

2025

INVALIDITY SEARCH

US PATENT NO. 9,055,868

Our search unearthed fourteen references. The references are listed in the priority order of relevancy to the claims of subject patent ('868 Patent).

[CLICK HERE](#) to download PDF copies of the shortlisted prior-art references

ICUERIOUS RESEARCH SERVICES LLP
3/31/2025



CONTENTS

1. SCOPE OF THE SEARCH	3
2. SEARCH METHODOLOGY	4
3. KEY-FEATURES OF SUBJECT PATENT	5
4. BRIEF OVERVIEW OF REFERENCES	10
5. CHECKLIST	13
5.1 CHECKLIST FOR INDEPENDENT CLAIMS.....	13
5.2 CHECKLIST FOR DEPENDENT CLAIMS	15
6. RESULT-1 & 2 (PROPOSED COMBINATION).....	17
7. RESULT-3.....	75
8. RESULT-4.....	112
9. RESULT-5.....	118
10. RESULT-6.....	126
11. SEARCH HISTORY.....	130
11.1 CLASSIFICATIONS	130
11.3 KEY STRINGS.....	132
11.3 KEY WORDS	139
12. FILE HISTORY ANALYSIS	140
13. DISCLAIMER.....	142



1. SCOPE OF THE SEARCH

We conducted an invalidity search on all claims of US Patent No. 9,055,868 ('868). The shortlisted prior art references disclose one or more claim elements of subject patent ('868 Patent). One or more shortlisted prior art references may be combined with other prior arts to render claims of '868 patent obvious.

Only one patent per INPADOC family is cited after analysis of all the family members. We also performed citation analysis of the shortlisted relevant references.



2. SEARCH METHODOLOGY

Phase: I (UNDERSTANDING + CONTEXTUAL INSIGHTS)

1. Understanding of target claims in view of File Wrapper, Description, and Complaint Letter.
2. Checking if there is any post-issuance proceedings associated with subject Patent before PTAB and the District Court Proceedings.
3. If there is any post-issuance proceedings, checking what combinations of references were found to be sufficient and/or insufficient, and accordingly defining the scope of search and establishing claim construction.
4. Understanding the technology evolutions of the technology disclosed in the subject patent and identifying dominant companies, inventors, and authors.

PHASE: II (SEARCH FOR RELEVANT PATENTS and NON-PATENTS)

1. **CITATION ANALYSIS** (Comprehensive analysis of backward and forward citations)
2. **CLASS-BASED ANALYSIS** (Comprehensive search in large set of relevant IPC, CPC, U.S., JP F-terms)
3. **KEYWORD-BASED SEARCHING** (Comprehensive search using intelligent combination of relevant keywords)
4. **COMBINATION SEARCH:** Comprehensive search using intelligent combination of classes, keywords, assignees, and inventors.
5. **MAJOR ASSIGNEE & INVENTOR BASED SEARCH:** Analysis of all available NPLs and patents corresponding to major assignees, inventors, and authors in subject technology area.

PHASE: III (REPORT COMPILATION & QUALITY CHECK)

COMPOSITION OF SEARCH REPORT: (Overview of Relevant, Related, and Peripheral Patent and non-patent references + Detailed claim charts for highly relevant prior arts + Summary of File wrapper, and Search History)

QUALITY CHECK: Quality check by subject matter expert.



3. KEY-FEATURES OF SUBJECT PATENT

1. A diagnostic system comprising:
 - a. a light source comprising:
 - i. a plurality of semiconductor diodes with light beams;
 - ii. a multiplexer capable of combining the plurality of semiconductor diode light beams and generating at least a multiplexed light beam comprising one or more wavelengths;
 - iii. one or more waveguide structures configured to receive at least a portion of the one or more wavelengths and to communicate at least the portion of the one or more wavelengths to an output end of the one or more waveguide structures to form an output beam; and
 - iv. a lens system configured to receive at least a portion of the output beam and to communicate at least the portion of the output beam onto a part of a user's body comprising blood to perform a measurement on a user;
 - b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;
 - c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information,
 - i. wherein the control system is further capable of receiving voice input signals and manually entered input signals; and
 - d. a host comprising:
 - i. a digital file for receiving and storing at least a portion of the wireless data;



- ii. control logic at the host to process at least the portion of the wireless data to generate a status of the user;
 - iii. a memory storage device for recording the status; and
 - iv. an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.
- 2. The portion of the output beam is adapted for use in a diagnostics to measure a property of the blood, wherein the diagnostics comprise a spectroscopic procedure, wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood.
- 3. The control system is further capable of providing feedback control data associated at least in part with the physiological information or a position information to a device control module.
- 4. The control system is further coupled to a headset or a heads-up display.
- 5. The control logic includes voice recognition software to process at least a portion of the voice input signals, and wherein the control system further comprises a voice recognition module.
- 6. The control system is further coupled to an audio output device capable of communicating at least a part of the processed portion of the physiological information.
- 7. A diagnostic system comprising:
 - a. a light source comprising:
 - i. one or more semiconductor diodes generating an input light beam; and
 - ii. a lens system configured to receive at least a portion of the input light beam and to communicate at least the portion of the input light beam onto a part of a user's body comprising blood, wherein at least the portion of the input light beam is used in a measurement on a user;



- b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;
 - c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, circuitry for obtaining position information from a location sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information
 - i. wherein the control system is further capable of receiving voice input signals and manually entered input signals; and
 - d. a host comprising:
 - i. a digital file for receiving and storing at least a portion of the wireless data;
 - ii. control logic at the host to process at least the portion of the wireless data to generate a status of the user;
 - iii. a memory storage device for recording the status; and
 - iv. an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.
8. The light source comprises a plurality of semiconductor diodes that are further coupled to a multiplexer capable of combining the plurality of semiconductor diodes and generating the input light beam comprising one or more wavelengths.
9. The portion of the input light beam is adapted for use in a diagnostics to measure a property of the blood, wherein the diagnostics comprise a spectroscopic procedure, wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood.
10. The control system is further coupled to a headset or a heads-up display.



11. The control logic includes voice recognition software to process at least a portion of the voice input signals, and wherein the control system further comprises a voice recognition module.
12. The control system is further capable of providing feedback control data associated at least in part with the physiological information or the position information to a device control module.
13. The control system is further coupled to a proximity sensor.
14. The control system is further coupled to an audio output device capable of communicating at least a part of the processed portion of the physiological information.
15. A diagnostic system comprising:
 - a. a light source comprising:
 - i. one or more semiconductor diodes generating an input light beam; and
 - ii. a lens system configured to receive at least a portion of the input light beam and to communicate at least the portion of the input light beam onto a part of a user's body comprising blood, wherein at least the portion of the input light beam is used in a measurement on a user, wherein the measurement comprises a spectroscopic procedure to measure a property of the blood, and wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood;
 - b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;
 - c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, circuitry for obtaining position information from a location sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information,



- i. wherein the control system is further capable of receiving voice input signals and manually entered input signals, and wherein the control system is further coupled to an audio output device; and
 - d. a host comprising:
 - i. a digital file for receiving and storing at least a portion of the wireless data;
 - ii. control logic at the host to process at least the portion of the wireless data to generate a status of the user, wherein the control logic includes a voice recognition software to process at least a portion of the voice input signals;
 - iii. a memory storage device for recording the status; and
 - iv. an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.
16. The control system is further coupled to a headset or a heads-up display.
17. The gesture signals are capable of being generated in response to a head motion.
18. The control system is further coupled to a proximity sensor.
19. The host is adapted to permit access of the status or associated information stored on the host from two or more different locations remote from the host.
20. The control system is further capable of providing feedback control data associated at least in part with the physiological information or the position information to a device control module.



4. BRIEF OVERVIEW OF REFERENCES

On completion of search, following prior arts were found. Prior arts are arranged on the basis of their relevancy to claims of subject patent ('868).

H - Highly Relevant | **M+** - Relevant (some of the elements may be logically inferred) | **M** - Related (one or more claim element may be missing) | **L** - Low Relevancy results

Relevant Date of Prior-art reference corresponding to earliest priority date of subject patent ('868 Patent)

S. No.	Publication number	Title	Publication Date	Filing Date	Priority Date	Assignee	Relevancy
1	CN202120263U	Portable terminal of remote health monitoring and managing system	Jan 18, 2012	Jul 06, 2011	Jul 06, 2011	YIFAN DING	H (PROPOSED COMBINATION)
2	US5891022A	Apparatus for performing multiwavelength photoplethysmography	Apr 06, 1999	Sep 25, 1996	Sep 25, 1996	DATEX OHMEDA	
3	US20090171170 A1	Medical Monitoring With Portable Electronic Device System And Method	Jul 02, 2009	Dec 24, 2008	Dec 28, 2007	NELLCOR PURITAN BENNETT	H
4	US6616613B1	Physiological signal monitoring system	Sep 09, 2003	Apr 27, 2000	Apr 27, 2000	VITALSINES INTERNATIONAL	M+
5	US20020198473 A1	System and method for real-time monitoring, assessment, analysis, retrieval, and storage of physiological data over a wide area network	Dec 26, 2002	Mar 28, 2002	Mar 28, 2001	ABODYNE	M+
6	TWM341495U	Hand-held device based remote medical diagnosis platform	Oct 01, 2008	Apr 17, 2008	Apr 17, 2008	ORIENTAL INSTITUTE OF TECHNOLOGY	M+



S. No.	Publication number	Title	Publication Date	Filing Date	Priority Date	Assignee	Relevancy
7	US20100030043 A1	Implantable medical system including multiple sensing modules	Feb 04, 2010	Jul 30, 2008	Jul 30, 2008	MEDTRON IC	M [Implantable medical device + sensor modules + wavelength division multiplexing + waveguide + external device (control system) + remote server (host)]
8	US20030208113 A1	Closed loop glycemic index system	Nov 06, 2003	Jul 18, 2001	Aug 02, 1999	HEALTH TECH	M [Sensors + electronic device (control system) + software + remote computer (host)]
9	US20040002634 A1	System and method for interacting with a user's virtual physiological model via a mobile terminal	Jan 01, 2004	Jun 28, 2002	Jun 28, 2002	NOKIA	M [Physiological sensor + mobile terminal + (control system) + software + server (host)]
10	-	In-Home Wireless Monitoring of Physiological Data for Heart Failure Patients	Oct, 2002	-	-	G. G. MENDOZA	M [Wireless monitoring + physiological data + sensors + central station (server) + analysis and reports (software-based) + health care providers (remote)]



S. No.	Publication number	Title	Publication Date	Filing Date	Priority Date	Assignee	Relevancy
11	US6599241B1	Diagnostic system and apparatus	Jul 29, 2003	May 11, 2000	May 11, 1999	REMOTE DIAGNOSTIC TECHNOLOGIES	M [Diagnostic system + sensors + handsfree-headset + heads-up display + remote monitoring]
12	JP2004199004A	Speech input type medical control system	Jul 15, 2004	Dec 20, 2002	Dec 20, 2002	OLYMPUS	M [Voice input medical control system + light source + waveguide + headset + voice recognition device + speaker]
13	DE102007032533A1	Operating process for medical diagnosis apparatus involves controlled movement of part of apparatus, using sensors and evaluating results for further use	Jan 15, 2009	Jul 12, 2007	Jul 12, 2007	SIEMENS	M [Medical diagnosis and therapy device + control unit (control system) + proximity sensor]
14	US20120229383A1	Gesture support for controlling and/or operating a medical device	Sep 13, 2012	Jan 14, 2010	Jan 14, 2010	BRAINLAB	M [Medical device + gesture-based + control/operation of medical device]



5. CHECKLIST

5.1 CHECKLIST FOR INDEPENDENT CLAIMS

Y – Reference discloses the complete claim element | I – Reference inferentially discloses the claim element | P – Reference discloses only a part of the claim element

S. N o.	Publication Number / Publication Name	Independent Claims													
		1pre, 7pre, 15pre	1a, 7a, 15a	1a(i), 7a(i), 15a(i)	1a(ii)	1a(iii)	1a(iv), 7a(ii), 15a(i)	1b, 7b, 15b	1c, 7c, 15c	1c(i), 7c(i), 15c(i)	1d, 7d, 15d	1d(i), 7d(i), 15d(i)	1d(ii), 7d(ii), 15d(i)	1d(iii), 7d(iii), 15d(ii)	1d(iv), 7d(iv), 15d(i)
1	CN202120263U	Y	Y	Y			Y	Y	I	Y	Y	Y	Y	Y	Y
2	US5891022A	Y	Y	Y	Y	Y	I								
3	US2009017117 0A1	Y	Y	Y			Y	Y	Y	I	Y	Y	Y	Y	Y
4	US6616613B1	Y	Y	Y			I	Y	Y	P	Y	Y	I	Y	I
5	US2002019847 3A1	Y					P	Y	P	Y	Y	Y	I	Y	I
6	TWM341495U	Y	Y	Y			I	Y	P	I	Y	Y	Y	Y	Y
7	US2010003004 3A1	Y	Y	Y	P	P	I	Y	P	P	Y	I		Y	I
8	US2003020811 3A1	Y	Y	Y			I	Y	I	Y	Y	Y	Y	Y	Y
9	US2004000263 4A1	Y	Y					Y	P	P	Y	Y	Y	Y	Y



S. N o.	Publication Number / Publication Name	Independent Claims													
		1pre, 7pre, 15pre	1a, 7a, 15a	1a(i), 7a(i), 15a(i)	1a(ii)	1a(iii)	1a(iv), 7a(ii), 15a(i)	1b, 7b, 15b	1c, 7c, 15c	1c(i), 7c(i), 15c(i)	1d, 7d, 15d	1d(i), 7d(i), 15d(i)	1d(ii), 7d(ii), 15d(i)	1d(iii), 7d(iii), 15d(ii)	1d(iv), 7d(iv), 15d(i v)
10	In-Home Wireless Monitoring Of Physiological Data For Heart Failure Patients	Y	Y					Y	P		Y	Y	I		P
11	US6599241B1	Y	Y					P	P		Y	P	P		
12	JP2004199004 A	Y	Y	P		P									
13	DE1020070325 33A1	Y													
14	US2012022938 3A1	Y													



5.2 CHECKLIST FOR DEPENDENT CLAIMS

Y – Reference discloses the complete claim | I – Reference inferentially discloses the claim | P – Reference discloses only a part of the claim

S. No.	Publication Number / Publication Name	Dependent Claims								
		2, 9	3, 12, 20	4, 10, 16	5, 11	6, 14	8	13, 18	17	19
1	CN202120263U	I	Y							
2	US5891022A						Y			
3	US20090171170A1	I	Y							
4	US6616613B1	Y								I
5	US20020198473A1	I								I
6	TWM341495U	I	Y							Y
7	US20100030043A1	I					P			P
8	US20030208113A1	I	Y		Y					I
9	US20040002634A1	I	I							
10	In-Home Wireless Monitoring of Physiological Data for Heart Failure Patients	I	I							



S. No.	Publication Number / Publication Name	Dependent Claims								
		2, 9	3, 12, 20	4, 10, 16	5, 11	6, 14	8	13, 18	17	19
11	US6599241B1	I		Y	I	Y				
12	JP2004199004A			Y	Y	I				
13	DE102007032533A1		Y					Y		
14	US20120229383A1								Y	



6. RESULT-1 & 2 (PROPOSED COMBINATION)

CORRELATION TABLE

CLAIM TERMS (US Patent No. US9055868)	PRIOR ART (CN Patent No. 202120263U)	PRIOR ART (US Patent No. 5891022A)
CONTROL SYSTEM	Mobile phone terminal	-
HOST	Remote system service center platform	-
SEMICONDUCTOR DIODES	Diodes	Light-emitting diodes
WAVEGUIDE	-	Optical fiber



(12) 实用新型专利

(10) 授权公告号 CN 202120263 U

(45) 授权公告日 2012.01.18

United States Patent [19]
Polage

[11] **Patent Number:** **5,891,022**

[45] **Date of Patent:** **Apr. 6, 1999**

Publication No. Publication No. [CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

1pre. A diagnostic system comprising:

[CN202120263U](#)

[Para 0011] "[A portable terminal for remote health monitoring management system, consisting of a data acquisition part, an A/D converter, a processor and its peripheral devices; the data acquisition part includes an electrocardiogram module, a blood](#)

Ding discloses a remote health monitoring management system comprising multiple



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	<u>pressure module, a blood oxygen module and a positioning module, and the collected information is transmitted to the processor after passing through the A/D converter; the peripheral devices of the processor include an extended RAM, a FLASH, an LED display screen, a keyboard and a USB chip interface.</u>" US5891022A [Abstract] "<u>A photoplethysmographic measurement device that utilizes wavelength division multiplexing is provided. Signals from multiple light emitters are combined into a single multiplexed light signal in a test unit before being delivered to a physically separated probe head attached to a test subject.</u> The probe then causes the single multiplexed signal to be transmitted through a tissue under test on the test subject, after which it is processed to determine a blood analyte level of the test subject. By combining the light signals into a single multiplexed signal before delivering the signals to the probe, a single light guide, such as a single optical fiber, can be used to deliver the signals to the probe, thereby reducing system implementation cost and increasing the flexibility of the probe cable. In addition, the invention allows the signals from the light emitters to be directed into the test subject from a single point source, which can significantly increase measurement accuracy." [Page 5, Col 2, Line 8] "<u>It is an object of the present invention to provide a photoplethysmographic measurement system that utilizes wavelength division multiplexing (WDM) to deliver light pulses between a main test unit and a probe.</u>"	sensors to capture the physiological data of a user. Pologe discloses a photoplethysmographic device that utilizes wavelength division multiplexing for providing physiological measurements.



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
1a. a light source comprising: 1a(i). a plurality of semiconductor diodes with light beams;	CN202120263U [Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. <u>Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photocell receiving the transmitted light reflects the transmitted light intensity of the two lights.</u> It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood." The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert_Beer law and the empirical formula of the instrument." [Para 0038] "As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is	<i>Ding discloses a blood oxygen module consisting of a light source comprising a plurality of light-emitting diodes (semiconductor diodes) to capture blood-related measurements.</i>



Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

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Publication No. [US5891022A](#)

Jun 10, 2013

Publishing Date: Apr 06, 1999

Researcher's
Comments

400~1150 nm and the peak absorption wavelength is 900 nm. The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.

