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**Park et al.**

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(54) **PORTABLE BIOMETRIC MONITORING DEVICES AND METHODS OF OPERATING SAME**

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(51) **Int. Cl.**  
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**G05B 23/00** (2006.01)  
(Continued)

(52) **U.S. Cl.**  
CPC ..... **A61B 5/0002** (2013.01); **A61B 5/02416** (2013.01); **A61B 5/02427** (2013.01);  
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(56) **References Cited**

U.S. PATENT DOCUMENTS

6,583,369 B2 6/2003 Montagnino et al.  
6,720,860 B1\* 4/2004 Narayanaswami ..... G06F 21/31 340/5.54

(Continued)

FOREIGN PATENT DOCUMENTS

EP 1 721 237 8/2012

OTHER PUBLICATIONS

US First Action Interview Pilot Program, Pre-Interview Communication, dated Jan. 7, 2015, issued in U.S. Appl. No. 14/073,702.

(Continued)

*Primary Examiner* — George Bugg

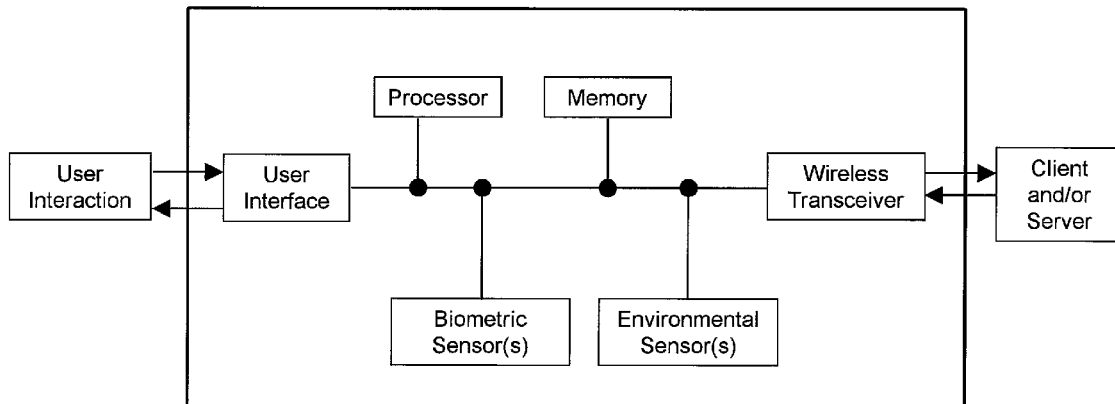
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(57) **ABSTRACT**

The present inventions, in one aspect, are directed to portable biometric monitoring device including a housing having a physical size and shape that is adapted to couple to the user's body, at least one band to secure the monitoring device to the user, a physiological sensor, disposed in the housing, to generate data which is representative of a physiological condition of the user data. The physiological sensor may include a light source to generate and output light having at least a first wavelength, and a photodetector to detect scattered light (e.g., from the user). A light pipe is disposed in the housing and optically coupled to the light source directs/transmits light therefrom along a predetermined path to an outer surface of the housing. Processing circuitry calculates a heart rate of the user using data which is representative of the scattered light.

**20 Claims, 30 Drawing Sheets**



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**H04B 1/00** (2006.01)  
**H04B 3/00** (2006.01)  
**H04Q 1/00** (2006.01)  
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**A61B 5/11** (2006.01)  
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- (52) **U.S. Cl.**  
 CPC ..... **A61B 5/02433** (2013.01); **A61B 5/02438** (2013.01); **A61B 5/11** (2013.01); **A61B 5/1123** (2013.01); **A61B 5/4812** (2013.01); **A61B 5/681** (2013.01); **H04W 4/027** (2013.01); **H04L 67/12** (2013.01); **H04W 4/008** (2013.01)
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 See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,559,877 B2\* 7/2009 Parks et al. .... 482/8  
 8,475,367 B1\* 7/2013 Yuen ..... G06F 19/3418  
 128/920  
 2002/0091049 A1\* 7/2002 Hisano ..... A63B 71/0686  
 482/148  
 2002/0092252 A1\* 7/2002 Kettler et al. .... 52/403.1  
 2006/0028429 A1\* 2/2006 Kanevsky ..... G06F 3/017  
 345/156  
 2007/0179359 A1 8/2007 Goodwin  
 2008/0152196 A1 6/2008 Saliba et al.  
 2008/0162555 A1\* 7/2008 Schuler ..... G06Q 50/22  
 2008/0222701 A1\* 9/2008 Saaranen et al. .... 726/3  
 2008/0249836 A1\* 10/2008 Angell et al. .... 705/10  
 2009/0099462 A1\* 4/2009 Almen ..... 600/484  
 2010/0185398 A1\* 7/2010 Berns ..... A41D 13/1281  
 702/19  
 2010/0331145 A1 12/2010 Lakovic et al.  
 2010/0331657 A1 12/2010 Mensinger et al.  
 2011/0009713 A1\* 1/2011 Feinberg ..... A61B 5/0205  
 600/301  
 2011/0009727 A1 1/2011 Mensinger et al.

