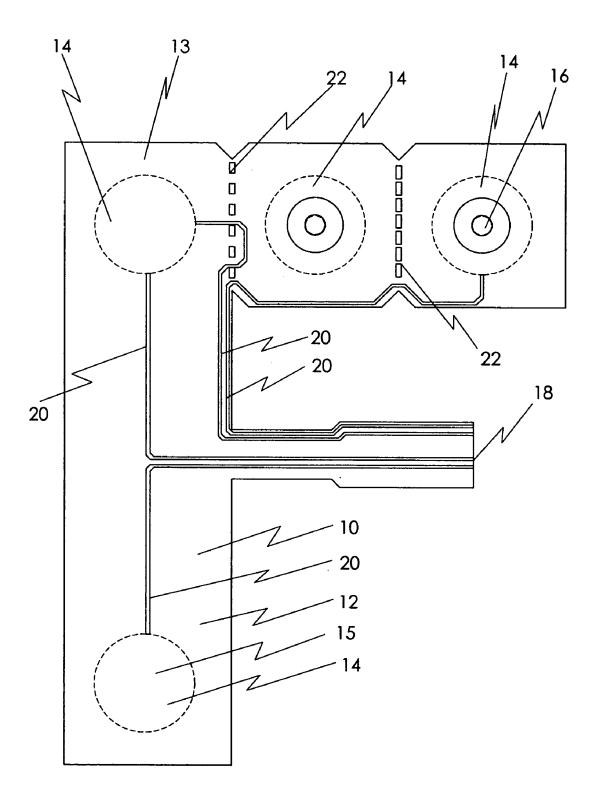


Fig 1



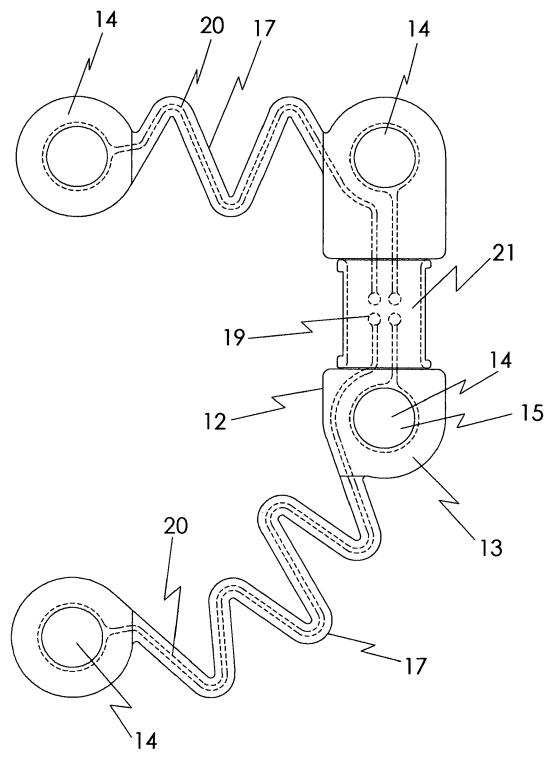


FIG 2



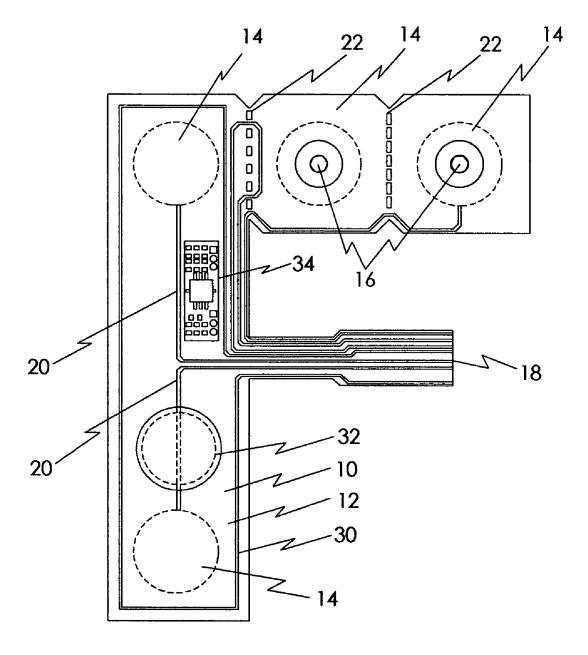


Fig 3

# DOCKET

## Explore Litigation Insights



Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## **Real-Time Litigation Alerts**



Keep your litigation team up-to-date with **real-time** alerts and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

### **Advanced Docket Research**



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

### **Analytics At Your Fingertips**



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

#### API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

#### **LAW FIRMS**

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

#### **FINANCIAL INSTITUTIONS**

Litigation and bankruptcy checks for companies and debtors.

#### **E-DISCOVERY AND LEGAL VENDORS**

Sync your system to PACER to automate legal marketing.