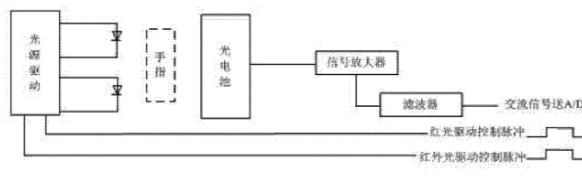


图 4

[US5891022A](#)

[Page 5, Col 2, Line 45] "In accordance with one aspect of the present invention, a photoplethysmographic measurement apparatus is provided having: a plurality of separate emitters, wherein each emitter produces a light signal having a unique spectral content; means for combining the light signals from the plurality of emitters into a single light signal; means for delivering the single light signal to the tissue so that the single light signal is directed into the tissue; means for receiving a transmitted light signal from the tissue, the transmitted light signal resulting from the transmission of the single light signal through the tissue; and means for processing the transmitted light signal to determine one or more blood analyte levels in the tissue."

[Page 6, Col 3, Line 1] "The plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes. In general, the signal delivery means includes a single input/single output light guide such as a single optical fiber, a single fiber bundle, or other type of light guiding means. The single input/single output light guide delivers light to a

Pologe discloses that the plethysmographic measurement device includes plurality of emitters (semiconductor diodes) having different wavelengths.



Publication No. [Publication No. CN202120263U](#)[US9055868B2](#)

Publishing Date: Jan 18, 2012

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Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

probe head which couples the light into the tissue under test. The probe head can also include detection means for converting the light signal transmitted through the tissue under test into an electrical signal. In one embodiment, the plurality of emitters and the combining unit are included in a housing, such as a bench top test unit or a handheld unit. The housing may also include means for communicating measurement results to users and means for receiving commands from users. The probe head is physically separated from the housing with the single input/single output light guide connecting them."

[Page 6, Col 4, Line 63] "The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions; a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28."

[Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single



Publication No. [Publication No. CN202120263U](#)
[US9055868B2](#)

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Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."

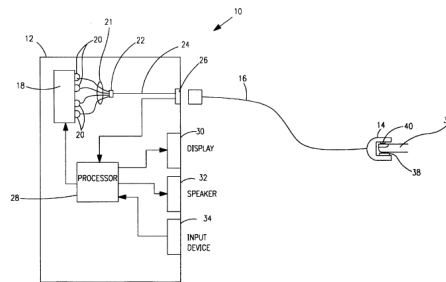


FIG. I

1a(ii). a multiplexer capable of combining the plurality of semiconductor diode light beams and generating at least a multiplexed light beam comprising one or more wavelengths;

1a(iv). one or more waveguide structures

[CN202120263U](#)

N/A

N/A

[US5891022A](#)

[Abstract] "A photoplethysmographic measurement device that utilizes wavelength division multiplexing is provided. Signals from multiple light emitters are combined into a single multiplexed light signal in a test unit before being delivered to a physically separated probe head attached to a test subject. The probe then causes the single multiplexed signal to be transmitted through a tissue under test on the test subject, after which it is processed to determine a blood analyte level of the test subject. By

Pologe discloses a photoplethysmographic measurement device that utilizes wavelength division multiplexing (WDM). The light signals emitted from plurality of sources are combined into a



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configured to receive at least a portion of the one or more wavelengths and to communicate at least the portion of the one or more wavelengths to an output end of the one or more waveguide structures to form an output beam; and	<u>combining the light signals into a single multiplexed signal before delivering the signals to the probe, a single light guide, such as a single optical fiber, can be used to deliver the signals to the probe, thereby reducing system implementation cost and increasing the flexibility of the probe cable.</u> In addition, the invention allows the signals from the light emitters to be directed into the test subject from a single point source, which can significantly increase measurement accuracy.” [Page 5, Col 2, Line 29] <u>“To achieve the above objectives, a system is provided that utilizes wavelength division multiplexing to combine the output signals from multiple light sources (i.e., emitters) into a single multiplexed signal. Thereafter, a single optical transmission line, such as a fiber optic cable, a fiber bundle, or other light guiding means may be utilized between the main test unit and the probe to deliver all light pulses to the probe, regardless of the number of light sources being used.</u> In addition, because all of the light pulses exist on a single transmission line, the light pulses may be directed from the probe into the tissue under test from a single point source, thereby eliminating measurement errors due to differing optical paths. Further, because the light sources are included in the main test unit, rather than the probe, the probe may be relatively lightweight, is not prone to heating, and is relatively inexpensive to produce, allowing it to be disposable.” [Page 6, Col 4, Line 20] <u>“The present invention relates to a system for performing photoplethysmographic measurements using wavelength division multiplexing.</u> The system is relatively inexpensive to produce and is capable of efficiently and accurately performing photoplethysmographic measurements. <u>The system uses wavelength division multiplexing (WDM) to combine the light signals from multiple light sources in a main test unit into a single multiplexed signal before the signal is delivered to the probe. The multiplexed signal may then be delivered to the</u>	single multiplexed signal. The multiplexed signal is delivered to the probe using a single optical fiber (waveguide structure).



Publication No. US9055868B2	Publication No. CN202120263U	
Target Date: Jun 10, 2013	Publishing Date: Jan 18, 2012	Researcher's Comments
	Publication No. US5891022A	
	Publishing Date: Apr 06, 1999	

probe over a single optical line, such as a single fiber optic cable, a single fiber bundle, or any other single light guide.”

[Page 6, Col 4, Line 63] “The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions; a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28.”

[Page 7, Col 5, Line 44] “The optical coupler 22 may comprise any type of device capable of receiving individual light signals from multiple sources and combining them into a single multiplexed signal. In this regard, any of a number of different types of wavelength division multiplexing (WDM) couplers may be used, such as WDM couplers using lenses, prisms, interference filters, diffraction gratings, or butt coupling. Also, active WDM couplers can be used, such as those including cascaded or parallel emitters on a single substrate. Wavelength division multiplexing refers to any method whereby multiple light signals having unique and substantially non-overlapping spectral contents are coupled onto a common light guide. The individual components of the multiplexed signal can then be separated back out by any of a number of methods.”



Publication No. [CN202120263U](#)
[US9055868B2](#)
 Publishing Date: Jan 18, 2012
 Target Date: Jun 10, 2013
 Publication No. [US5891022A](#)
 Publishing Date: Apr 06, 1999

Researcher's
 Comments

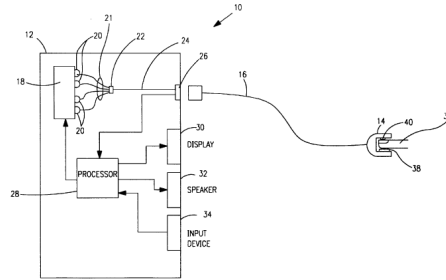


FIG. 1

1a(iv). a lens system configured to receive at least a portion of the output beam and to communicate at least the portion of the output beam onto a part of a user's body comprising blood to perform a measurement on a user;

[CN202120263U](#)

[Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photocell receiving the transmitted light reflects the transmitted light intensity of the two lights. It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood.

The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to

Ding discloses a BPW34 silicon photocell and two diodes (semiconductor diodes) that emit light to capture physiological data. Additionally, the material covering the light emitting diodes (LEDs) acts as a lens, receiving the output light from the LEDs and projecting it into the sample.



Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Publication No. [US5891022A](#)

Jun 10, 2013

Publishing Date: Apr 06, 1999

Researcher's
Comments

calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert-Beer law and the empirical formula of the instrument.”

[Para 0038] “As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150 nm and the peak absorption wavelength is 900 nm. The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.”

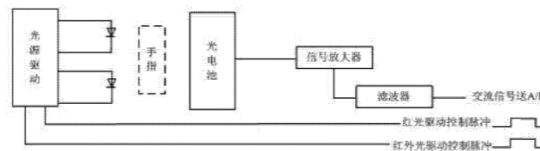


图 4

[US5891022A](#)

[Page 5, Col 2, Line 45] “In accordance with one aspect of the present invention, a photoplethysmographic measurement apparatus is provided having: a plurality of separate emitters, wherein each emitter produces a light signal having a unique spectral content; means for combining the light signals from the plurality of emitters into a single light signal; means for delivering the single light signal to the tissue so that the single light signal is directed into the tissue; means for receiving a transmitted light signal from the tissue, the transmitted light signal resulting from the transmission of the single light signal through the tissue; and means

Pologe discloses the plethysmographic measurement device contains plurality of sources emitting light signals for multiple wavelengths. Additionally, the material covering the light emitting diodes (LEDs) acts as a



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	for processing the transmitted light signal to determine one or more blood analyte levels in the tissue." [Page 6, Col 3, Line 1] "The plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes. In general, the signal delivery means includes a single input/single output light guide such as a single optical fiber, a single fiber bundle, or other type of light guiding means. The single input/single output light guide delivers light to a probe head which couples the light into the tissue under test. The probe head can also include detection means for converting the light signal transmitted through the tissue under test into an electrical signal. In one embodiment, the plurality of emitters and the combining unit are included in a housing, such as a bench top test unit or a handheld unit. The housing may also include means for communicating measurement results to users and means for receiving commands from users. The probe head is physically separated from the housing with the single input/single output light guide connecting them." [Page 6, Col 4, Line 63] "The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions; a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28."	<i>lens, receiving the output light from the LEDs and projecting it into the sample.</i>



Publication No. [Publication No. CN202120263U](#)[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Publication No. [US5891022A](#)

Jun 10, 2013

Publishing Date: Apr 06, 1999

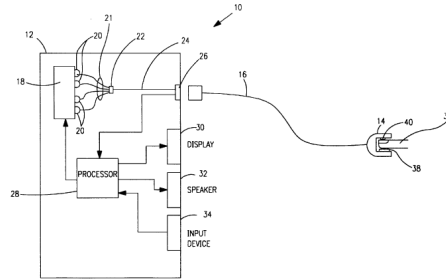
Researcher's
Comments

FIG. 1

[Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
1b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;	CN202120263U [Para 0040] <u>"The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet."</u> [Para 0041] <u>"At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal.</u> The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps."	Ding discloses an application software capable of displaying the calculated physiological data of a user by the sensor.



Publication No. US9055868B2 Publication No. CN202120263U Target Date: Jun 10, 2013 Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999 Researcher's Comments		
	US5891022A N/A	N/A
1c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information, 1c(i). wherein the control system is	CN202120263U [Para 0039] <u>"The personnel positioning of the utility model is realized by the GPSONe positioning module.</u> As a new positioning technology, GPSONe composite base station positioning has many advantages compared with traditional GPS positioning technology. It can greatly improve the quality of positioning services and solve the positioning problem in places where GPS signals are blocked. GPSONE composite positioning technology simplifies the work of the terminal and transfers the most arduous tasks such as satellite scanning and positioning calculations from the terminal side to the positioning server on the network side. The positioning accuracy, sensitivity and cold start speed of the terminal are improved, and the power consumption of the terminal is reduced. When neither GPS satellite signals nor wireless network signals can complete positioning independently, the GPSONE composite positioning system will combine these two information sources. Positioning can be completed with only one satellite and one cell site, solving problems that traditional GPS cannot solve. The improved performance enables the GPSONE hybrid positioning method to work properly deep inside modern buildings or between buildings in urban areas. GPSONE combines wireless network-assisted GPS positioning and CDMA triangulation positioning to improve indoor positioning results." [Para 0040] <u>"The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by</u>	<i>Ding discloses that the human body monitoring data captured by the sensor module (input source) is sent to a mobile phone terminal (control system), which collects, displays, and processes the information. The mobile terminal (control system) has capability to initiate voice, suggesting voice-input capability. Additionally, the mobile phone terminal is connected to a remote system service center platform (host) wirelessly,</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
further capable of receiving voice input signals and manually entered input signals; and	<u>the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network</u>, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet.” [Para 0041] <u>“At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal.</u> The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps.”	suggesting a wireless transceiver.
	US5891022A N/A	N/A



Publication No. US9055868B2	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
1d. a host comprising: 1d(i). a digital file for receiving and storing at least a portion of the wireless data; 1d(ii). control logic at the host to process at least the portion of the wireless data to generate a status of the user; 1d(iii). a memory storage device for recording the status; and 1d(iv). an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are	CN202120263U [Para 0040] “The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet.” [Para 0042] “The utility model is equipped with a remote health management service center platform. The platform consists of a data communication port, health monitoring management business system software, intelligent expert analysis software, a data storage background database and a GIS geographic system software. The background database stores massive data collected by personal terminals. These data can be automatically analyzed by the intelligent expert analysis software. The front-end obtains the user's human physiological parameters and generates a health status analysis report, providing users with expert evaluation and health guidance services and issuing a monthly health management analysis report. The GIS system software uses the positioning parameters obtained from the utility model to display the precise geographic location information of the cared person on the electronic map of the service platform in real time, and can guide rescue personnel to quickly and effectively implement rescue when they call for help in an emergency.” [Para 0043] “While providing doctors or medical staff with safe, reliable and accurate user health information, the remote health management service platform also classifies and processes the	<i>Ding discloses a remote health management service center platform (host) consisting of a data storage database (memory) to store user-related health data (digital files), that can be accessed by doctors or medical staff (remote users) to access the user's record and analyze their health status.</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
located remotely from the host.	collected data through the huge database of the data processing center. After reaching a systematic and accurate conclusion, it immediately sends it back to the user and his relatives. At the same time, it also designs a set of personalized diagnosis, treatment, exercise and diet service plans for the patient and sends them back. Doctors can rely on this system to conveniently observe patients' physiological conditions, timely understand their conditions and medication efficacy, assess patients' health status, evaluate treatment effects, and achieve real-time interaction between doctors and patients." [Para 0044] "The remote health management service center platform includes intelligent expert analysis system software, which uses artificial intelligence technology to collect and transmit periodic human electrocardiogram, blood pressure, blood oxygen, and pulse data through the front-end personal health management monitoring terminal, conducts automated analysis, and produces a health status analysis report. The intelligent expert analysis system software is developed based on the LINUX or WINDOW operating system running on a server based on an X86 architecture processor. <u>The functions performed include: importing and converting human physiological data collected and transmitted by the front-end terminal, parameter analysis calculation, and generating health status analysis reports.</u>" US5891022A N/A	N/A



Publication No. US9055868B2	Publication No. CN202120263U Publishing Date: Jan 18, 2012	Researcher's Comments
Target Date: Jun 10, 2013	Publication No. US5891022A Publishing Date: Apr 06, 1999	
2. The diagnostic system of claim 1, wherein at least the portion of the output beam is adapted for use in a diagnostics to measure a property of the blood, wherein the diagnostics comprise a spectroscopic procedure, wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood.	CN202120263U [Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. <u>Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photoreceiver receiving the transmitted light reflects the transmitted light intensity of the two lights.</u> It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood. <u>The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert Beer law and the empirical formula of the instrument.</u>"	Ding discloses a blood oxygen module using dual-wavelength photoelectric measurement method. The light beams are emitted on a finger. The photoreceiver receives the transmitted light, to calculate the blood-related measurements.



Publication No. [Publication No. CN202120263U](#)[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Jun 10, 2013

Publication No. [US5891022A](#)

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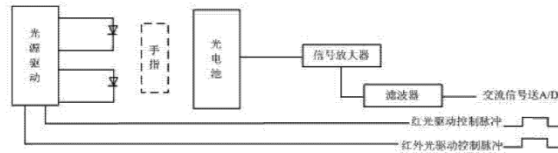
Researcher's
Comments

图 4

[Para 0038] “As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150 nm and the peak absorption wavelength is 900 nm. The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.”



Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

[US5891022A](#)

[Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."

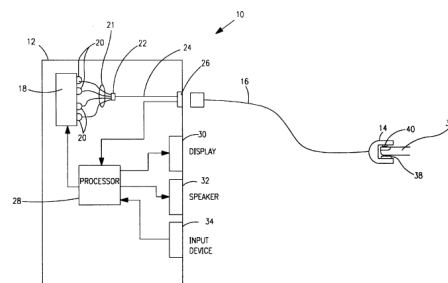


FIG. 1

Pologe discloses that, to measure oxygen saturation (a property of blood), the devices use multiple light sources, implying a spectroscopic procedure.