2011/0032105 A1 2/2011 Hoffman et al.  
 2012/0050046 A1 3/2012 Satorius  
 2012/0075168 A1 3/2012 Osterhout et al.  
 2012/0148115 A1 6/2012 Birdwell et al.  
 2012/0274508 A1 11/2012 Brown et al.  
 2012/0316471 A1 12/2012 Rahman et al.  
 2013/0106684 A1 5/2013 Weast et al.  
 2013/0163390 A1\* 6/2013 Gossweiler et al. .... 368/14  
 2013/0278414 A1\* 10/2013 Sprigg ..... G08B 21/0453  
 340/539.12  
 2013/0280682 A1\* 10/2013 Levine ..... G09B 25/00  
 434/236  
 2013/0300578 A1 11/2013 Uchida  
 2013/0303087 A1\* 11/2013 Hauser ..... H04W 4/206  
 455/41.2  
 2014/0099614 A1 4/2014 Hu et al.  
 2014/0107493 A1 4/2014 Yuen et al.  
 2014/0125491 A1 5/2014 Park et al.  
 2014/0214442 A1\* 7/2014 Duffy ..... G06F 19/3481  
 705/2  
 2014/0218496 A1 8/2014 Park et al.

OTHER PUBLICATIONS

US Office Action, dated Mar. 12, 2015, issued in U.S. Appl. No. 14/073,702.  
 US Office Action, dated Dec. 3, 2015, issued in U.S. Appl. No. 14/073,702.  
 US Office Action, dated Mar. 14, 2014, issued in U.S. Appl. No. 14/154,009.  
 U.S. Appl. No. 14/073,702, filed Nov. 6, 2013, Park et al.  
 U.S. Appl. No. 14/154,009, filed Jan. 13, 2014, Brumbach et al.  
 U.S. Appl. No. 14/154,019, filed Jan. 13, 2014, Brumbach et al.  
 "Activator is One of the Best Cydia iPhone Hacks | Control your iPhone with Gestures," iphone-tips-and-advice.com, [retrieved on Jul. 9, 2013 at <http://www.iphone-tips-and-advice.com/activator.html>], 10 pp.  
 Chudnow, Alan (Dec. 3, 2012) "Basis Wristband Make Its Debut," *The Wired Self, Living in a Wired World*, published in Health [retrieved on Jul. 22, 2013 at <http://thewiredself.com/health/basis-wrist-band-make-its-debut/>], 3pp.  
 Cooper, Daniel (Aug. 16th, 2013) *Withings Pulse review*, <http://www.engadget.com/2013/08/16/withings-pulse-review/>, 8 pages.  
 DesMarais, Christina (posted on Sep. 3, 2013) "Which New Activity Tracker is Best for You?" *Health and Home, Health & Fitness, Guides & Reviews*, [Retrieved on Sep. 23, 2013 at <http://www.techlicious.com/guide/which-new-activity-tracker-is-right-for-you/>] 4 pp.  
 Empson, Rip, (Sep. 22, 2011) "Basis Reveals an Awesome New Affordable Heart and Health Tracker You Can Wear on Your Wrist," [retrieved on Sep. 23, 2013 at <http://techcrunch.com/2011/09/22/basis-reveals-an-awesome-new-...>], 3 pp.  
 Fitbit User's Manual, Last Updated Oct. 22, 2009, 15 pages.  
 Forerunner® 201 personal trainer owner's manual, (Feb. 2006) Garmin Ltd., 48 pp.  
 Forerunner® 301 personal trainer owner's manual, (Feb. 2006) Garmin Ltd., 66 pp.  
 Forerunner® 50 with ANT+Sport™ wireless technology, Owner's Manual, (Nov. 2007) Garmin Ltd., 44 pp.  
 Forerunner® 205/305 Owner's Manual, GPS-enabled trainer for runners, (2006-2008), Garmin Ltd., 80 pp.  
 Forerunner® 405CX Owner's Manual, "GPS-Enabled Sports Watch With Wireless Sync," (Mar. 2009), Garmin Ltd., 56 pp.  
 Forerunner® 110 Owner's Manual, (2010) "GPS-Enabled Sport Watch," Garmin Ltd., 16 pp.  
 Forerunner® 210 Owner's Manual, (2010) "GPS-Enabled Sport Watch," Garmin Ltd., 28 pp.  
 Forerunner® 410 Owner's Manual, (Jul. 2012) "GPS-Enabled Sport Watch with Wireless Sync," Garmin Ltd., 52 pp.  
 Forerunner® 10 Owner's Manual (Aug. 2012), Garmin Ltd., 10 pp.

