

US007598878B2

## (12) United States Patent

#### Goldreich

#### (54) METHOD AND DEVICE FOR MEASURING PHYSIOLOGICAL PARAMETERS AT THE WRIST

- (76) Inventor: **Rami Goldreich**, 96 Ayalon Street, 48621 Rosh Ha'ayin (IL)
- (\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.
- (21) Appl. No.: 10/497,169
- (22) PCT Filed: Dec. 10, 2002
- (86) PCT No.: **PCT/IL02/00995**

§ 371 (c)(1), (2), (4) Date: Jun. 9, 2004

(87) PCT Pub. No.: WO03/050643

PCT Pub. Date: Jun. 19, 2003

#### (65) **Prior Publication Data**

US 2005/0116820 A1 Jun. 2, 2005

(51) **Int. Cl.** 

DOCKF

- **A61B 5/00** (2006.01)

See application file for complete search history.

#### (56) **References Cited**

#### U.S. PATENT DOCUMENTS

		Hattes 600/407 Broadwater et al.
4,407,295 A		
4,418,700 A	12/1983	Warner
4,784,152 A *	11/1988	Shinoda et al 600/503

#### (10) Patent No.: US 7,598,878 B2

#### (45) **Date of Patent:** Oct. 6, 2009

4,819,860 A *	4/1989	Hargrove et al 600/483
4,952,928 A	8/1990	Carroll et al.
5,045,839 A	9/1991	Ellis et al.
5,410,471 A	4/1995	Alyfuku et al.
5,416,695 A	5/1995	Stutman et al.
5,462,051 A	10/1995	Oka et al.
5,515,858 A *	5/1996	Myllymaki 600/301
5,544,649 A	8/1996	David et al.

#### (Continued)

#### FOREIGN PATENT DOCUMENTS

DE 10005526 8/2001

#### (Continued)

#### OTHER PUBLICATIONS

Yang et al, "Development of the Ring Sensor for Healthcare Automation", *Robotics and Autonomous Systems*, 30:273-281, 2000.

#### (Continued)

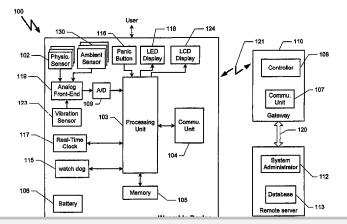
Primary Examiner—Daniel Wu Assistant Examiner—Son M Tang

(74) Attorney, Agent, or Firm—Kohn & Associates, PLLC

#### (57) **ABSTRACT**

A wrist-mounted device for measuring at least one physiological parameter of a subject. The present invention enables such a measurement to preferably be transformed into clinically useful information about the subject. Such information may then optionally be sent to medical personnel, for example at a contact and/or monitoring center, through a gateway device. The gateway device preferably communicates with the wrist-mounted device of the present invention through a wireless communication channel.

#### 32 Claims, 6 Drawing Sheets



Find authenticated court documents without watermarks at docketalarm.com.

#### U.S. PATENT DOCUMENTS

	0.5.1		DOCOMENTS
5,652,570	А	7/1997	Lepkofker
5,669,392	A *	9/1997	Ljungstrom 600/510
5,771,001	Α	6/1998	Cobb
5,772,586	Α	6/1998	Heinonen et al.
5,778,882	A *	7/1998	Raymond et al 600/513
5,807,267	A *	9/1998	Bryars et al 600/500
5,853,005	Α	12/1998	Scanlon
5,862,803	Α	1/1999	Besson et al.
5,877,675	Α	3/1999	Rebstock et al.
5,899,928	Α	5/1999	Sholder et al.
5,917,415	Α	6/1999	Atlas
5,942,979		8/1999	Luppino 340/576
6,046,761	Α	4/2000	Echerer
6,134,504		10/2000	Douglas et al.
6,139,494		10/2000	Cairnes
6,160,478		12/2000	Jacobsen et al 340/539.12
6,327,495		12/2001	Iwabuchi et al.
6,348,867	B1 *	2/2002	Myllymaki 340/573.1
6,353,396		3/2002	Atlas 340/693.9
6,413,233		7/2002	Sites et al.
6,443,890		9/2002	Schulze et al.
6,491,647		12/2002	Bridger et al 600/585
6,494,829	B1 *	12/2002	New et al 600/300
6,616,613		9/2003	Goodman
6,694,180		2/2004	Boesen 600/547
6,840,904		1/2005	Goldberg 600/300
6,893,396		5/2005	Schulze et al 600/300
, ,	B2 *	5/2006	Drinan et al 600/300
7,285,090		10/2007	Stivoric et al 600/300
2001/0012916		8/2001	Deuter
	A1	4/2002	Ford et al.
2003/0107487	A1	6/2003	Korman et al.
2004/0204635	A1*	10/2004	Scharf et al 600/323