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
3. The diagnostic system of claim 1, wherein the control system is further capable of providing feedback control data associated at least in part with the physiological information or a position information to a device control module.	CN202120263U [Para 0041] “At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal. The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps.” [Para 0042] “<u>The utility model is equipped with a remote health management service center platform. The platform consists of a data communication port, health monitoring management business system software, intelligent expert analysis software, a data storage background database and a GIS geographic system software. The background database stores massive data collected by personal terminals. These data can be automatically analyzed by the intelligent expert analysis software. The front-end obtains the user's human physiological parameters and generates a health status analysis report, providing users with expert evaluation and health guidance services and issuing a monthly health management analysis report.</u> The GIS system software uses the positioning parameters	<i>Ding discloses the remote health monitoring system comprising a mobile terminal (control system) capable of providing medical reports and charts (feedback) to users regarding their physiological data.</i>



Publication No. US9055868B2		Publication No. CN202120263U	Researcher's Comments
Target Date: Jun 10, 2013		Publishing Date: Jan 18, 2012	
		Publication No. US5891022A	
		Publishing Date: Apr 06, 1999	
	obtained from the utility model to display the precise geographic location information of the cared person on the electronic map of the service platform in real time, and can guide rescue personnel to quickly and effectively implement rescue when they call for help in an emergency."		
	US5891022A N/A		N/A
4. The diagnostic system of claim 1, wherein the control system is further coupled to a headset or a heads-up display.	CN202120263U N/A		N/A
	US5891022A N/A		N/A
5. The diagnostic system of claim 1, wherein the control logic includes voice recognition software to process at least a portion of the voice input signals, and wherein the control system further comprises a voice recognition module.	CN202120263U N/A		N/A
	US5891022A N/A		N/A



Publication No. CN202120263U US9055868B2 Target Date: Jun 10, 2013 Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999 Researcher's Comments		
6. The diagnostic system of claim 1, wherein the control system is further coupled to an audio output device capable of communicating at least a part of the processed portion of the physiological information.	CN202120263U N/A	N/A
	US5891022A N/A	N/A
7pre. A diagnostic system comprising:	CN202120263U [Para 0011] “A portable terminal for remote health monitoring management system, consisting of a data acquisition part, an A/D converter, a processor and its peripheral devices; the data acquisition part includes an electrocardiogram module, a blood pressure module, a blood oxygen module and a positioning module, and the collected information is transmitted to the processor after passing through the A/D converter; the peripheral devices of the processor include an extended RAM, a FLASH, an LED display screen, a keyboard and a USB chip interface.”	Ding discloses a remote health monitoring management system comprising multiple sensors to capture the physiological data of a user.
	US5891022A [Abstract] “A photoplethysmographic measurement device that utilizes wavelength division multiplexing is provided. Signals from multiple light emitters are combined into a single multiplexed light signal in a test unit before being delivered to a physically separated probe head attached to a test subject. The probe then causes the single multiplexed signal to be transmitted	Pologe discloses a photoplethysmographic device that utilizes wavelength division multiplexing for providing



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	through a tissue under test on the test subject, after which it is processed to determine a blood analyte level of the test subject. By combining the light signals into a single multiplexed signal before delivering the signals to the probe, a single light guide, such as a single optical fiber, can be used to deliver the signals to the probe, thereby reducing system implementation cost and increasing the flexibility of the probe cable. In addition, the invention allows the signals from the light emitters to be directed into the test subject from a single point source, which can significantly increase measurement accuracy." [Page 5, Col 2, Line 8] <u>"It is an object of the present invention to provide a photoplethysmographic measurement system that utilizes wavelength division multiplexing (WDM) to deliver light pulses between a main test unit and a probe."</u>	<i>physiological measurements.</i>
7a. a light source comprising: 7a(i). a plurality of semiconductor diodes with light beams;	CN202120263U [Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. <u>Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photocell receiving the transmitted light reflects the transmitted light intensity of the two lights.</u> It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude	<i>Ding discloses a blood oxygen module consisting of a light source comprising a plurality of light-emitting diodes (semiconductor diodes) to capture blood-related measurements.</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood. The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert_Beer law and the empirical formula of the instrument.” [Para 0038] “As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150 nm and the peak absorption wavelength is 900 nm. <u>The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.</u>” 图 4	
	US5891022A [Page 5, Col 2, Line 45] “<u>In accordance with one aspect of the present invention, a photoplethysmographic measurement apparatus is provided having: a plurality of separate emitters, wherein each emitter produces a light signal having a unique</u>	Pologe discloses that the plethysmographic measurement device includes plurality of



Publication No. US9055868B2	Publication No. CN202120263U	Researcher's Comments
Target Date: Jun 10, 2013	Publishing Date: Jan 18, 2012	
	Publication No. US5891022A Publishing Date: Apr 06, 1999	

spectral content; means for combining the light signals from the plurality of emitters into a single light signal; means for delivering the single light signal to the tissue so that the single light signal is directed into the tissue; means for receiving a transmitted light signal from the tissue, the transmitted light signal resulting from the transmission of the single light signal through the tissue; and means for processing the transmitted light signal to determine one or more blood analyte levels in the tissue.”

[Page 6, Col 3, Line 1] “The plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes. In general, the signal delivery means includes a single input/single output light guide such as a single optical fiber, a single fiber bundle, or other type of light guiding means. The single input/single output light guide delivers light to a probe head which couples the light into the tissue under test. The probe head can also include detection means for converting the light signal transmitted through the tissue under test into an electrical signal. In one embodiment, the plurality of emitters and the combining unit are included in a housing, such as a bench top test unit or a handheld unit. The housing may also include means for communicating measurement results to users and means for receiving commands from users. The probe head is physically separated from the housing with the single input/single output light guide connecting them.”

[Page 6, Col 4, Line 63] “The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions;

emitters (semiconductor diodes) having different wavelengths.



Publication No. [Publication No. CN202120263U](#)[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28."

[Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."

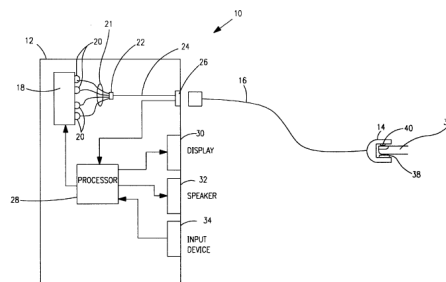
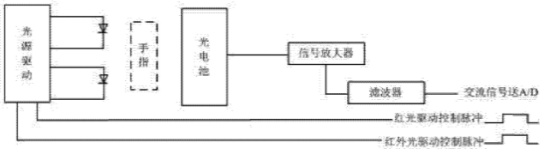


FIG. 1



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
7a(ii). a lens system configured to receive at least a portion of the output beam and to communicate at least the portion of the output beam onto a part of a user's body comprising blood to perform a measurement on a user;	CN202120263U [Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. <u>Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photocell receiving the transmitted light reflects the transmitted light intensity of the two lights.</u> It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood. <u>The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert_Beer law and the empirical formula of the instrument."</u> [Para 0038] "As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150	<i>Ding discloses a BPW34 silicon photocell and two diodes (semiconductor diodes) that emit light to capture physiological data. Additionally, the material covering the light emitting diodes (LEDs) acts as a lens, receiving the output light from the LEDs and projecting it into the sample.</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	nm and the peak absorption wavelength is 900 nm. The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.”  图 4	
	US5891022A [Page 5, Col 2, Line 45] “In accordance with one aspect of the present invention, a photoplethysmographic measurement apparatus is provided having: a plurality of separate emitters, wherein each emitter produces a light signal having a unique spectral content; means for combining the light signals from the plurality of emitters into a single light signal; means for delivering the single light signal to the tissue so that the single light signal is directed into the tissue; means for receiving a transmitted light signal from the tissue, the transmitted light signal resulting from the transmission of the single light signal through the tissue; and means for processing the transmitted light signal to determine one or more blood analyte levels in the tissue.” [Page 6, Col 3, Line 1] “The plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes. In general, the signal delivery means includes a single input/single output light guide such as a single optical fiber, a single fiber bundle, or other type of light guiding means. The single input/single output light guide delivers light to a probe head which couples the light into the tissue under test. The probe head can also include detection means for converting the light	Pologe discloses the plethysmographic measurement device contains plurality of sources emitting light signals for multiple wavelengths. Additionally, the material covering the light emitting diodes (LEDs) acts as a lens, receiving the output light from the LEDs and projecting it into the sample.



Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Publication No. [US5891022A](#)

Jun 10, 2013

Publishing Date: Apr 06, 1999

Researcher's
Comments

signal transmitted through the tissue under test into an electrical signal. In one embodiment, the plurality of emitters and the combining unit are included in a housing, such as a bench top test unit or a handheld unit. The housing may also include means for communicating measurement results to users and means for receiving commands from users. The probe head is physically separated from the housing with the single input/single output light guide connecting them.”

[Page 6, Col 4, Line 63] [“The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions; a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28.”](#)

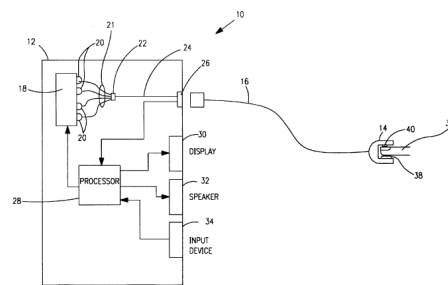


FIG. 1

[Page 7, Col 5, Line 16] “To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."	
7b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;	CN202120263U [Para 0040] "The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet." [Para 0041] "At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and	Ding discloses an application software capable of displaying the calculated physiological data of a user by the sensor.



Publication No. Publication No. <u>CN202120263U</u> US9055868B2 Target Date: Jun 10, 2013 Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999		Researcher's Comments
	positioning terminal. The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSOne and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps."	
	US5891022A N/A	N/A
7c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the	CN202120263U [Para 0039] "The personnel positioning of the utility model is realized by the GPSOne positioning module. As a new positioning technology, GPSOne composite base station positioning has many advantages compared with traditional GPS positioning technology. It can greatly improve the quality of positioning services and solve the positioning problem in places where GPS signals are blocked. GPSONE composite positioning technology simplifies the work of the terminal and transfers the most arduous tasks such as satellite scanning and positioning calculations from the terminal side to the positioning server on the network side. The positioning accuracy,	<i>Ding discloses that the human body monitoring data captured by the sensor module (input source) is sent to a mobile phone terminal (control system), which collects, displays, and processes the</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information, 7c(i). wherein the control system is further capable of receiving voice input signals and manually entered input signals; and	sensitivity and cold start speed of the terminal are improved, and the power consumption of the terminal is reduced. When neither GPS satellite signals nor wireless network signals can complete positioning independently, the GPSONE composite positioning system will combine these two information sources. Positioning can be completed with only one satellite and one cell site, solving problems that traditional GPS cannot solve. The improved performance enables the GPSONE hybrid positioning method to work properly deep inside modern buildings or between buildings in urban areas. GPSONE combines wireless network-assisted GPS positioning and CDMA triangulation positioning to improve indoor positioning results.” <u>[Para 0040] “The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet.”</u> <u>[Para 0041] “At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal.</u> The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone.	<i>information. The mobile terminal (control system) has capability to initiate voice, suggesting voice-input capability. Additionally, the mobile phone terminal is connected to a remote system service center platform (host) wirelessly, suggesting a wireless transceiver.</i>



Publication No. Publication No. <u>CN202120263U</u> US9055868B2 Target Date: Jun 10, 2013 Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999		Researcher's Comments
	If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps."	
	US5891022A N/A	N/A
7d. a host comprising: 7d(i). a digital file for receiving and storing at least a portion of the wireless data; 7d(ii). control logic at the host to process at least the portion of the wireless data to generate a status of the user; 7d(iii). a memory storage device for recording the status; and	CN202120263U [Para 0040] "The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet. " [Para 0042] " <u>The utility model is equipped with a remote health management service center platform. The platform consists of a data communication port, health monitoring management business system software, intelligent expert analysis software, a data storage background database and a GIS geographic system software. The background database stores massive data collected by personal terminals. These data can be automatically analyzed by the intelligent expert analysis software. The front-end obtains the user's human physiological</u> "	<i>Ding discloses a remote health management service center platform (host) consisting of a data storage database (memory) to store user-related health data (digital files), that can be accessed by doctors or medical staff (remote users) to access the user's record and analyze their health status.</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
7d(iv). an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.	parameters and generates a health status analysis report, providing users with expert evaluation and health guidance services and issuing a monthly health management analysis report. The GIS system software uses the positioning parameters obtained from the utility model to display the precise geographic location information of the cared person on the electronic map of the service platform in real time, and can guide rescue personnel to quickly and effectively implement rescue when they call for help in an emergency.” [Para 0043] “While providing doctors or medical staff with safe, reliable and accurate user health information, the remote health management service platform also classifies and processes the collected data through the huge database of the data processing center. After reaching a systematic and accurate conclusion, it immediately sends it back to the user and his relatives. At the same time, it also designs a set of personalized diagnosis, treatment, exercise and diet service plans for the patient and sends them back. Doctors can rely on this system to conveniently observe patients' physiological conditions, timely understand their conditions and medication efficacy, assess patients' health status, evaluate treatment effects, and achieve real-time interaction between doctors and patients.” [Para 0044] “The remote health management service center platform includes intelligent expert analysis system software, which uses artificial intelligence technology to collect and transmit periodic human electrocardiogram, blood pressure, blood oxygen, and pulse data through the front-end personal health management monitoring terminal, conducts automated analysis, and produces a health status analysis report. The intelligent expert analysis system software is developed based on the LINUX or WINDOW operating system running on a server based on an X86 architecture processor. The functions performed include: importing and converting human physiological data collected	



Publication No. US9055868B2 Publication No. CN202120263U Target Date: Jun 10, 2013 Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999 Researcher's Comments		
	and transmitted by the front-end terminal, parameter analysis calculation, and generating health status analysis reports."	
	US5891022A N/A	N/A
8. The diagnostic system of claim 7, wherein the light source comprises a plurality of semiconductor diodes that are further coupled to a multiplexer capable of combining the plurality of semiconductor diodes and generating the input light beam comprising one or more wavelengths.	CN202120263U N/A	N/A
	US5891022A [Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. <u>The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24.</u> Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."	<i>Pologe discloses that the plurality of emitters (semiconductor diodes) is combined in an optical coupler into a single multiplexed signal (input light beam).</i>



Publication No. US9055868B2	Publication No. CN202120263U	Researcher's Comments
Target Date: Jun 10, 2013	Publishing Date: Jan 18, 2012	
	Publication No. US5891022A Publishing Date: Apr 06, 1999	

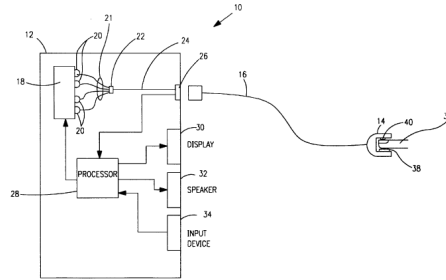


FIG. 1

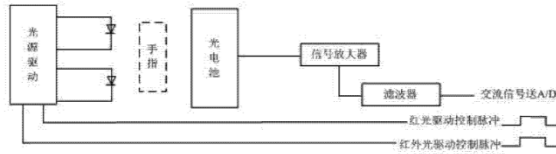
9. The diagnostic system of claim 7, wherein at least the portion of the input light beam is adapted for use in a diagnostics to measure a property of the blood, wherein the diagnostics comprise a spectroscopic procedure, wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated

[CN202120263U](#)

[Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. **The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photodiode receiving the transmitted light reflects the transmitted light intensity of the two lights.** It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood. **The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals.**

Ding discloses a blood oxygen module using dual-wavelength photoelectric measurement method. The light beams are emitted on a finger. The photodiode receives the transmitted light, to calculate the blood-related measurements.



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
wavelengths transmitted or reflected from the blood.	<u>Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert Beer law and the empirical formula of the instrument.”</u>  图 4 [Para 0038] “As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150 nm and the peak absorption wavelength is 900 nm. The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.”	



Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:
Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

[US5891022A](#)

[Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."

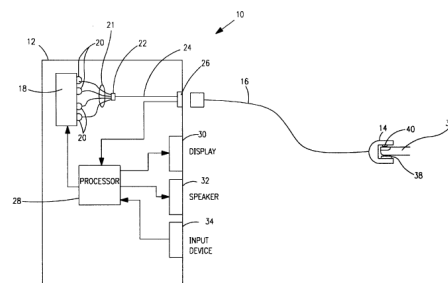


FIG. 1

Pologe discloses that, to measure oxygen saturation (a property of blood), the devices use multiple light sources, implying a spectroscopic procedure.



Publication No. US9055868B2 Publication No. CN202120263U Target Date: Jun 10, 2013 Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999 Researcher's Comments		
10. The diagnostic system of claim 7, wherein the control system is further coupled to a headset or a heads-up display.	CN202120263U N/A	N/A
	US5891022A N/A	N/A
11. The diagnostic system of claim 7, wherein the control logic includes voice recognition software to process at least a portion of the voice input signals, and wherein the control system further comprises a voice recognition module.	CN202120263U N/A	N/A
	US5891022A N/A	N/A
12. The diagnostic system of claim 7, wherein the control system is further capable of providing feedback control data associated at least	CN202120263U [Para 0041] “At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal. The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless	<i>Ding discloses the remote health monitoring system comprising a mobile terminal (control system) capable of providing medical reports and charts</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
in part with the physiological information or the position information to a device control module.	phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPS and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps." [Para 0042] <u>"The utility model is equipped with a remote health management service center platform. The platform consists of a data communication port, health monitoring management business system software, intelligent expert analysis software, a data storage background database and a GIS geographic system software. The background database stores massive data collected by personal terminals. These data can be automatically analyzed by the intelligent expert analysis software. The front-end obtains the user's human physiological parameters and generates a health status analysis report, providing users with expert evaluation and health guidance services and issuing a monthly health management analysis report.</u> The GIS system software uses the positioning parameters obtained from the utility model to display the precise geographic location information of the cared person on the electronic map of the service platform in real time, and can guide rescue personnel to quickly and effectively implement rescue when they call for help in an emergency." US5891022A N/A	(feedback) to users regarding their physiological data. N/A



Publication No. US9055868B2 Target Date: Jun 10, 2013 Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999 Researcher's Comments		
13. The diagnostic system of claim 7, wherein the control system is further coupled to a proximity sensor.	CN202120263U	N/A
	N/A	
	US5891022A	N/A
	N/A	
14. The diagnostic system of claim 7, wherein the control system is further coupled to an audio output device capable of communicating at least a part of the processed portion of the physiological information.	CN202120263U	N/A
	N/A	
	US5891022A	N/A
	N/A	
15pre. A diagnostic system comprising:	CN202120263U [Para 0011] “<u>A portable terminal for remote health monitoring management system, consisting of a data acquisition part, an A/D converter, a processor and its peripheral devices; the data acquisition part includes an electrocardiogram module, a blood pressure module, a blood oxygen module and a positioning module, and the collected information is transmitted to the processor after passing through the A/D converter; the peripheral devices of the processor include an extended RAM, a FLASH, an LED display screen, a keyboard and a USB chip interface.</u>”	<i>Ding discloses a remote health monitoring management system comprising multiple sensors to capture the physiological data of a user.</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	US5891022A [Abstract] "A photoplethysmographic measurement device that utilizes wavelength division multiplexing is provided. Signals from multiple light emitters are combined into a single multiplexed light signal in a test unit before being delivered to a physically separated probe head attached to a test subject. The probe then causes the single multiplexed signal to be transmitted through a tissue under test on the test subject, after which it is processed to determine a blood analyte level of the test subject. By combining the light signals into a single multiplexed signal before delivering the signals to the probe, a single light guide, such as a single optical fiber, can be used to deliver the signals to the probe, thereby reducing system implementation cost and increasing the flexibility of the probe cable. In addition, the invention allows the signals from the light emitters to be directed into the test subject from a single point source, which can significantly increase measurement accuracy." [Page 5, Col 2, Line 8] "It is an object of the present invention to provide a photoplethysmographic measurement system that utilizes wavelength division multiplexing (WDM) to deliver light pulses between a main test unit and a probe."	<i>Pologe discloses a photoplethysmographic device that utilizes wavelength division multiplexing for providing physiological measurements.</i>
15a. a light source comprising: 15a(i). a plurality of semiconductor diodes with light beams;	CN202120263U [Para 0037] "FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO₂) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO₂ and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. Two wavelengths of red light 660nm and near-infrared light 940nm are selected to	<i>Ding discloses a blood oxygen module consisting of a light source comprising a plurality of light-emitting diodes (semiconductor diodes) to capture</i>



Publication No. US9055868B2	Publication No. CN202120263U	Researcher's Comments
Target Date: Jun 10, 2013	Publishing Date: Jan 18, 2012	
	Publication No. US5891022A	
	Publishing Date: Apr 06, 1999	

	<u>pass through the upper part of the human finger respectively.</u> <u>The electrical signal generated by the silicon photocell receiving the transmitted light reflects the transmitted light intensity of the two lights.</u> It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood. The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert_Beer law and the empirical formula of the instrument.” [Para 0038] “As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150 nm and the peak absorption wavelength is 900 nm. <u>The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.</u>”	<i>blood-related measurements.</i>
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Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Publication No. [US5891022A](#)

Jun 10, 2013

Publishing Date: Apr 06, 1999

Researcher's
Comments

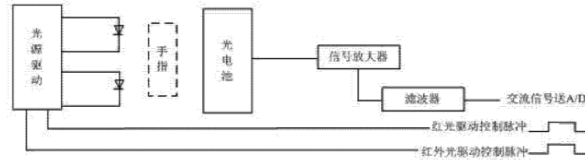


图 4

[US5891022A](#)

[Page 5, Col 2, Line 45] “In accordance with one aspect of the present invention, a photoplethysmographic measurement apparatus is provided having: a plurality of separate emitters, wherein each emitter produces a light signal having a unique spectral content; means for combining the light signals from the plurality of emitters into a single light signal; means for delivering the single light signal to the tissue so that the single light signal is directed into the tissue; means for receiving a transmitted light signal from the tissue, the transmitted light signal resulting from the transmission of the single light signal through the tissue; and means for processing the transmitted light signal to determine one or more blood analyte levels in the tissue.”