(56)

**References Cited**

OTHER PUBLICATIONS

Forerunner® 405 Owner's Manual, (Mar. 2011) "GPS-Enabled Sport Watch with Wireless Sync," Garmin Ltd., 56 pp.  
Forerunner® 910XT Owner's Manual, (Jan. 2013) Garmin Ltd., 56 pp.  
Garmin Swim™ Owner's Manual (Jun. 2012), 12 pp.  
Larklife, User Manual, (2012) *Lark Technologies*, 7 pp.  
Lark/Larkpro, User Manual, (2012) "What's in the box," *Lark Technologies*, 7 pp.  
LIFETRNR, User Manual (2003, specific date unknown), NB new balance®, Implus Footcare, LLC, 3 pages.  
Nike+ FuelBand GPS Manual, User's Guide (Product Release Date Unknown, downloaded Jul. 22, 2013), 26 pages.  
Nike+SportBand User's Guide, (Product Release Date Unknown, downloaded Jul. 22, 2013), 36 pages.  
Nike+SportWatch GPS Manual, User's Guide, Powered by TOMTOM, (Product Release Date Unknown, downloaded Jul. 22, 2013), 42 pages.

"Parts of Your Band," (Product Release Date Unknown, downloaded Jul. 22, 2013) Jawbone UP Band, 1 page.  
Rainmaker, (Jun. 25, 2012, updated Feb. 16, 2013) "Garmin Swim watch In-Depth Review," [retrieved on Sep. 9, 2013 at <http://www.dcrainmaker.com/2012/06/garmin-swim-in-depth-review.html>], 38 pp.  
Rainmaker, (Jul. 25, 2013) "Basis B<sub>1</sub> Watch In-Depth Review," [retrieved on Feb. 4, 2014 at <http://www.dcrainmaker.com/2013/07/basis-b1-review.html>], 56 pp.  
"Withings pulse, Quick Installation Guide" (Jul. 24th, 2013) Withings Pulse QIG, v 1.3, [withings.com/pulse](http://withings.com/pulse), 16 pages.  
US Final Office Action, dated Jun. 26, 2015, issued in U.S. Appl. No. 14/073,702.  
US Final Office Action, dated Jun. 30, 2016, issued in U.S. Appl. No. 14/073,702.  
US Notice of Allowance, dated Nov. 15, 2016, issued in U.S. Appl. No. 14/073,702.