#### FOREIGN PATENT DOCUMENTS

DE	10009882	10/2001
DE	20119965	4/2002

DOCKE

Δ

RM

EP	0770349	5/1997
EP	1070479	1/2001
EP	0876790	2/2003
GB	2003276	3/1979
WO	WO 96/01585	1/1996
WO	WO99/04685	2/1999
WO	WO 00/40145	7/2000
WO	WO 01/15056	1/2001
WO	WO 01/97686	12/2001
WO	WO 03/050642	6/2003
WO	WO 03/050643	6/2003
WO	WO2004/047633	6/2004

#### OTHER PUBLICATIONS

Rhee et al, "Artifact\_resistant Power-Efficient Design of Finger-Ring Plethysmographic Sensors", *IEEE Transactions On Biomedical Enginering*, 48(7):795-805, 2001.

Yang et al, "A Twenty-Four Hour Tele-Nursing System Using a Ring Sensor", *Proc. Of 1998 Int. Conf. On Robotics and Automation*, Leuven, Belgium, pp. 387-392, 1998.

Rhee et al, "The Ring Sensor: A New Ambulatory Wearable Sensor for Twenty-Four Hour Patient Monitoring", *Proceedings of the 20th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Hong Kong, 1998.

Mascaro, SA, "Photoplethymograph Fingernail Sensors for Measuring Finger Forces Without Haptic Obstruction", *IEEE Transactions On Robotics and Automation*, 17(5):698-708, 2001.

Yang et al, "Cuff-less Continuous Monitoring of Beat-to-Beat Blood Pressure Using Sensor Fusion", available through http://web.mit. edu/zyi/www/pdf/IEEETRans2000.pdf as of Dec. 9, 2001.

Yang, et al, "Sensor Fusion for Noninvasive Continuous Monitoring of Pulsating Blood Pressure Based on an Arterial Hemodynamic Model", available through http://www.mit.edu/afs/athena.mit.edu/ user/z/y/zyi/www/pdf/ASME99.pdf.

Zhang et al. "A Telemedical Multilevel Server Network System", Chinese Journal of Medical Instrumentation, 25(1): 30-33, 2001. In Chinese, Abstract in English.