[Page 6, Col 3, Line 1] “The plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes. In general, the signal delivery means includes a single input/single output light guide such as a single optical fiber, a single fiber bundle, or other type of light guiding means. The single input/single output light guide delivers light to a probe head which couples the light into the tissue under test. The probe head can also include detection means for converting the light signal transmitted through the tissue under test into an electrical signal. In one embodiment, the plurality of emitters and the combining unit are included in a housing, such as a bench top test unit or a handheld unit. The housing may also include means for communicating measurement results to users and means for

Pologe discloses that the plethysmographic measurement device includes plurality of emitters (semiconductor diodes) having different wavelengths.



Publication No. [Publication No. CN202120263U](#)[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Jun 10, 2013

Publication No. [US5891022A](#)

Publishing Date: Apr 06, 1999

Researcher's
Comments

receiving commands from users. The probe head is physically separated from the housing with the single input/single output light guide connecting them.”

[Page 6, Col 4, Line 63] “The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions; a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28.”

[Page 7, Col 5, Line 16] “To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term “light emitting diode” includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	is returned to the main test unit 12 via probe cable 16 in either optical or electrical form.” FIG. 1	
15a(ii). a lens system configured to receive at least a portion of the input light beam and to communicate at least the portion of the input light beam onto a part of a user's body comprising blood, wherein at least the portion of the input light beam is used in a measurement on a user, wherein the measurement comprises a	CN202120263U [Para 0037] “FIG4 shows a schematic diagram of a blood oxygen module. Blood oxygen saturation is the ratio of the volume of oxygenated hemoglobin (HbO2) to the total volume of hemoglobin in the blood. The dual-wavelength transmission Photoelectric measurement method adopted in the present invention is based on the absorption spectrum characteristics of oxygenated hemoglobin HbO2 and reduced hemoglobin Hb in the blood in the red light and near-infrared light regions. <u>Two wavelengths of red light 660nm and near-infrared light 940nm are selected to pass through the upper part of the human finger respectively. The electrical signal generated by the silicon photocell receiving the transmitted light reflects the transmitted light intensity of the two lights.</u> It is a composite signal, which contains a pulsating component and a stable component. The pulsating component, that is, the alternating current signal AC is the stable component of the change in light absorption caused by the pulsating arterial blood, and the direct current signal DC reflects the magnitude of light absorption caused by various non-arterial tissues, such as epidermis, muscle, bone and venous blood.	Ding discloses a BPW34 silicon photocell and two diodes (semiconductor diodes) that emit light to capture physiological data. Additionally, the material covering the light emitting diodes (LEDs) acts as a lens, receiving the output light from the LEDs and projecting it into the sample.

Publication No. [Publication No. CN202120263U](#)

[US9055868B2](#)

Publishing Date: Jan 18, 2012

Target Date:

Publication No. [US5891022A](#)

Jun 10, 2013

Publishing Date: Apr 06, 1999

Researcher's
Comments

spectroscopic procedure to measure a property of the blood, and wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood;

The only factor that can reflect the change of blood oxygen saturation is the ratio of the amplitudes of the two wavelength AC signals, while the two-wavelength DC signals can be used to calibrate the AC signals. Therefore, by calculating the ratio of the AC and DC components of the transmitted red light intensity to the transmitted near-infrared light intensity, the blood oxygen saturation can be finally calculated according to the Lambert-Beer law and the empirical formula of the instrument.”

[Para 0038] “As shown in Figure 4, this embodiment uses the BPW34 silicon photocell produced by VISHAY as the photocell (photodetector). The photocell has the characteristics of high speed and high sensitivity. The response wavelength range is 400~1150 nm and the peak absorption wavelength is 900 nm. The ARM architecture processor controls the generation of driving pulse signals for red light and infrared light, so that the two diodes emit light alternately, and the A/D converter alternately collects AC signals and DC signals of corresponding wavelengths.”

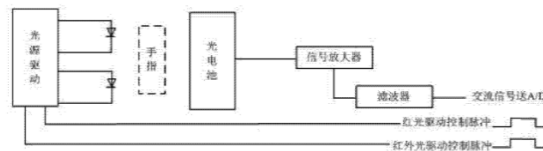


图 4

[US5891022A](#)

[Page 5, Col 2, Line 45] “In accordance with one aspect of the present invention, a photoplethysmographic measurement apparatus is provided having: a plurality of separate emitters, wherein each emitter produces a light signal having a unique spectral content; means for combining the light signals from the plurality of emitters into a single light signal; means for delivering the single light signal to the tissue so that the single light signal is directed into the tissue; means for receiving a transmitted light signal

Pologe discloses the plethysmographic measurement device contains plurality of sources emitting light signals for multiple wavelengths. Additionally, the



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	from the tissue, the transmitted light signal resulting from the transmission of the single light signal through the tissue; and means for processing the transmitted light signal to determine one or more blood analyte levels in the tissue.” [Page 6, Col 3, Line 1] “The plurality of separate emitters includes multiple separate light sources, such as light emitting diodes (LEDs) and laser diodes. In general, the signal delivery means includes a single input/single output light guide such as a single optical fiber, a single fiber bundle, or other type of light guiding means. The single input/single output light guide delivers light to a probe head which couples the light into the tissue under test. The probe head can also include detection means for converting the light signal transmitted through the tissue under test into an electrical signal. In one embodiment, the plurality of emitters and the combining unit are included in a housing, such as a bench top test unit or a handheld unit. The housing may also include means for communicating measurement results to users and means for receiving commands from users. The probe head is physically separated from the housing with the single input/single output light guide connecting them.” [Page 6, Col 4, Line 63] “The main test unit 12 includes: an emitter module 18 having a plurality of emitters 20, each capable of producing a light signal having a unique spectral content; a plurality of optical cables 21 each coupled to a single emitter source for carrying the corresponding light signal; an optical coupler 22 for coupling light signals from each of the plurality of cables 21 to a single output cable 24; a front panel connector 26 for use in coupling the probe cable 16 to the main test unit 12; a processor unit 28 for performing processing and control functions; a display unit 30 for displaying measurement values to a user; a speaker 32 for providing audible tones to the user; and an input	<i>material covering the light emitting diodes (LEDs) acts as a lens, receiving the output light from the LEDs and projecting it into the sample.</i>



Publication No. [US9055868B2](#)
 Target Date: Jun 10, 2013
 Publication No. [CN202120263U](#)
 Publishing Date: Jan 18, 2012
 Publication No. [US5891022A](#)
 Publishing Date: Apr 06, 1999

Researcher's
 Comments

device 34, such as a keypad or a touch screen, for allowing the user to input commands and other information to the processor unit 28."

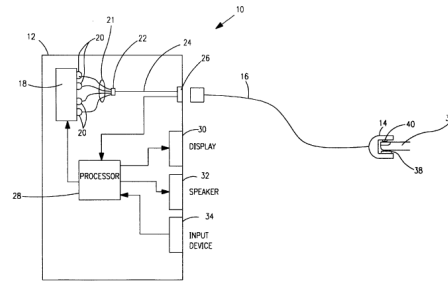


FIG. 1

[Page 7, Col 5, Line 16] "To perform an oxygen saturation measurement, the processor unit 28 sends a signal to the emitter unit 18 causing the emitters 20 to produce their corresponding light signals. The emitters 20 may include, for example, laser diodes or light emitting diodes (LEDs). In addition, in one embodiment of the invention, the plurality of emitters includes one or more broadband light sources and appropriate filtering means. As used herein, the term "light emitting diode" includes both infrared emitting diodes and ultraviolet emitting diodes. The light signals are combined in the optical coupler 22 into a single multiplexed light signal on output cable 24. Output cable 24 delivers the multiplexed signal to front panel connector 26 from which it is launched onto a single optical light guide within probe cable 16. Probe cable 16 delivers the multiplexed light signal to the probe 14, from which it is directed into the test subject's finger 36. After the multiplexed light signal has been transmitted through the finger 36, it is returned to the main test unit 12 via probe cable 16 in either optical or electrical form."



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
15b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;	CN202120263U [Para 0040] <u>“The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet.”</u> [Para 0041] <u>“At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal.</u> The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps.” US5891022A	Ding discloses an application software capable of displaying the calculated physiological data of a user by the sensor. N/A



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
	N/A	
15c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information, 15c(i). wherein the control system is further capable of receiving voice input signals and	CN202120263U [Para 0039] <u>"The personnel positioning of the utility model is realized by the GPSONe positioning module.</u> As a new positioning technology, GPSONe composite base station positioning has many advantages compared with traditional GPS positioning technology. It can greatly improve the quality of positioning services and solve the positioning problem in places where GPS signals are blocked. GPSONE composite positioning technology simplifies the work of the terminal and transfers the most arduous tasks such as satellite scanning and positioning calculations from the terminal side to the positioning server on the network side. The positioning accuracy, sensitivity and cold start speed of the terminal are improved, and the power consumption of the terminal is reduced. When neither GPS satellite signals nor wireless network signals can complete positioning independently, the GPSONE composite positioning system will combine these two information sources. Positioning can be completed with only one satellite and one cell site, solving problems that traditional GPS cannot solve. The improved performance enables the GPSONE hybrid positioning method to work properly deep inside modern buildings or between buildings in urban areas. GPSONE combines wireless network-assisted GPS positioning and CDMA triangulation positioning to improve indoor positioning results." [Para 0040] <u>"The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network,</u> and then the human body vital sign parameters are	<i>Ding discloses that the human body monitoring data captured by the sensor module (input source) is sent to a mobile phone terminal (control system), which collects, displays, and processes the information. The mobile terminal (control system) has capability to initiate voice, suggesting voice-input capability. Additionally, the mobile phone terminal is connected to a remote system service center platform (host) wirelessly, suggesting a wireless transceiver.</i>



Publication No. US9055868B2	Publication No. CN202120263U Publishing Date: Jan 18, 2012	Researcher's Comments
Target Date: Jun 10, 2013	Publication No. US5891022A Publishing Date: Apr 06, 1999	
manually entered input signals; and	remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet.” [Para 0041] <u>“At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal.</u> The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps.”	
	US5891022A N/A	N/A



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. CN202120263U Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999	Researcher's Comments
15d. a host comprising: 15d(i). a digital file for receiving and storing at least a portion of the wireless data; 15d(ii). control logic at the host to process at least the portion of the wireless data to generate a status of the user, wherein the control logic includes a voice recognition software to process at least a portion of the voice input signals 15d(iii). a memory storage device for recording the status; and 15d(iv). an output for communicating at least a portion of the status or associated	CN202120263U [Para 0040] “The utility model can realize the synchronous real-time measurement and data conversion of the electrocardiogram, blood pressure, blood oxygen and pulse of personnel. The above human body monitoring data is sent by the utility model to a mobile phone or a fixed-line gateway device installed with application software through a Bluetooth network, and then the human body vital sign parameters are remotely transmitted to the system service center platform through a 2.5G or 3G mobile communication network or through a fixed-line gateway device through the Internet.” [Para 0042] “The utility model is equipped with a remote health management service center platform. The platform consists of a data communication port, health monitoring management business system software, intelligent expert analysis software, a data storage background database and a GIS geographic system software. The background database stores massive data collected by personal terminals. These data can be automatically analyzed by the intelligent expert analysis software. The front-end obtains the user's human physiological parameters and generates a health status analysis report, providing users with expert evaluation and health guidance services and issuing a monthly health management analysis report. The GIS system software uses the positioning parameters obtained from the utility model to display the precise geographic location information of the cared person on the electronic map of the service platform in real time, and can guide rescue personnel to quickly and effectively implement rescue when they call for help in an emergency.” [Para 0043] “While providing doctors or medical staff with safe, reliable and accurate user health information, the remote health management service platform also classifies and processes the	<i>Ding discloses a remote health management service center platform (host) consisting of a data storage database (memory) to store user-related health data (digital files), that can be accessed by doctors or medical staff (remote users) to access the user's record and analyze their health status.</i>



Publication No. US9055868B2	Publication No. CN202120263U Publishing Date: Jan 18, 2012	Researcher's Comments
Target Date: Jun 10, 2013	Publication No. US5891022A Publishing Date: Apr 06, 1999	
information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.	collected data through the huge database of the data processing center. After reaching a systematic and accurate conclusion, it immediately sends it back to the user and his relatives. At the same time, it also designs a set of personalized diagnosis, treatment, exercise and diet service plans for the patient and sends them back. Doctors can rely on this system to conveniently observe patients' physiological conditions, timely understand their conditions and medication efficacy, assess patients' health status, evaluate treatment effects, and achieve real-time interaction between doctors and patients." [Para 0044] "The remote health management service center platform includes intelligent expert analysis system software, which uses artificial intelligence technology to collect and transmit periodic human electrocardiogram, blood pressure, blood oxygen, and pulse data through the front-end personal health management monitoring terminal, conducts automated analysis, and produces a health status analysis report. The intelligent expert analysis system software is developed based on the LINUX or WINDOW operating system running on a server based on an X86 architecture processor. <u>The functions performed include: importing and converting human physiological data collected and transmitted by the front-end terminal, parameter analysis calculation, and generating health status analysis reports.</u>"	
	US5891022A N/A	N/A
16. The diagnostic system of claim 15, wherein the	CN202120263U N/A	N/A



Publication No. US9055868B2 Publication No. CN202120263U Target Date: Jun 10, 2013 Publishing Date: Jan 18, 2012 Publication No. US5891022A Publishing Date: Apr 06, 1999 Researcher's Comments		
control system is further coupled to a headset or a heads-up display.	US5891022A N/A	N/A
17. The diagnostic system of claim 16, wherein gesture signals are capable of being generated in response to a head motion.	CN202120263U N/A	N/A
	US5891022A N/A	N/A
18. The diagnostic system of claim 15, wherein the control system is further coupled to a proximity sensor.	CN202120263U N/A	N/A
	US5891022A N/A	N/A
19. The diagnostic system of claim 15, wherein the host is adapted to permit access of the status or associated information stored on the host from two or more different locations remote from the host.	CN202120263U N/A	N/A
	US5891022A N/A	N/A



Publication No. US9055868B2	Publication No. CN202120263U Publishing Date: Jan 18, 2012	Researcher's Comments
Target Date: Jun 10, 2013	Publication No. US5891022A Publishing Date: Apr 06, 1999	
20. The diagnostic system wherein the control system is further capable of providing feedback control data associated at least in part with the physiological information or the position information to a device control module.	CN202120263U [Para 0041] “At the same time, the utility model can realize the normal short message sending and voice call functions through the mobile phone installed with relevant application software, and can also display the physiological sign parameters of the person collected by the personal health monitoring and positioning terminal. The mobile phone can be bound to a fixed telephone through a telephone gateway and used as a cordless phone at ordinary times to avoid accidents such as slipping and falling, spraining muscles and ligaments, etc. caused by the elderly's limited mobility when answering the phone. If an elderly person is at home and an accident occurs and the mobile signal is poor, the emergency center will be automatically connected through the communication gateway. The personal health management monitoring terminal also has the composite precise positioning function of GPSone and mobile base station, which can help the service personnel of the remote health management service center platform to achieve real-time indoor and outdoor precise positioning of the cared person through GIS electronic maps.” [Para 0042] “<u>The utility model is equipped with a remote health management service center platform. The platform consists of a data communication port, health monitoring management business system software, intelligent expert analysis software, a data storage background database and a GIS geographic system software. The background database stores massive data collected by personal terminals. These data can be automatically analyzed by the intelligent expert analysis software. The front-end obtains the user's human physiological parameters and generates a health status analysis report, providing users with expert evaluation and health guidance services and issuing a monthly health management analysis report.</u> The GIS system software uses the positioning parameters	Ding discloses the remote health monitoring system comprising a mobile terminal (control system) capable of providing medical reports and charts (feedback) to users regarding their physiological data.



Publication No. US9055868B2	Publication No. CN202120263U	
Target Date: Jun 10, 2013	Publishing Date: Jan 18, 2012	Researcher's Comments
	Publication No. US5891022A	
	Publishing Date: Apr 06, 1999	

	obtained from the utility model to display the precise geographic location information of the cared person on the electronic map of the service platform in real time, and can guide rescue personnel to quickly and effectively implement rescue when they call for help in an emergency."	
	US5891022A N/A	N/A

Researcher's comment: The prior art [CN202120263U](#) discloses a remote health monitoring management system via a portable terminal. The system comprises sensors, a mobile phone terminal (control system), and a remote health management service center platform (host). The input source includes a BPW34 silicon photocell and two diodes (semiconductor diodes) that emit light to capture physiological data, suggesting time-based multiplexing. The mobile phone terminal (control system) may be equipped with a GPSONe positioning module (location sensor). The physiological data collected by the sensors is sent to the system service center platform (host) via the mobile phone (control system). The mobile phone terminal (control system) is equipped with relevant application software (software) to display the collected physiological data and has voice capability to initiate a call. The remote health management service center platform (host) consists of a data storage database (memory) to store user-related health data (digital files) and specialized software for generating health status reports. Doctors and/or medical staff (remote users) may access the collected human physiological data and evaluate the patient's health status.