\* cited by examiner

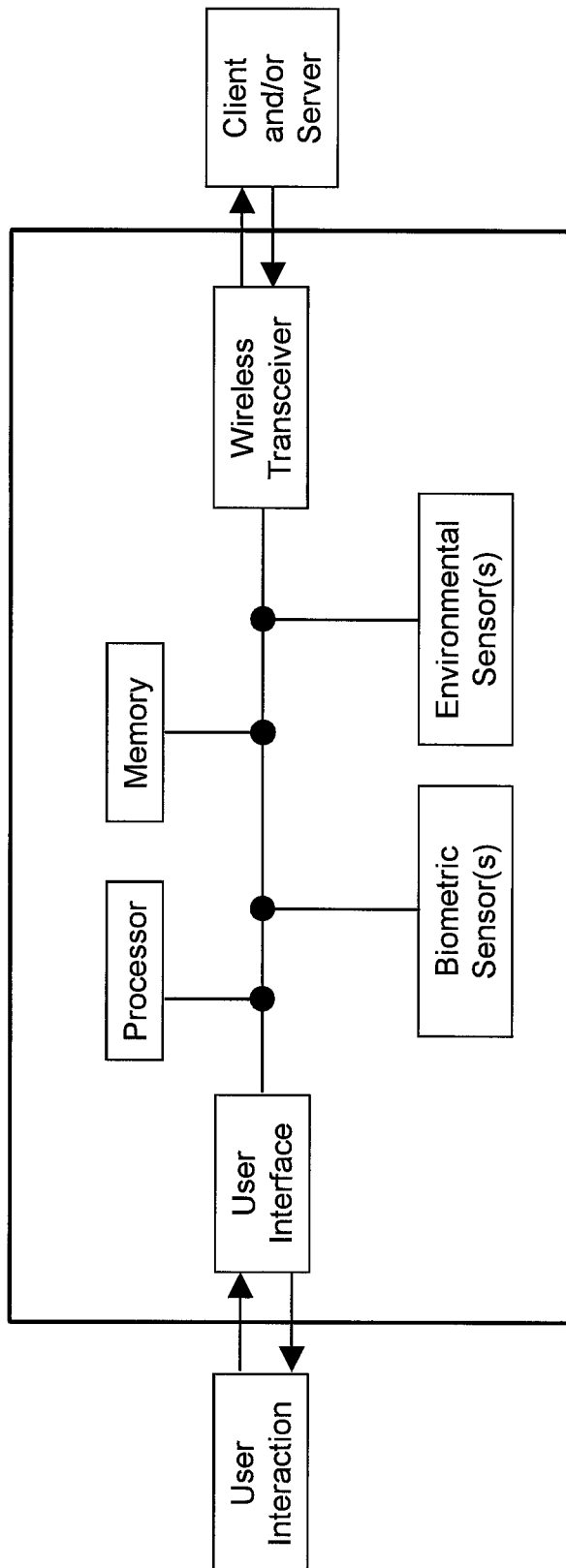


FIG. 1

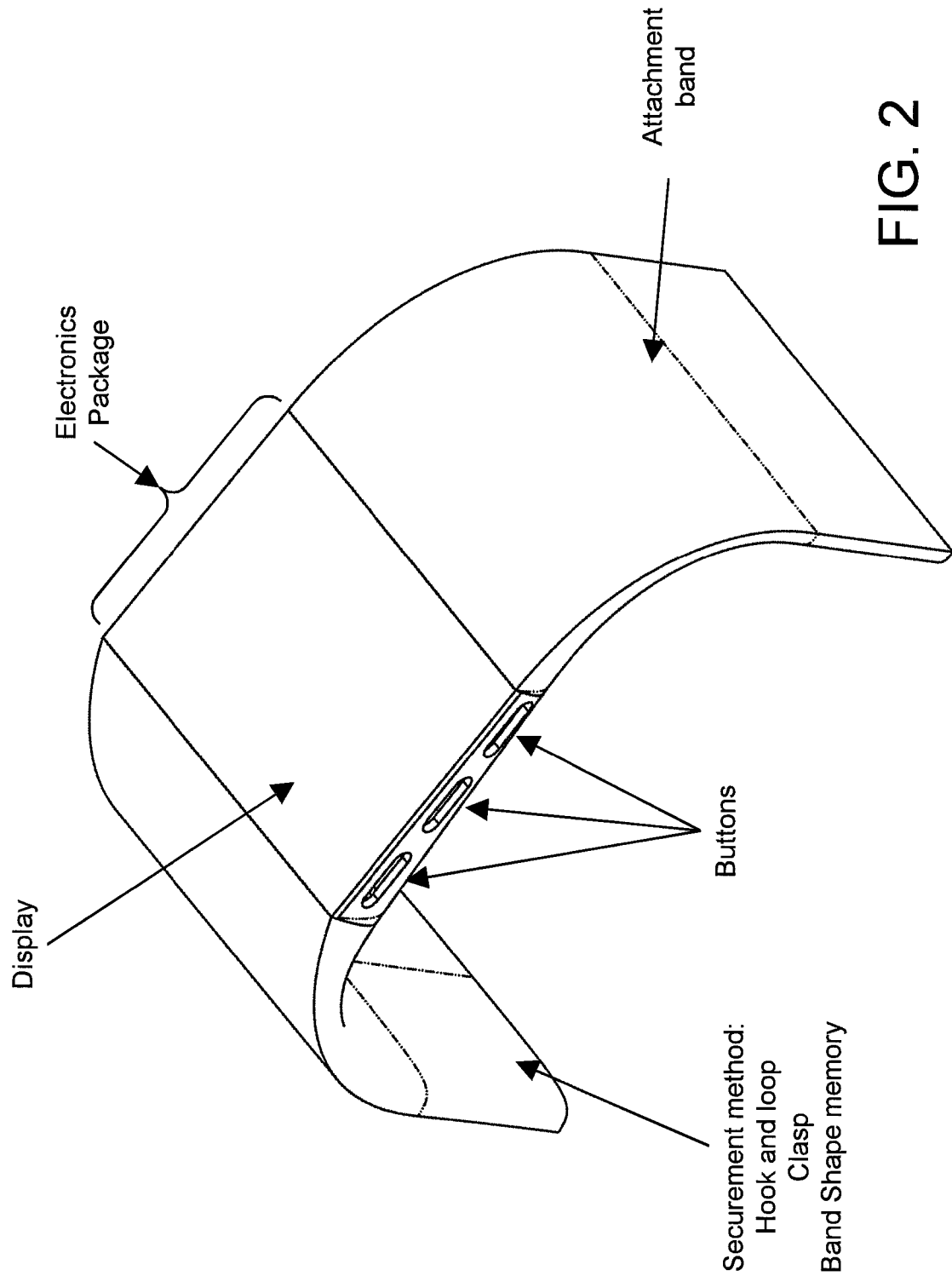


FIG. 2

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