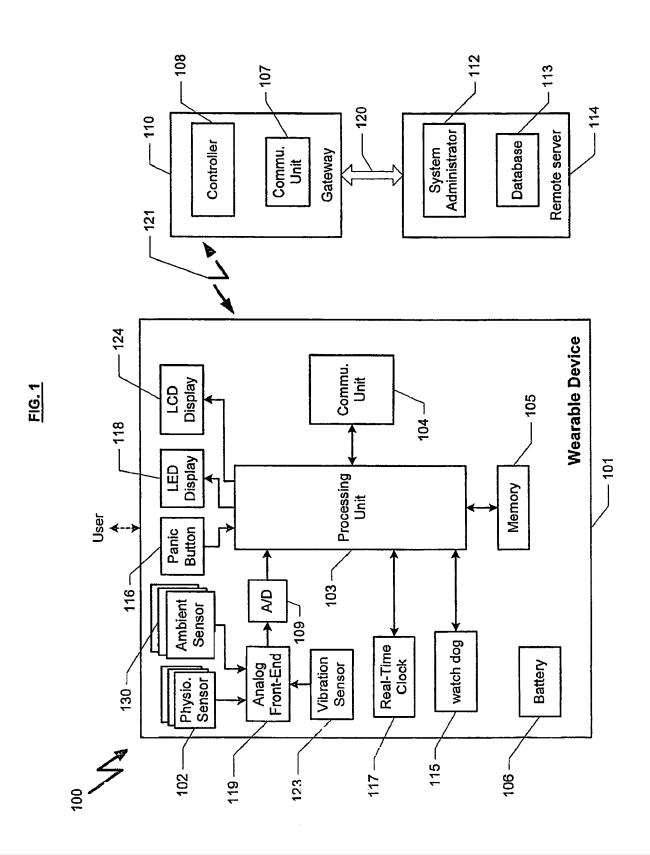
\* cited by examiner

**CKF** 

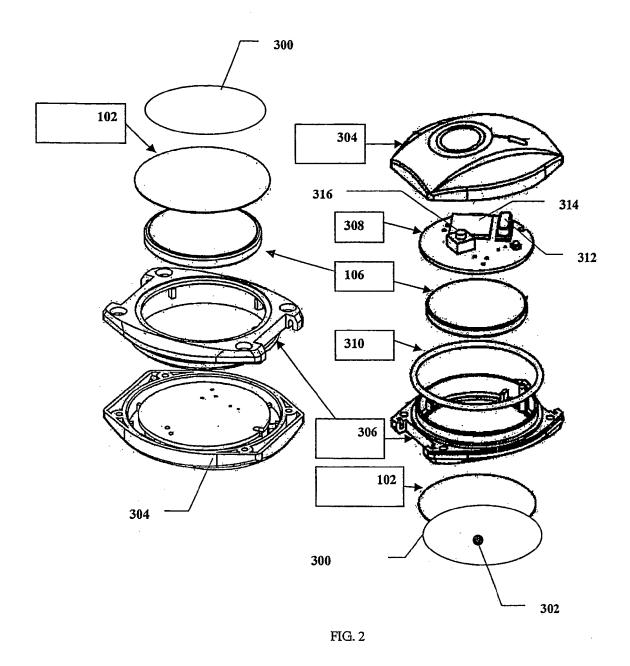
Δ

R

Α

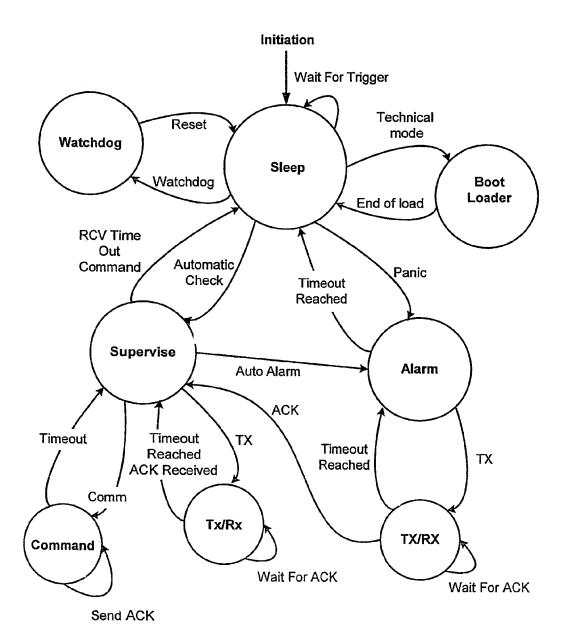


Find authenticated court documents without watermarks at <u>docketalarm.com</u>.



DOCKET ALARM Find authenticated court documents without watermarks at <u>docketalarm.com</u>.





## DOCKET A L A R M



# 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.