The prior art [US5891022A](#) discloses a photoplethysmographic measurement device that combines multiple light signals from a plurality of emitters (semiconductor diodes) into a single multiplexed light signal using wavelength division multiplexing. This single light signal is guided to the probe using a fiber optic cable (waveguide). The emitters can be LEDs, suggesting that the material covering the LEDs acts as a lens, receiving output from the LEDs and delivering it to the multiplexer.

A person of ordinary skill in the art would be motivated to integrate the technique of [CN202120263U](#), which focuses on time-based multiplexing for capturing physiological data, with the technique of [US5891022A](#), which multiplexes multiple light signals into a single beam using wavelength division multiplexing and explicitly includes a multiplexer. This integration would enable efficient physiological data collection and transmission by leveraging both time-based and wavelength-based multiplexing techniques. Hence, when both the references are combined, the limitations of one reference are overcome by the other. Given that both references fall within the domain of medical apparatus, their logical combination may be justified to invalidate the subject patent.



7. RESULT-3

CORRELATION TABLE

CLAIM TERMS (US Patent No. 9055868)	PRIOR ART (US Application No. 20090171170)
CONTROL SYSTEM	Portable medical device
HOST	Remote computer
SEMICONDUCTOR DIODES	Light emitting diodes

(19) **United States**
 (12) **Patent Application Publication** (10) Pub. No.: **US 2009/0171170 A1**
 Li et al. (43) Pub. Date: **Jul. 2, 2009**

Publication No. **Publication No. US20090171170A1**
US9055868B2 Publishing Date: Jul 02, 2009
 Target Date: Jun 10, 2013
 Researcher's Comments

1pre. A diagnostic system comprising:

[Abstract] "**In an embodiment, a system is provided that includes a sensor configured to monitor a physiological parameter of the patient.** The sensor is further configured to communicate with a portable electronic device configured to communicate over a wireless network. A method of operation of a sensor is provided that includes receiving data from a sensor configured to sense a physiological parameter and determining the physiological parameter from the data. A method of operation of a portable electronic device is also provided."

[Para 0011] "**In one embodiment, a system is provided that includes a sensor configured to monitor a physiological parameter, wherein the sensor is further configured to communicate with a portable electronic device.**"

[Para 0014] "**In another embodiment, a system is provided that includes a monitor configured to connect to a sensor**"

Li discloses a medical monitoring system that includes sensors to monitor a user's physiological parameters.



Publication No. US20090171170A1 Publishing Date: Jul 02, 2009		Researcher's Comments
Publication No. US9055868B2 Target Date: Jun 10, 2013	configured to monitor a physiological parameter, wherein the monitor is further configured to communicate with a portable electronic device."	
1a. a light source comprising: 1a(i). a plurality of semiconductor diodes with light beams;	[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. <u>For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue.</u> In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."	<i>Li discloses sensors configured with multiple light emitting diodes (semiconductor diodes) to measure physiological parameters.</i>



Publication No. US20090171170A1

US9055868B2

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's

Comments

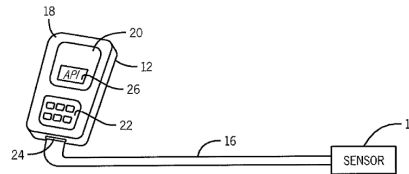


FIG. 1

1a(ii). a multiplexer capable of combining the plurality of semiconductor diode light beams and generating at least a multiplexed light beam comprising one or more wavelengths;

1a(iv). one or more waveguide structures configured to receive at least a portion of the one or more wavelengths and to communicate at least the portion of the one or more wavelengths to an

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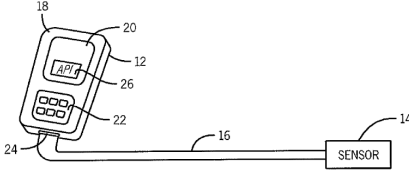
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Publication No. US20090171170A1 Publishing Date: Jul 02, 2009		Researcher's Comments
Target Date: Jun 10, 2013		
output end of the one or more waveguide structures to form an output beam; and		
1a(iv). a lens system configured to receive at least a portion of the output beam and to communicate at least the portion of the output beam onto a part of a user's body comprising blood to perform a measurement on a user;	[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the	<i>Li discloses a medical monitoring system comprising sensors configured with multiple light-emitting diodes (semiconductor diodes) to measure physiological parameters. Furthermore, the material covering the LEDs may function as a lens, receiving the output light from the LEDs and projecting it into the pulsatile tissue to measure blood-related physiological data.</i>



Publication No. US9055868B2	Publication No. US20090171170A1	Researcher's Comments
Target Date: Jun 10, 2013	Publishing Date: Jul 02, 2009	

	portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."  FIG. 1	
1b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;	[Para 0025] "The portable medical device 12 may run any suitable operating system, such as Symbian OS, Linux, Windows CE, Palm OS, etc., or the portable medical device 12 may run a custom operating system suitably designed for the application described herein. <u>Additionally, to support software that may be used with the sensor 14, such as the user interface and sensor interface, the portable medical device 12 may include an application programming interface (API) 26. The API 26 may facilitate development of the user interface, sensor interface, and other software by providing a set of requests, calls, methods, or other useful programming interfaces that allow easier usage of the resources provided by the portable medical device 12. For example, the API 26 may provide details for implementing the user interface, such as how to display a window, move a window, or display user interface objects such as buttons, icons, etc. In addition, with regard to the sensor interface, the API 26 may provide details on how the portable medical device 12 may receive, send, and process information to/from the sensor 14 and/or the sensor cable 16.</u> In one embodiment, the APT 26 may comprise the Binary Runtime Environment for Wireless (BREW). In another embodiment, the API 26 may comprise	<i>Li discloses that a portable medical device (control system) may include an application programming interface (API), enabling software applications. The portable device can send, receive, and process physiological information to and from the sensor. Further, it can display the generated physiological data to the user.</i>



Publication No. [Publication No. US20090171170A1](#)

[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

Java Platform Micro Edition (J2ME). However, in some embodiments an API 26 may not be provided.”

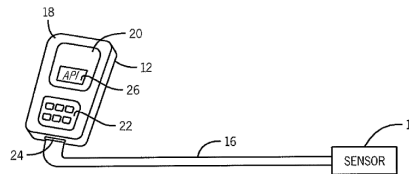


FIG. 1

1c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least

[Para 0022] “Referring now to FIG. 1, a portable medical device 12 is shown connected to a sensor 14, according to an embodiment. The portable medical device 12 may be a cellular phone, a personal data assistant, a GPS device, any wireless handheld device, or any other portable medical device 12, or any other device capable of wireless communication. Additionally, the portable medical device 12 may be a combination of any of the devices listed above.”

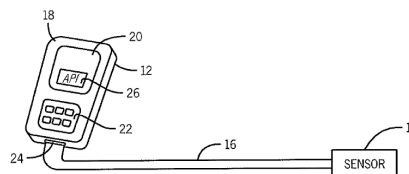


FIG. 1

[Para 0024] “In an embodiment, the portable medical device 12 may include an enclosure 18, a display 20, and one or more user inputs 22. The user inputs 22 may include a keyboard, and/or any number of knobs, buttons, dials, or any other suitable input device. The display 20 may display a user interface and various

Li discloses a portable medical device (control system) capable of sending, receiving, and processing physiological information to and from the sensor via an application programming interface (API), suggesting software capability. The portable medical device (control system) includes a GPS device (location sensor), multiple user inputs such as a touchscreen, and



Publication No. US9055868B2	Publication No. US20090171170A1	Researcher's
Target Date:	Publishing Date: Jul 02, 2009	Comments
Jun 10, 2013		

a part of the physiological information, 1c(i). wherein the control system is further capable of receiving voice input signals and manually entered input signals; and	<u>indicators for the portable medical device 12, the sensor 14, and/or the sensor cable 16. In some embodiments, the display 20 may comprise a touchscreen, and user inputs may be available through the touchscreen, with or without the inclusion of user inputs 22.</u> The portable medical device 12 may include a connector 24 configured to connect to the sensor cable 16. The connector 24 may be a Universal serial bus (USB) connector, FireWire (IEEE 1394) connector, or any other suitable connector. Alternatively, the connector 24 may be custom designed to interface with the sensor cable 16 such that other cables or devices may not be used with the connector 24.” [Para 0025] “The portable medical device 12 may run any suitable operating system, such as Symbian OS, Linux, Windows CE, Palm OS, etc., or the portable medical device 12 may run a custom operating system suitably designed for the application described herein. Additionally, to support software that may be used with the sensor 14, such as the user interface and sensor interface, the portable medical device 12 may include an application programming interface (API) 26. The API 26 may facilitate development of the user interface, sensor interface, and other software by providing a set of requests, calls, methods, or other useful programming interfaces that allow easier usage of the resources provided by the portable medical device 12. For example, the API 26 may provide details for implementing the user interface, such as how to display a window, move a window, or display user interface objects such as buttons, icons, etc. <u>In addition, with regard to the sensor interface, the API 26 may provide details on how the portable medical device 12 may receive, send, and process information to/from the sensor 14 and/or the sensor cable 16.</u> In one embodiment, the APT 26 may comprise the Binary Runtime Environment for Wireless (BREW). In another embodiment, the API 26 may comprise Java Platform Micro Edition (J2ME). However, in some embodiments an API 26 may not be provided.”	<i>the ability to make calls, suggesting voice capabilities. Additionally, it features both wired and wireless communication capabilities, indicating the presence of a wireless transceiver.</i>
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Publication No. [Publication No. US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Researcher's
Comments

Target Date:
Jun 10, 2013

[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."

[Para 0028] "In addition to monitoring, the portable medical device 12 may use information received from the sensor 14 to provide alarms, alerts, or any other notification based on the status of the physiological parameter of the user monitored by the sensor 12. As discussed further below, in an embodiment, if the physiological parameter is above or below a specified threshold, the portable



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

	<u>medical device 12 may provide an alarm or any other audio or visual notification, thus notifying the user of the abnormal condition. Additionally, or alternatively, the portable medical device 12 may send an alert to remote location, such as to a caregiver responsible for monitoring or treating the patient or user. For example, if the portable medical device 12 includes a cellular telephone, a call and/or text message could be sent to a caregiver to provide information related to the patient's condition.</u> Similarly, if the portable medical device 12 includes wireless Internet capability, an email could be sent to a caregiver to provide information related to the patient's condition. Thus, the status of a user's physiological parameter and any abnormal conditions related to those physiological parameters may be monitored, and a caregiver may be automatically notified without any intervention from the patient or user using the portable medical device 12 and the sensor 14."	
1d. a host comprising: 1d(i). a digital file for receiving and storing at least a portion of the wireless data; 1d(ii). control logic at the host to process at least the portion of the wireless data to generate a status of the user;	[Para 0027] "As described further below, implementation of the sensor 14 with the portable medical device 12 may provide for a variety of monitoring and alert functions. <u>For example, in one embodiment the portable medical device 12 may compile a summary report of data received by the sensor, and the portable medical device 12 may send reports to a remote location at a specified time interval, such as every 10 minutes, every hour, every day, etc. Alternatively, the portable medical device 12 may continuously send data to the remote location.</u> Further, the sensor 14 may be configured to continuously monitor and/or periodically monitor the physiological characteristic of a user. For example, if the sensor 14 is a pulse oximetry sensor, it would likely provide substantially continuous monitoring of the patient. On the other hand, if the sensor 14 is a blood pressure sensor, it would likely provide only periodic measurements."	<i>Li discloses a remote computer (host) for storing (memory) and archiving users' medical information (digital files), such as reports and results. Furthermore, the archived medical information on the remote computer (host) associated with a user may be accessed by a caregiver (remote user) via a handheld</i>



Publication No. [US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:
 Jun 10, 2013

Researcher's
 Comments

1d(iii). a memory storage device for recording the status; and

1d(iv). an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.

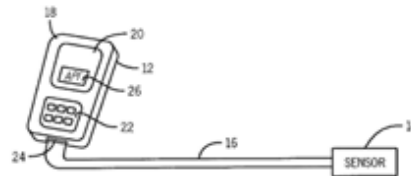


FIG. 1

[Para 0030] “Other devices may be connected to the network 102 and may send or receive data from the portable medical device 12. The network may include other portable electronic devices 104, such as those used or carried by a caregiver 106. Additionally, the network may include a remote computer 108, such as a desktop, server, database server, or any other computer at a remote location.”

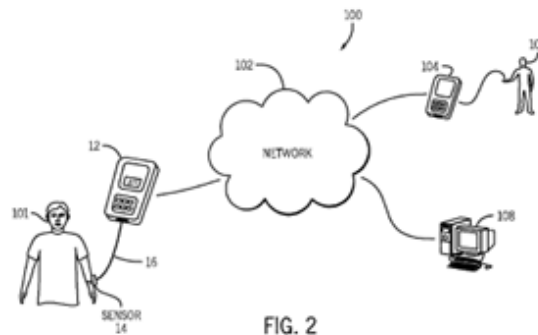


FIG. 2

[Para 0032] “Additionally, if one of the functions performed by the portable medical device 12 is generation of summary reports of data received from the sensor 14, the portable medical device 12 may send those reports to the remote computer 108 for storage and archiving. A caregiver 106 may then review a user's history on the remote computer 108, and then take the appropriate action. For

device (display
 output device).



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

	example, a user's history reviewed on the remote computer 108 may indicate that a change in treatment is necessary, such as a change in medication, scheduling of a checkup, an increase or reduction in therapies, et cetera."	
2. The diagnostic system of claim 1, wherein at least the portion of the output beam is adapted for use in a diagnostics to measure a property of the blood, wherein the diagnostics comprise a spectroscopic procedure, wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood.	[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. <u>For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue.</u> For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."	<i>Li discloses a pulse oximetry sensor in which light signals are emitted onto a user's finger, and the signals reflected from the tissues are detected, suggesting a spectroscopic procedure in which a comparison of different signals is used for diagnosis.</i>



Publication No. [Publication No. US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

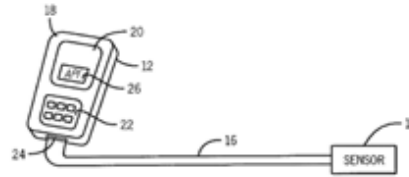
Researcher's
Comments


FIG. 1

3. The diagnostic system of claim 1, wherein the control system is further capable of providing feedback control data associated at least in part with the physiological information or a position information to a device control module.

[Para 0028] "In addition to monitoring, the portable medical device 12 may use information received from the sensor 14 to provide alarms, alerts, or any other notification based on the status of the physiological parameter of the user monitored by the sensor 12. As discussed further below, in an embodiment, if the physiological parameter is above or below a specified threshold, the portable medical device 12 may provide an alarm or any other audio or visual notification, thus notifying the user of the abnormal condition. Additionally, or alternatively, the portable medical device 12 may send an alert to remote location, such as to a caregiver responsible for monitoring or treating the patient or user. For example, if the portable medical device 12 includes a cellular telephone, a call and/or text message could be sent to a caregiver to provide information related to the patient's condition. Similarly, if the portable medical device 12 includes wireless Internet capability, an email could be sent to a caregiver to provide information related to the patient's condition. Thus, the status of a user's physiological parameter and any abnormal conditions related to those physiological parameters may be monitored, and a caregiver may be automatically notified without any intervention from the patient or user using the portable medical device 12 and the sensor 14."

Li discloses that the monitoring system comprises a portable medical device (control system) capable of providing auditory or visual alerts/notifications (feedback) to users regarding their physiological data.



Publication No. Publication No. [US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's

Comments

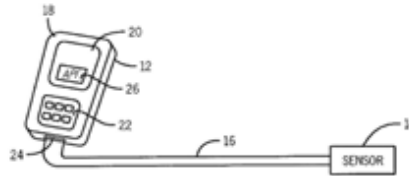


FIG. 1

4. The diagnostic system of claim 1, wherein the control system is further coupled to a headset or a heads-up display.

N/A

N/A

5. The diagnostic system of claim 1, wherein the control logic includes voice recognition software to process at least a portion of the voice input signals, and wherein the control system further comprises a voice recognition module.

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Publication No. [Publication No. US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:
 Jun 10, 2013

Researcher's
 Comments

6. The diagnostic system of claim 1, wherein the control system is further coupled to an audio output device capable of communicating at least a part of the processed portion of the physiological information.	N/A	N/A
7 pre. A diagnostic system comprising:	[Abstract] <u>"In an embodiment, a system is provided that includes a sensor configured to monitor a physiological parameter of the patient."</u> The sensor is further configured to communicate with a portable electronic device configured to communicate over a wireless network. A method of operation of a sensor is provided that includes receiving data from a sensor configured to sense a physiological parameter and determining the physiological parameter from the data. A method of operation of a portable electronic device is also provided." [Para 0011] <u>"In one embodiment, a system is provided that includes a sensor configured to monitor a physiological parameter, wherein the sensor is further configured to communicate with a portable electronic device."</u> [Para 0014] <u>"In another embodiment, a system is provided that includes a monitor configured to connect to a sensor configured to monitor a physiological parameter, wherein the</u>	<i>Li discloses a medical monitoring system that includes sensors to monitor a user's physiological parameters.</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. US20090171170A1 Publishing Date: Jul 02, 2009	Researcher's Comments
	monitor is further configured to communicate with a portable electronic device.”	
7a. a light source comprising: 7a(i). a plurality of semiconductor diodes with light beams;	[Para 0026] “The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user’s finger and may be configured to emit signals or waves into the patient’s or user’s tissue and detect these signals or waves after dispersion and/or reflection by the tissue. <u>For example, the sensor 14 may be configured to emit light from two or more light emitting diodes (“LEDs”) into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue.</u> In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power.”	<i>Li discloses sensors configured with multiple light emitting diodes (semiconductor diodes) to measure physiological parameters.</i>



Publication No. US9055868B2	Publication No. US20090171170A1	Researcher's
Target Date:	Publishing Date: Jul 02, 2009	Comments
Jun 10, 2013		

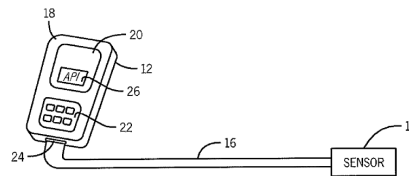


FIG. 1

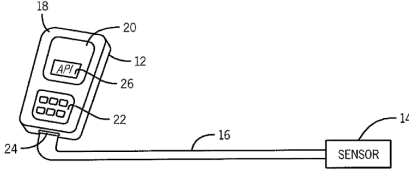
7a(ii). a lens system configured to receive at least a portion of the output beam and to communicate at least the portion of the output beam onto a part of a user's body comprising blood to perform a measurement on a user;

[Para 0026] “The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. **For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 14 may be configured to emit light from two or more light emitting diodes (“LEDs”) into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue.** In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or

Li discloses a medical monitoring system comprising sensors configured with multiple light-emitting diodes (semiconductor diodes) to measure physiological parameters. Furthermore, the material covering the LEDs may function as a lens, receiving the output light from the LEDs and projecting it into the pulsatile tissue to measure blood-related physiological data.



Publication No. US9055868B2	Publication No. US20090171170A1	Researcher's
Target Date:	Publishing Date: Jul 02, 2009	Comments
Jun 10, 2013		

	updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power.”  FIG. 1	
7b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;	[Para 0025] “The portable medical device 12 may run any suitable operating system, such as Symbian OS, Linux, Windows CE, Palm OS, etc., or the portable medical device 12 may run a custom operating system suitably designed for the application described herein. <u>Additionally, to support software that may be used with the sensor 14, such as the user interface and sensor interface, the portable medical device 12 may include an application programming interface (API) 26. The API 26 may facilitate development of the user interface, sensor interface, and other software by providing a set of requests, calls, methods, or other useful programming interfaces that allow easier usage of the resources provided by the portable medical device 12. For example, the API 26 may provide details for implementing the user interface, such as how to display a window, move a window, or display user interface objects such as buttons, icons, etc. In addition, with regard to the sensor interface, the API 26 may provide details on how the portable medical device 12 may receive, send, and process information to/from the sensor 14 and/or the sensor cable 16.</u> In one embodiment, the APT 26 may comprise the Binary Runtime Environment for Wireless (BREW). In another embodiment, the API 26 may comprise	<i>Li discloses that a portable medical device (control system) may include an application programming interface (API), enabling software applications. The portable device can send, receive, and process physiological information to and from the sensor. Further, it can display the generated physiological data to the user.</i>



Publication No. [Publication No. US20090171170A1](#)

[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

Java Platform Micro Edition (J2ME). However, in some embodiments an API 26 may not be provided."

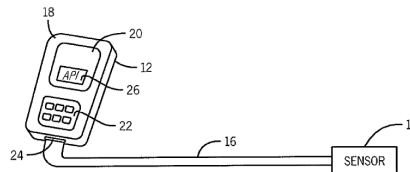


FIG. 1

7c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least

[Para 0022] "Referring now to FIG. 1, a portable medical device 12 is shown connected to a sensor 14, according to an embodiment. The portable medical device 12 may be a cellular phone, a personal data assistant, a GPS device, any wireless handheld device, or any other portable medical device 12, or any other device capable of wireless communication. Additionally, the portable medical device 12 may be a combination of any of the devices listed above."

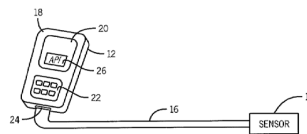


FIG. 1

[Para 0024] "In an embodiment, the portable medical device 12 may include an enclosure 18, a display 20, and one or more user inputs 22. The user inputs 22 may include a keyboard, and/or any number of knobs, buttons, dials, or any other suitable input device. The display 20 may display a user interface and various indicators for the portable medical device 12, the sensor 14, and/or the sensor cable 16. In some embodiments,

Li discloses a portable medical device (control system) capable of sending, receiving, and processing physiological information to and from the sensor via an application programming interface (API), suggesting software capability. The portable medical device (control system) includes a GPS device (location sensor), multiple user inputs such as a touchscreen, and



Publication No. US9055868B2	Publication No. US20090171170A1	Researcher's Comments
Target Date: Jun 10, 2013	Publishing Date: Jul 02, 2009	

a part of the physiological information, 7c(i). wherein the control system is further capable of receiving voice input signals and manually entered input signals,	<u>the display 20 may comprise a touchscreen, and user inputs may be available through the touchscreen, with or without the inclusion of user inputs 22.</u> The portable medical device 12 may include a connector 24 configured to connect to the sensor cable 16. The connector 24 may be a Universal serial bus (USB) connector, FireWire (IEEE 1394) connector, or any other suitable connector. Alternatively, the connector 24 may be custom designed to interface with the sensor cable 16 such that other cables or devices may not be used with the connector 24.” [Para 0025] “The portable medical device 12 may run any suitable operating system, such as Symbian OS, Linux, Windows CE, Palm OS, etc., or the portable medical device 12 may run a custom operating system suitably designed for the application described herein. Additionally, to support software that may be used with the sensor 14, such as the user interface and sensor interface, the portable medical device 12 may include an application programming interface (API) 26. The API 26 may facilitate development of the user interface, sensor interface, and other software by providing a set of requests, calls, methods, or other useful programming interfaces that allow easier usage of the resources provided by the portable medical device 12. For example, the API 26 may provide details for implementing the user interface, such as how to display a window, move a window, or display user interface objects such as buttons, icons, etc. <u>In addition, with regard to the sensor interface, the API 26 may provide details on how the portable medical device 12 may receive, send, and process information to/from the sensor 14 and/or the sensor cable 16.</u> In one embodiment, the APT 26 may comprise the Binary Runtime Environment for Wireless (BREW). In another embodiment, the API 26 may comprise Java Platform Micro Edition (J2ME). However, in some embodiments an API 26 may not be provided.” [Para 0026] “The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body	<i>the ability to make calls, suggesting voice capabilities. Additionally, it features both wired and wireless communication capabilities, indicating the presence of a wireless transceiver.</i>
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Publication No. [Publication No. US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:
 Jun 10, 2013

Researcher's
 Comments

part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."

[Para 0028] "In addition to monitoring, the portable medical device 12 may use information received from the sensor 14 to provide alarms, alerts, or any other notification based on the status of the physiological parameter of the user monitored by the sensor 12. As discussed further below, in an embodiment, if the physiological parameter is above or below a specified threshold, the portable medical device 12 may provide an alarm or any other audio or visual notification, thus notifying the user of the abnormal



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

	<u>condition. Additionally, or alternatively, the portable medical device 12 may send an alert to remote location, such as to a caregiver responsible for monitoring or treating the patient or user. For example, if the portable medical device 12 includes a cellular telephone, a call and/or text message could be sent to a caregiver to provide information related to the patient's condition.</u> Similarly, if the portable medical device 12 includes wireless Internet capability, an email could be sent to a caregiver to provide information related to the patient's condition. Thus, the status of a user's physiological parameter and any abnormal conditions related to those physiological parameters may be monitored, and a caregiver may be automatically notified without any intervention from the patient or user using the portable medical device 12 and the sensor 14."	
7d. a host comprising: 7d(i). a digital file for receiving and storing at least a portion of the wireless data; 7d(ii). control logic at the host to process at least the portion of the wireless data to generate a status of the user; 7d(iii). a memory storage device for	[Para 0027] "As described further below, implementation of the sensor 14 with the portable medical device 12 may provide for a variety of monitoring and alert functions. <u>For example, in one embodiment the portable medical device 12 may compile a summary report of data received by the sensor, and the portable medical device 12 may send reports to a remote location at a specified time interval, such as every 10 minutes, every hour, every day, etc. Alternatively, the portable medical device 12 may continuously send data to the remote location.</u> Further, sensor 14 may be configured to continuously monitor and/or periodically monitor the physiological characteristic of a user. For example, if the sensor 14 is a pulse oximetry sensor, it would likely provide substantially continuous monitoring of the patient. On the other hand, if the sensor 14 is a blood pressure sensor, it would likely provide only periodic measurements."	<i>Li discloses a remote computer (host) for storing (memory) and archiving users' medical information (digital files), such as reports and results. Furthermore, the archived medical information on the remote computer (host) associated with a user may be accessed by a caregiver (remote user) via a handheld device (display output device).</i>



Publication No. [US20090171170A1](#)
 US9055868B2

Publishing Date: Jul 02, 2009

Target Date:
 Jun 10, 2013

Researcher's
 Comments

recording the
 status; and

7d(iv). an output
 for communicating
 at least a portion
 of the status or
 associated
 information over a
 communication
 link to one or more
 display output
 devices, wherein
 the one or more
 display output
 devices are
 located remotely
 from the host.

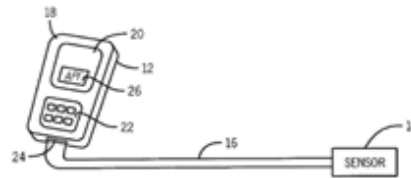


FIG. 1

[Para 0030] “Other devices may be connected to the network 102 and may send or receive data from the portable medical device 12. The network may include other portable electronic devices 104, such as those used or carried by a caregiver 106. Additionally, the network may include a remote computer 108, such as a desktop, server, database server, or any other computer at a remote location.”

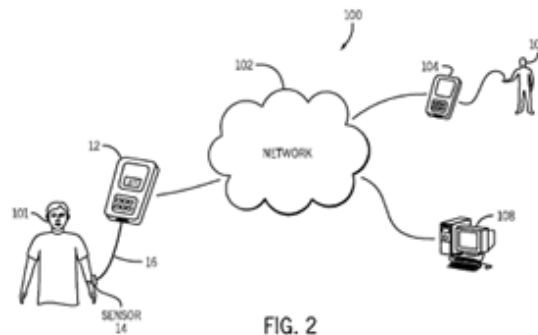


FIG. 2

[Para 0032] “Additionally, if one of the functions performed by the portable medical device 12 is generation of summary reports of data received from the sensor 14, the portable medical device 12 may send those reports to the remote computer 108 for storage and archiving. A caregiver 106 may then review a user's history on the remote computer 108, and then take the appropriate action. For



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

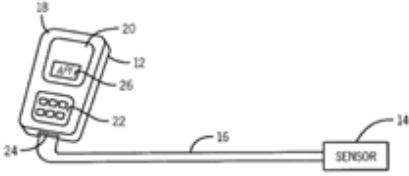
Target Date:

Jun 10, 2013

Researcher's
Comments

	example, a user's history reviewed on the remote computer 108 may indicate that a change in treatment is necessary, such as a change in medication, scheduling of a checkup, an increase or reduction in therapies, et cetera."	
8. The diagnostic system of claim 7, wherein the light source comprises a plurality of semiconductor diodes that are further coupled to a multiplexer capable of combining the plurality of semiconductor diodes and generating the input light beam comprising one or more wavelengths.	N/A	N/A
9. The diagnostic system of claim 7, wherein at least the portion of the input light beam is adapted for use in a diagnostics to measure a property of the blood, wherein the diagnostics	[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. <u>For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue.</u> For example, the sensor 14 may be configured to emit light from two or more light	<i>Li discloses a pulse oximetry sensor in which light signals are emitted onto a user's finger, and the signals reflected from the tissues are detected, suggesting a spectroscopic procedure in which a comparison of</i>



Publication No. US9055868B2 Target Date: Jun 10, 2013	Publication No. US20090171170A1 Publishing Date: Jul 02, 2009	Researcher's Comments
comprise a spectroscopic procedure, wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood.	emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."  FIG. 1	<i>different signals is used for diagnosis.</i>
10. The diagnostic system of claim 7, wherein the control system is further coupled to a headset or a heads-up display.	N/A	N/A



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

11. The diagnostic system of claim 7, wherein the control logic includes voice recognition software to process at least a portion of the voice input signals, and wherein the control system further comprises a voice recognition module.	N/A	N/A
12. The diagnostic system of claim 7, wherein the control system is further capable of providing feedback control data associated at least in part with the physiological information or the position information to a device control module.	[Para 0028] "In addition to monitoring, the portable medical device 12 may use information received from the sensor 14 to provide alarms, alerts, or any other notification based on the status of the physiological parameter of the user monitored by the sensor 12. <u>As discussed further below, in an embodiment, if the physiological parameter is above or below a specified threshold, the portable medical device 12 may provide an alarm or any other audio or visual notification, thus notifying the user of the abnormal condition. Additionally, or alternatively, the portable medical device 12 may send an alert to remote location, such as to a caregiver responsible for monitoring or treating the patient or user. For example, if the portable medical device 12 includes a cellular telephone, a call and/or text message could be sent to a caregiver to provide information related to the patient's condition.</u> Similarly, if the portable medical device 12 includes wireless Internet capability, an email could be sent to a caregiver to provide information related to the patient's condition. Thus, the status	<i>Li discloses that the monitoring system comprises a portable medical device (control system) capable of providing auditory or visual alerts/notifications (feedback) to users regarding their physiological data.</i>



Publication No. [Publication No. US20090171170A1](#)

[US9055868B2](#)

Publishing Date: Jul 02, 2009

Researcher's
Comments

Target Date:
Jun 10, 2013

of a user's physiological parameter and any abnormal conditions related to those physiological parameters may be monitored, and a caregiver may be automatically notified without any intervention from the patient or user using the portable medical device 12 and the sensor 14."

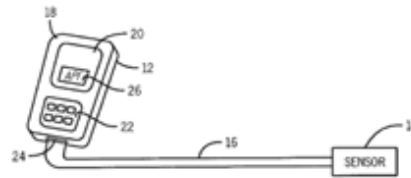


FIG. 1

13. The diagnostic system of claim 7, wherein the control system is further coupled to a proximity sensor.

N/A

N/A

14. The diagnostic system of claim 7, wherein the control system is further coupled to an audio output device capable of communicating at least a part of the processed portion of the

N/A

N/A



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

physiological information.		
15 pre. A diagnostic system comprising:	[Abstract] <u>"In an embodiment, a system is provided that includes a sensor configured to monitor a physiological parameter of the patient."</u> The sensor is further configured to communicate with a portable electronic device configured to communicate over a wireless network. A method of operation of a sensor is provided that includes receiving data from a sensor configured to sense a physiological parameter and determining the physiological parameter from the data. A method of operation of a portable electronic device is also provided." [Para 0011] <u>"In one embodiment, a system is provided that includes a sensor configured to monitor a physiological parameter, wherein the sensor is further configured to communicate with a portable electronic device."</u> [Para 0014] <u>"In another embodiment, a system is provided that includes a monitor configured to connect to a sensor configured to monitor a physiological parameter, wherein the monitor is further configured to communicate with a portable electronic device."</u>	<i>Li discloses a medical monitoring system that includes sensors to monitor a user's physiological parameters.</i>
15a. a light source comprising: 15a(i). a plurality of semiconductor diodes with light beams;	[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. <u>For example, the sensor 14 may be configured to</u>	<i>Li discloses sensors configured with multiple light emitting diodes (semiconductor diodes) to measure physiological parameters.</i>



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."

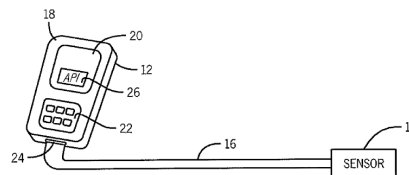


FIG. 1

15a(ii). [a lens system configured to receive at least a portion of the input light beam and to](#)

[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. [For example, as a pulse oximetry](#)

Li discloses a medical monitoring system comprising sensors configured with multiple light-emitting diodes



Publication No. [Publication No. US20090171170A1](#)

[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

communicate at least the portion of the input light beam onto a part of a user's body comprising blood, wherein at least the portion of the input light beam is used in a measurement on a user, wherein the measurement comprises a spectroscopic procedure to measure a property of the blood, and wherein the spectroscopic procedure is based at least in part on a comparison of amplitudes at a plurality of associated wavelengths transmitted or reflected from the blood;

sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."

(semiconductor diodes) to measure physiological parameters. Furthermore, the material covering the LEDs may function as a lens, receiving the output light from the LEDs and projecting it into the pulsatile tissue to measure blood-related physiological data.

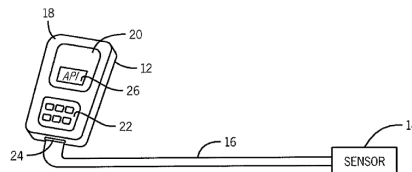


FIG. 1



Publication No. [US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:
 Jun 10, 2013

Researcher's
 Comments

15b. a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user;

[Para 0025] "The portable medical device 12 may run any suitable operating system, such as Symbian OS, Linux, Windows CE, Palm OS, etc., or the portable medical device 12 may run a custom operating system suitably designed for the application described herein. Additionally, to support software that may be used with the sensor 14, such as the user interface and sensor interface, the portable medical device 12 may include an application programming interface (API) 26. The API 26 may facilitate development of the user interface, sensor interface, and other software by providing a set of requests, calls, methods, or other useful programming interfaces that allow easier usage of the resources provided by the portable medical device 12. For example, the API 26 may provide details for implementing the user interface, such as how to display a window, move a window, or display user interface objects such as buttons, icons, etc. In addition, with regard to the sensor interface, the API 26 may provide details on how the portable medical device 12 may receive, send, and process information to/from the sensor 14 and/or the sensor cable 16. In one embodiment, the APT 26 may comprise the Binary Runtime Environment for Wireless (BREW). In another embodiment, the API 26 may comprise Java Platform Micro Edition (J2ME). However, in some embodiments an API 26 may not be provided."

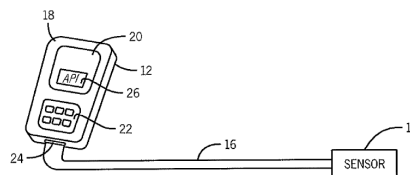


FIG. 1

Li discloses that a portable medical device (control system) may include an application programming interface (API), enabling software applications. The portable device can send, receive, and process physiological information to and from the sensor. Further, it can display the generated physiological data to the user.



Publication No. US9055868B2	Publication No. US20090171170A1	Researcher's Comments
Target Date: Jun 10, 2013	Publishing Date: Jul 02, 2009	

15c. the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor, and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information,

15c(i). wherein the control system is further capable of receiving voice input signals and manually entered input signals; and

[Para 0022] “Referring now to FIG. 1, a portable medical device 12 is shown connected to a sensor 14, according to an embodiment. The portable medical device 12 may be a cellular phone, a personal data assistant, a GPS device, any wireless handheld device, or any other portable medical device 12, or any other device capable of wireless communication. Additionally, the portable medical device 12 may be a combination of any of the devices listed above.”

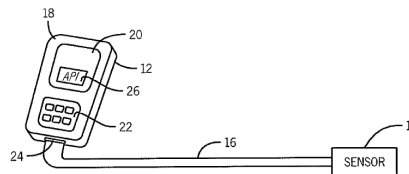


FIG. 1

[Para 0024] “In an embodiment, the portable medical device 12 may include an enclosure 18, a display 20, and one or more user inputs 22. The user inputs 22 may include a keyboard, and/or any number of knobs, buttons, dials, or any other suitable input device. The display 20 may display a user interface and various indicators for the portable medical device 12, the sensor 14, and/or the sensor cable 16. In some embodiments, the display 20 may comprise a touchscreen, and user inputs may be available through the touchscreen, with or without the inclusion of user inputs 22. The portable medical device 12 may include a connector 24 configured to connect to the sensor cable 16. The connector 24 may be a Universal serial bus (USB) connector, FireWire (IEEE 1394) connector, or any other suitable connector. Alternatively, the connector 24 may be custom designed to interface with the sensor cable 16 such that other cables or devices may not be used with the connector 24.”

Li discloses a portable medical device (control system) capable of sending, receiving, and processing physiological information to and from the sensor via an application programming interface (API), suggesting software capability. The portable medical device (control system) includes a GPS device (location sensor), multiple user inputs such as a touchscreen, and the ability to make calls, suggesting voice capabilities. Additionally, it features both wired and wireless communication capabilities, indicating the presence of a wireless transceiver.



Publication No. [Publication No. US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Researcher's
Comments

Target Date:
Jun 10, 2013

[Para 0025] "The portable medical device 12 may run any suitable operating system, such as Symbian OS, Linux, Windows CE, Palm OS, etc., or the portable medical device 12 may run a custom operating system suitably designed for the application described herein. Additionally, to support software that may be used with the sensor 14, such as the user interface and sensor interface, the portable medical device 12 may include an application programming interface (API) 26. The API 26 may facilitate development of the user interface, sensor interface, and other software by providing a set of requests, calls, methods, or other useful programming interfaces that allow easier usage of the resources provided by the portable medical device 12. For example, the API 26 may provide details for implementing the user interface, such as how to display a window, move a window, or display user interface objects such as buttons, icons, etc. In addition, with regard to the sensor interface, the API 26 may provide details on how the portable medical device 12 may receive, send, and process information to/from the sensor 14 and/or the sensor cable 16. In one embodiment, the APT 26 may comprise the Binary Runtime Environment for Wireless (BREW). In another embodiment, the API 26 may comprise Java Platform Micro Edition (J2ME). However, in some embodiments an API 26 may not be provided."

[Para 0026] "The sensor 14 may be any sensor configured to monitor a physiological parameter and may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 14 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. For example, as a pulse oximetry sensor, the sensor 14 may clip onto a patient or user's finger and may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 14 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue. In other embodiments, the sensor may be a reflectance-type pulse oximetry sensor, an electrocardiogram (EKG), a blood sugar (glucose) sensor, a blood pressure sensor, a temperature sensor, or any other sensor configured to monitor a physiological parameter. Indeed) the sensor 14 could include an implanted device, such as a pacemaker or defibrillator that communicates with the portable device wirelessly. The sensor 14 may read data from a patient or user and send the data to the portable medical device 12. Additionally, the sensor 14 may receive data from the portable medical device 12, such as calibration information or updated firmware. The sensor 14 may also receive power from the portable medical device 12 via sensor cable 16, or the sensor 14 may include a battery to provide power."

[Para 0028] "In addition to monitoring, the portable medical device 12 may use information received from the sensor 14 to provide alarms, alerts, or any other notification based on the status of the physiological parameter of the user monitored by the sensor 12. As discussed further below, in an embodiment, if the physiological parameter is above or below a specified threshold, the portable medical device 12 may provide an alarm or any other audio or visual notification, thus notifying the user of the abnormal condition. Additionally, or alternatively, the portable medical device 12 may send an alert to remote location, such as to a caregiver responsible for monitoring or treating the patient or user. For example, if the portable medical device 12 includes a cellular telephone, a call and/or text message could be sent to a caregiver to provide information related to the patient's condition. Similarly, if the portable medical device 12 includes wireless Internet capability, an email could be sent to a caregiver to provide information related to the patient's condition. Thus, the status



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

of a user's physiological parameter and any abnormal conditions related to those physiological parameters may be monitored, and a caregiver may be automatically notified without any intervention from the patient or user using the portable medical device 12 and the sensor 14."

15d. a host
comprising:

15d(i). a digital file
for receiving and
storing at least a
portion of the
wireless data;

15d(ii). control
logic at the host to
process at least
the portion of the
wireless data to
generate a status
of the user,
wherein the
control logic
includes a voice
recognition
software to
process at least a
portion of the
voice input signals

15d(iii). a memory
storage device for

[Para 0027] "As described further below, implementation of the sensor 14 with the portable medical device 12 may provide for a variety of monitoring and alert functions. For example, in one embodiment the portable medical device 12 may compile a summary report of data received by the sensor, and the portable medical device 12 may send reports to a remote location at a specified time interval, such as every 10 minutes, every hour, every day, etc. Alternatively, the portable medical device 12 may continuously send data to the remote location.

Further, the sensor 14 may be configured to continuously monitor and/or periodically monitor the physiological characteristic of a user. For example, if the sensor 14 is a pulse oximetry sensor, it would likely provide substantially continuous monitoring of the patient. On the other hand, if the sensor 14 is a blood pressure sensor, it would likely provide only periodic measurements."

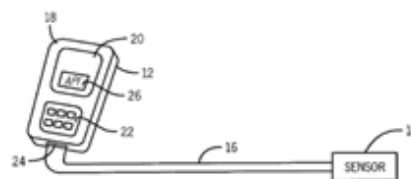


FIG. 1

[Para 0030] "Other devices may be connected to the network 102 and may send or receive data from the portable medical device 12. The network may include other portable electronic devices 104, such as those used or carried

Li discloses a remote computer (host) for storing (memory) and archiving users' medical information (digital files), such as reports and results. Furthermore, the archived medical information on the remote computer (host) associated with a user may be accessed by a caregiver (remote user) via a handheld device (display output device).



Publication No. [US20090171170A1](#)
[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

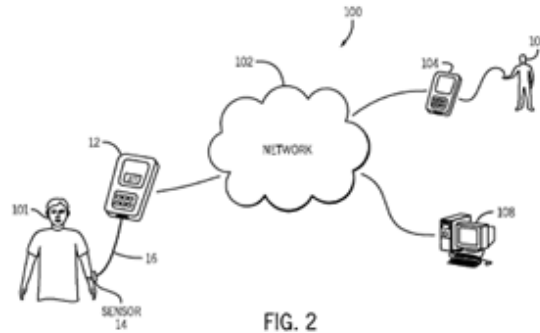
Jun 10, 2013

Researcher's
Comments

recording the status; and

15d(iv). an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.

by a caregiver 106. Additionally, the network may include a remote computer 108, such as a desktop, server, database server, or any other computer at a remote location.”



[Para 0032] “Additionally, if one of the functions performed by the portable medical device 12 is generation of summary reports of data received from the sensor 14, the portable medical device 12 may send those reports to the remote computer 108 for storage and archiving. A caregiver 106 may then review a user's history on the remote computer 108, and then take the appropriate action. For example, a user's history reviewed on the remote computer 108 may indicate that a change in treatment is necessary, such as a change in medication, scheduling of a checkup, an increase or reduction in therapies, et cetera.”

16. The diagnostic system of claim 15, wherein the control system is further coupled to a headset or a heads-up display.

N/A

N/A



Publication No. [Publication No. US20090171170A1](#)[US9055868B2](#)

Publishing Date: Jul 02, 2009

Researcher's
CommentsTarget Date:
Jun 10, 2013

17. The diagnostic system of claim 16, wherein gesture signals are capable of being generated in response to a head motion.	N/A	N/A
18. The diagnostic system of claim 15, wherein the control system is further coupled to a proximity sensor.	N/A	N/A
19. The diagnostic system of claim 15, wherein the host is adapted to permit access of the status or associated information stored on the host from two or more different locations remote from the host.	N/A	N/A
20. The diagnostic system of claim 15, wherein the	[Para 0028] "In addition to monitoring, the portable medical device 12 may use information received from the sensor 14 to provide alarms, alerts, or any other notification based on the status of the	Li discloses that the monitoring system comprises a portable



Publication No. [Publication No. US20090171170A1](#)

[US9055868B2](#)

Publishing Date: Jul 02, 2009

Target Date:

Jun 10, 2013

Researcher's
Comments

control system is further capable of providing feedback control data associated at least in part with the physiological information or the position information to a device control module.

physiological parameter of the user monitored by the sensor 12. As discussed further below, in an embodiment, if the physiological parameter is above or below a specified threshold, the portable medical device 12 may provide an alarm or any other audio or visual notification, thus notifying the user of the abnormal condition. Additionally, or alternatively, the portable medical device 12 may send an alert to remote location, such as to a caregiver responsible for monitoring or treating the patient or user. For example, if the portable medical device 12 includes a cellular telephone, a call and/or text message could be sent to a caregiver to provide information related to the patient's condition. Similarly, if the portable medical device 12 includes wireless Internet capability, an email could be sent to a caregiver to provide information related to the patient's condition. Thus, the status of a user's physiological parameter and any abnormal conditions related to those physiological parameters may be monitored, and a caregiver may be automatically notified without any intervention from the patient or user using the portable medical device 12 and the sensor 14."

medical device (control system) capable of providing auditory or visual alerts/notifications (feedback) to users regarding their physiological data.

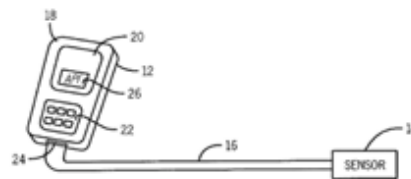


FIG. 1



8. RESULT-4

(12) **United States Patent**
Goodman

(10) Patent No.: **US 6,616,613 B1**
(45) Date of Patent: **Sep. 9, 2003**

US6616613B1 (RELEVANT FOR CLAIMS 1pre, 1a, 1a(i), 1a(iv), 1b, 1c, 1c(i) (partial), 1d, 1d(i), 1d (ii) (inferential), 1d(iii), 1d(iv) (inferential), 2, 7pre, 7a, 7a(i), 7a(ii), 7b, 7c, 7c(i)(partial), 7d, 7d(i), 7d(ii) (inferential), 7d(iii), 7d(iv) (inferential), 9, 15pre, 15a, 15a(i), 15a(ii), 15b, 15c, 15c (i) (partial), 15d, 15d(i), 15d(ii) (inferential), 15d(iii), 15d(iv) (inferential), 19 (inferential) OF '868 PATENT)

NOTE: The relevant text for claims is highlighted in GREEN color and the related text is highlighted in ORANGE color.

[Abstract] "A health monitoring and biofeedback system comprising a photoplethysmography (PPG) sensor, a processing device, and a Web site server for determining, displaying and analyzing various cardiovascular parameters. The PPG sensor is installed within a manually operated user input device such as a mouse or keyboard, measures a user's blood volume contour and transmits it to a processing device such as a personal computer or a personal digital assistant (PDA). The system determines a plurality of cardiovascular indices including mean blood pressure, heart rate, body temperature, respiratory rate, and arterial compliance on the basis of signal characteristics of the systolic wave pulse and the systolic reflected wave pulse present within the digital volume pulse derived from the PPG pulse contour. Signal characteristics of the systolic reflected wave pulse can be determined through various pulse analysis techniques including derivative analysis of the digital volume pulse signal, bandpass filtering or respiratory matrix frequency extraction techniques. By subtracting the systolic reflected wave pulse contour from the digital volume pulse contour, characteristics of the systolic wave pulse can also be identified. The system also provides for the accurate determination of systolic and diastolic blood pressure by using a non-invasive blood pressure monitor to calibrate the relationships between arterial or digital blood pressure and characteristics of the user's digital volume pulse contour. In this way, a wide variety of cardiovascular and respiratory data can be obtained. The system also facilitates the transmittal of such data to the system web site for further analysis, storage, and retrieval purposes."

[Page 33, Col 8, Line 53] "Reference is first made to FIG. 1, which shows the overall configuration of the preferred embodiment of a physiological monitoring system 10, according to the present invention. System 10 comprises a conventional plethysmography (PPG) sensor 12 coupled to a processing device 14 which is in data communication with a Web site server 16 through a communication network 18 (i.e. the Internet)."



US6616613B1 (RELEVANT FOR CLAIMS 1pre, 1a, 1a(i), 1a(iv), 1b, 1c, 1c(i) (partial), 1d, 1d(i), 1d(ii) (inferential), 1d(iii), 1d(iv) (inferential), 2, 7pre, 7a, 7a(i), 7a(ii), 7b, 7c, 7c(i)(partial), 7d, 7d(i), 7d(ii) (inferential), 7d(iii), 7d(iv) (inferential), 9, 15pre, 15a, 15a(i), 15a(ii), 15b, 15c, 15c(i) (partial), 15d, 15d(i), 15d(ii) (inferential), 15d(iii), 15d(iv) (inferential), 19 (inferential) OF '868 PATENT)

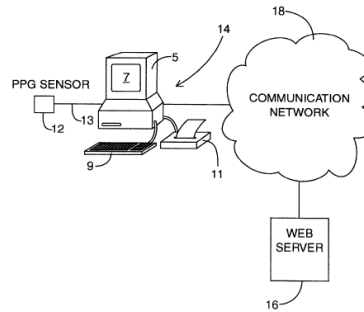


FIG. 1

[Page 33, Col 8, Line 60] “PPGs are well-known instruments which use light for determining and registering variations in a patient's blood volume. They can instantaneously track arterial blood volume changes during the cardiac cycle. PPG sensor 12 is installed within a computer mouse or some other computer peripheral (e.g. keyboard, touchpad, joystick) commonly associated with a computer processing device 14. It should be understood that it would be also possible to implement the invention by incorporating PPG sensor 12 within the casing of a personal digital assistant (PDA) or within some other type of stand alone data processing and transmitting device (e.g. a watch) or simply as a stand alone sensor device.”

[Page 34, Col 9, Line 6] “Processing device 14 is preferably a conventional personal computer having a central processing unit (CPU) 5, display 7, keyboard 9 and printer 11. Processing device 14 also preferably has a standard Universal Serial Bus (USB), sufficient memory and processing power to run the application programs associated with system 10, and a data transmission controller for sending and receiving data over data transmission cable 13, all built integrally with processing device 14. An executable program is installed within the permanent memory of processing device 14 to instruct the user through interactive menus to utilize the PPG sensor 12 such that proper PPG signals can be obtained from the user and to provide the user with his/her own generated physiological information through graphical means. It should be understood that such an executable program could also be available for downloading online from Web site server 16. The executable program has the functionality to allow a user to observe his/her own physiological signals in real time such that biofeedback is facilitated. Also, it is contemplated that processing device 14 could be used to store a user's physiological signals for later retrieval, comparative and display purposes. Commercially available signal measurement and analysis display software such as LabVIEW™ (available from National Instruments of Austin, Tex.) is utilized to



US6616613B1 (RELEVANT FOR CLAIMS 1pre, 1a, 1a(i), 1a(iv), 1b, 1c, 1c(i) (partial), 1d, 1d(i), 1d(ii) (inferential), 1d(iii), 1d(iv) (inferential), 2, 7pre, 7a, 7a(i), 7a(ii), 7b, 7c, 7c(i)(partial), 7d, 7d(i), 7d(ii) (inferential), 7d(iii), 7d(iv) (inferential), 9, 15pre, 15a, 15a(i), 15a(ii), 15b, 15c, 15c(i) (partial), 15d, 15d(i), 15d(ii) (inferential), 15d(iii), 15d(iv) (inferential), 19 (inferential) OF '868 PATENT)

perform the necessary data analysis as well as display the results of the calculations in easy-to-understand format. It should be understood that processing device 14 could just as easily be a PDA, as discussed above."

[Page 34, Col 9, Line 34] "Web site server 16 is a conventional server having sufficient memory and processing speed to handle the input, storage and manipulation of large volumes of data being simultaneously transmitted from a plurality of processing devices 14. Web site server 16 also must also be capable of transmitting additional relevant data back to user's computer 14 over communication network 18 for display on a user's processing device 14. Web site server 16 also provides encrypted and password protected secure storage of a user's physiological signals along with any other health documentation that the user may desire to store at the Web site. Web site server 16 could also allow for the storage and restricted access to a plurality of user's physiological signals (submitted on an anonymous basis) and associated health documentation for anonymous medical research purposes."

[Page 34, Col 9, Line 57] "PPG sensor 12 has a relatively small footprint (e.g. few square centimeters) and is implemented using a red LED₁ and an infrared LED₂, each associated with a photodiode PD₁ and PD₂ (FIG. 3) in a known configuration for reflective mode operation (i.e. light is transmitted into a body part and the amount of light reflected back is detected). The emitted monochromatic light emitted from LED₁ and LED₂ travels through a user's finger along a light path which passes through blood in a plurality of arteries as well as background tissue. As the monochromatic light travels along its light path it is partially absorbed by the background tissue and the blood. A portion of the monochromatic light is not absorbed and is reflected back to the appropriate photodiode PD₁ or PD₂. As is conventionally known, reflective mode PPG uses the reflected light from a site to estimate absorption of light and to generate a raw blood volume pulse contour signal. The detector is positioned on the same side as the radiating LED in order to detect the reflected light."

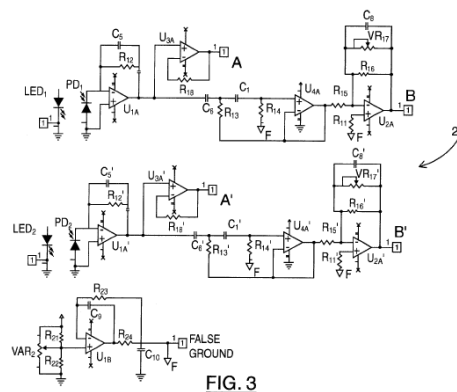


FIG. 3



US6616613B1 (RELEVANT FOR CLAIMS 1pre, 1a, 1a(i), 1a(iv), 1b, 1c, 1c(i) (partial), 1d, 1d(i), 1d(ii) (inferential), 1d(iii), 1d(iv) (inferential), 2, 7pre, 7a, 7a(i), 7a(ii), 7b, 7c, 7c(i)(partial), 7d, 7d(i), 7d(ii) (inferential), 7d(iii), 7d(iv) (inferential), 9, 15pre, 15a, 15a(i), 15a(ii), 15b, 15c, 15c(i) (partial), 15d, 15d(i), 15d(ii) (inferential), 15d(iii), 15d(iv) (inferential), 19 (inferential) OF '868 PATENT)

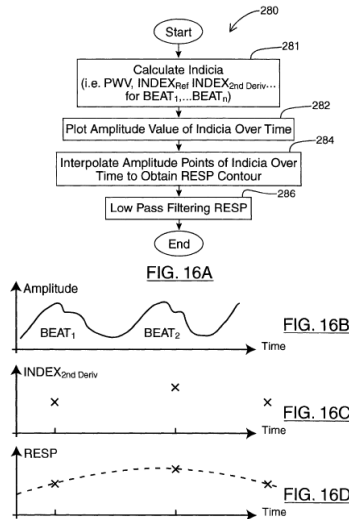
[Page 34, Col 10, Line 8] **"Also, as shown in FIG. 2, PPG sensor 12 utilizes cylindrical baffles 21 to house LED and LED and photodiodes PD and PD to prevent direct coupling of light from the LEDs to the photodiodes. When a user's finger is placed over the top openings of baffles 21, light will be only provided to the finger and Spillover light will be appreciably reduced. Well known techniques to accomplish motion artifact reduction such as that discussed in PCT Pat. Application No. 99/32030 to BTG International Limited could be utilized to further reduce the amount of motion artifact related distortion of the PPG signal."**

[Page 36, Col 13, Line 26] **"FIG. 5 shows another possible configuration of system 10 wherein processing device 14 is a PDA (e.g. Palm Pilot™) having PPG sensor 12 interfaced therein. PPG sensor 12 could be directly integrated into the shell of the PDA processing device 14. Alternatively, PPG sensor 12 could be implemented within a PDA accessory card or device, or adapted to interface with the PDA processing device 14 as an external wearable device. In the latter case, it would be possible for a user to wear a wearable user input device 12 such that blood volume pulse signal information could be collected by the PDA processing device 14 over the course of a day. It would be possible to arrange for periodic download of recorded volume pulse contour signal information collected by user input device 12 to processing device 14 and/or to Web site server 16 through processing device 14 over the communication network 18."**

[Page 46, Col 33, Line 50] **"Referring to FIGS. 1 and 16, once processing device 14 has calculated and digitized the physiological signals, it is a simple matter to convey that data to Web server 16 over communication network 18 as part of an interactive diagnostic Web site system 300. The internet Web site hosted at Web server 16 would provide service to users in possession of PPG sensor 12 appropriately integrated with their processing device 14, as well as attract visitors to the Web site through the display and description of physiological signals. Finally, the Web site would allow researchers to have access to physiological signals derived from PPG sensors 12."**



US6616613B1 (RELEVANT FOR CLAIMS 1pre, 1a, 1a(i), 1a(iv), 1b, 1c, 1c(i) (partial), 1d, 1d(i), 1d(ii) (inferential), 1d(iii), 1d(iv) (inferential), 2, 7pre, 7a, 7a(i), 7a(ii), 7b, 7c, 7c(i)(partial), 7d, 7d(i), 7d(ii) (inferential), 7d(iii), 7d(iv) (inferential), 9, 15pre, 15a, 15a(i), 15a(ii), 15b, 15c, 15c(i) (partial), 15d, 15d(i), 15d(ii) (inferential), 15d(iii), 15d(iv) (inferential), 19 (inferential) OF '868 PATENT)



[Page 46, Col 34, Line 8] "The Web site hosted on Web server 16 would provide users with additional functionality for analysis, storage, and retrieval of physiological signals that they convey to the Web site. All communication of physiological data would be encrypted in a secure fashion to preserve privacy (350). The user would have the ability to store their physiological data (352) as well as text based data (354) in a personal database with access to the user in a password protected secure fashion. The medical data file maintained for the user at the Web site may be periodically updated to reflect received measurement data. Specifically, the ability of system 10 described above to recognize each individual user through the unique nature of their volume pulse contour adds an additional level of security to system 10 by establishing a database of physiological fingerprints."



US6616613B1 (RELEVANT FOR CLAIMS 1pre, 1a, 1a(i), 1a(iv), 1b, 1c, 1c(i) (partial), 1d, 1d(i), 1d(ii) (inferential), 1d(iii), 1d(iv) (inferential), 2, 7pre, 7a, 7a(i), 7a(ii), 7b, 7c, 7c(i)(partial), 7d, 7d(i), 7d(ii) (inferential), 7d(iii), 7d(iv) (inferential), 9, 15pre, 15a, 15a(i), 15a(ii), 15b, 15c, 15c(i) (partial), 15d, 15d(i), 15d(ii) (inferential), 15d(iii), 15d(iv) (inferential), 19 (inferential) OF '868 PATENT)

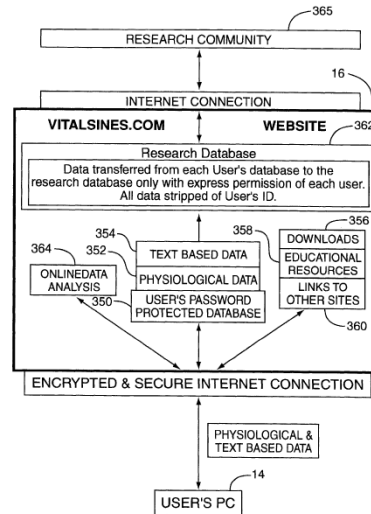


FIG. 17

[Page 46, Col 34, Line 33] The Web site hosted on Web server 16 could provide more sophisticated analysis means then would be possible at the user's processing device 14. The data stored by the user at the Web site on Web server 16 would be accessible to the user and health professionals authorized by the user anywhere any time. This would facilitate the exchange of medical information. Users without processing device 14 could use the database at the Web site for secure storage and retrieval of their medical documentary information."

[Page 46, Col 34, Line 53] The Web site hosted on Web server 16 could also offer third parties with educational resources (356), downloads (358) and hyperlinks to other related Web site (360). Users of system 10 could also benefit from biofeedback for relaxation and blood pressure reduction. Also, system 10 could be used to provide an index of cardiovascular risk for users seeking insurance. System 10 could also indicate an user's emotional state for purposes such as in the gaming field or as a lie detector. It could also permit access to user's medical history in emergency situations using a particular PIN or access code worn by the user."



9. RESULT-5

(19) United States	(10) Pub. No.: US 2002/0198473 A1
(12) Patent Application Publication	(43) Pub. Date: Dec. 26, 2002
Kumar et al.	

US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

NOTE: The relevant text for claims is highlighted in GREEN color and the related text is highlighted in ORANGE color.

[Abstract] "A System and method are provided for network-based monitoring of physiological data. At least one patient-side device collects physiological data from a patient. A provider-side device receives the data from at least one patient-side device via a wide area network. An engine communicates with atleast one patient-Side device and the provider-Side device. The engine manages transmission of the data from the patient-Side device to the provider-Side device."

[Para 0067] "FIG. 1A is a diagram of an exemplary system architecture 100 for network-based monitoring of data from a patient-side physiological collecting device according to one illustrative embodiment. AS shown, the System includes one or more patient-side devices 102 for collecting data from a patient/client, one or more provider-side devices 104, and an engine implemented on a central Server 106. The devices and engine are connected to a wide area network (WAN) 108 Such as the Internet, intranet, or extranet. The System allows for the real-time Streaming of raw, interpreted, and/or processed physiological data as well as textual/audio/video data from a patient to a health care provider. However, other embodiments may contemplate non-medical/non-biofeedback devices and non-human monitoring."



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii) , 15d(iii), 15d(iv), 19 OF '868 PATENT)

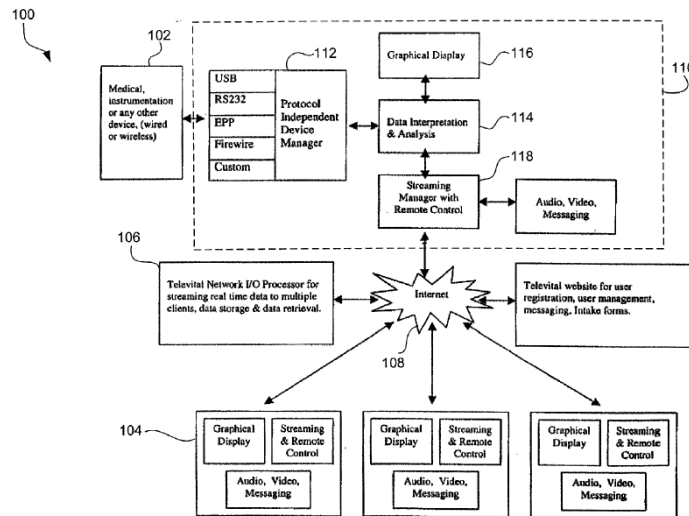


Fig. 1A

[Para 0068] **"The integration of biomedical and/or biofeedback devices along with the connection between service providers and patients allows for many applications, including but not limited to: telemedicine, remote sleep studies, physical evaluations, remote monitoring, event recordings, holter monitoring, home health care, disease management applications, biofeedback, pharmaceutical research, wireless monitoring, anesthesiology-related monitoring, and stress, health and wellness education."**

[Para 0071] **"The patient-side device is located with a patient and can be any device that gathers physiological data from the patient.** Illustrative patient-side devices include, but are not limited to, telemetry EKG, EMG and EEG monitors; continuous blood pressure and blood glucose watches; cellular transmission holter monitors; wireless plethysmograph rings; automated IBS and depression multimedia protocols; T-shirts wired with sensors that monitor and record physical and emotional indicators derived from heart activity, breathing patterns and blood pressure; bracelets, earrings and necklaces that monitor physiological activity; implanted devices that capture and transmits a person's vital body-function data, such as body temperature or pulse, to an internet-intergrated ground station while providing global positioning information."

[Para 0072] **"The patient-side device may then be connected via a computing device 110, such as a computer, handheld devices such as personal digital assistants (PDAs) and pocket PCs such as IPAQ with Windows CE operating System and Palm devices based on Palm OS), wireless telephone, or any other computing device, to**



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

the WAN. Optionally, the patient-side device may have a built-in computing device for communication over the WAN. **A protocol independent device manager 112 running on the computing device establishes a two-way communication with a vast array of client-side devices, including but not limited to medical and/or biofeedback devices, holter monitors, telemetry units, data acquisition units, etc. Each patient-side device can be wired or wireless, and communicates through a serial (RS232, USB, IEEE 1394, etc.), parallel, fire-wire, wireless, or customized interface/protocol. Similarly, the provider-side device can be any type of computing device, such as a computer, PDA, wireless telephone, etc.** In one embodiment, the provider's computing device (such as a PDA or telephone) has a wireless connection to the WAN so that, even though the doctor is not at a hospital or in his office, he may still be consulted remotely without the need to rush to the hospital. FIG. 1B illustrates browser-based real-time 3 lead and spirometry transmitting, viewing and receiving on a wireless Internet connection using a pocket PC 150."

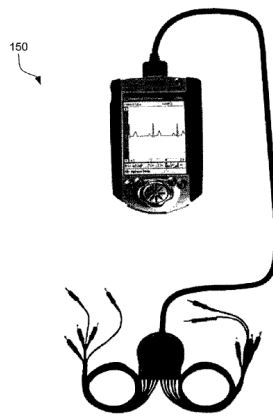


Fig. 1B

[Para 0074] **"Preferably, the present invention is built on a modular architecture in which the patient-side device and/or the computing device coupled to the patient-side device can send a request to the engine with an identifier of the patient-side device, and the engine will send the appropriate plug-in which allows the computing device to communicate with the patient-side device.** Thus, the present invention may support both plug-and-play web device drivers and customized graphical user interfaces (GUIs) for the various devices. Existing devices (which are not web-enabled) may be easily web-enabled by installation of the appropriate plug-and-play driver and GUI. Thus, virtually any device may be easily incorporated into the system. These teachings can also apply to the provider-side device."



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii) , 15d(iii), 15d(iv), 19 OF '868 PATENT)

[Para 0075] “The data interpretation and analysis module 114 is used to interpret the data stream from the client-side device, perform mathematical analysis on the data using FFT, DFT, etc., and generate statistics. The data may be displayed graphically on the display module 116.”

[Para 0076] “The data may also be simultaneously streamed to multiple remote providers over the WAN so that the remote providers can view the data in real time. The streaming manager 118 is responsible for managing transmission of the data to the remote providers, including, optionally, encrypting and compressing the data.”

[Para 0077] “The real time streaming of ECG, EEG, EMG, blood-gas readings, respiration, and other medical wave-forms can be supported by threshold and alarm controls, real-time and/or post-session analysis, email, teleconference medias, and storage, retrieval and replay of raw or interpreted data from any WAN connection, including a dialup Internet connection.”

[Para 0078] “By receiving data from the patient-side device, a provider is able to monitor the patient's physiology for research, keeping track of documentation, performing analysis, managing and maintaining records, diagnosing the patient, providing treatment in real-time to the patient, etc. Additionally, the patient may be “examined” by an expert or other medical personnel when one is not physically available or accessible. Such situations may occur, for example, when a patient or provider is in or on an airplane or ship, or when the patient or provider is located in a different part of the world. The present invention also allows for daily or periodic monitoring of patients without the need for the patient to travel to the provider's location. This is ideal for nursing homes and home care patients.”

[Para 0079] “Depending on available bandwidth, the system may allow for the real-time streaming of raw, interpreted, and processed physiological data as well as textual/audio/video data from a patient to a health care provider. For example, the devices on the patient and/or provider sides may allow for various forms of communication including, but not limited to instant messaging, an integrated e-mail system, real-time video, and real time audio. The audio and/or video can be synchronized with the biomedical signals to help correlate behavior with physiological activity. Preferably, the communications are provided via a browser-based interface.”

[Para 0080] “Using optional remote control features built in to the system, remote providers can control the software on the patient's end. Thus, patients do not need to know how to operate the software.”

[Para 0083] “Whether or not the provider is currently accessing real-time streamed information, the data may be stored in a secured storage device at the central server for later access, replay, and/or analysis. The storage device may also be used to store all patient data or information, and integrate the data, whether as raw



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii) , 15d(iii), 15d(iv), 19 OF '868 PATENT)

data, trended data, or summary data, into any electronic medical records system, for example. Thus, the exemplary embodiment may allow for simultaneous storage, retrieval, print, analysis, and play back from anywhere in the world with access to the storage device. This beneficially allows a provider to seek expert consultation for clinically difficult cases, by sharing the patient history and medical test results online. Further, storage of the data allows for the creation of statistical databases, including development of a database of biomedical test results, for example. For example the results of routine medical tests may be stored from the biomedical device directly into the patient's electronic medical record. Further, personal health information can be stored in smart-cards that can be carried by a patient, and which may also carry other personal information such as credit card and bank account data."

[Para 0085] "A remote client module (not shown) allows remote hosts to view the data being streamed in real time. The remote client module can also control the software being run on the patient's and/or provider's end. Multiple remote client modules can run concurrently, allowing multiple remote providers to view data form one device."

[Para 0087] "The present invention may be implemented on a program or code that can be stored in a computer-readable (or electronically-readable) medium. The system may be implemented using Apache web server, MySql on Linux, Oracle on Linux, Java servlets, Applets, HTML, JavaScript, Java, C#, Microsoft's .NET etc. Note also that the server may be implemented on the Internet, intranet, or an extranet."

[Para 0089] "In an example of use during a remote session, a patient is connected to a patient-side biophysical monitoring device, such as by adherence of the appropriate sensors to the patient's body. The sensors are coupled to a medical and/or biofeedback patient-side device that is in wireless or wired communication with a computing device. Such patient-side device may include, but is not limited to, EKG, EMG, EEG, and body temperature monitoring devices. FIG. 2 depicts an illustrative login screen 200, from which the patient then logs on to a website with a secure logon ID and password, thereby creating a session. The screen 300 shown in FIG. 3 is displayed. On this screen, the user can create a session by selecting button 302, review a prior session by selecting button 304, set a threshold for an alert by selecting button 306, read mail by selecting button 308, compose mail by selecting button 310, review a previously answered questionnaire by selecting button 312, fill out new questionnaires/surveys by selecting buttons 314 or 316 respectively, and fill out or amend an intake form by selecting button 318. A button 320 can be colored or lighted when the patient has new messages. The patient's remote healthcare provider is listed and the patient is notified if the provider is online, such as via a flashing "live" button 322."



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii) , 15d(iii), 15d(iv), 19 OF '868 PATENT)

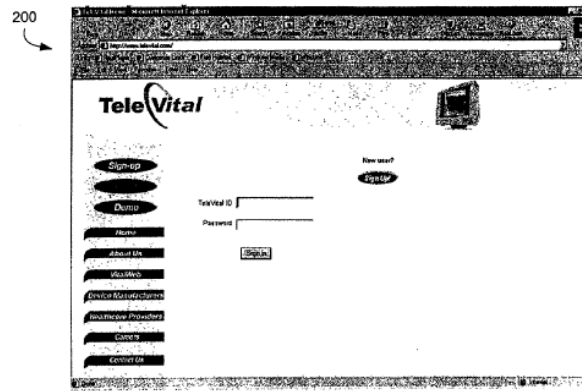


Fig. 2

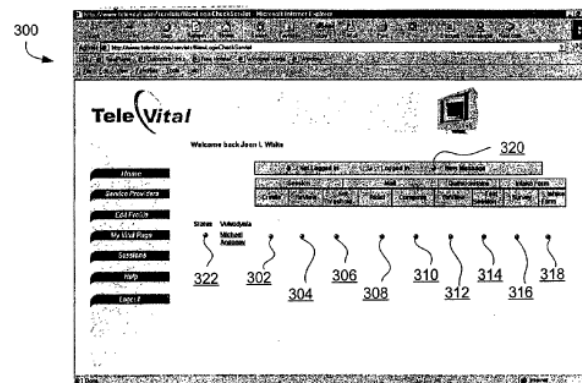


Fig. 3

[Para 0092] "By joining the session, the healthcare provider can immediately view their patient's real-physiological data by selecting button 504. The healthcare provider can remotely adjust the gain for optimal display, and both parties have the option to communicate with the built-in instant messaging feature, or an external or integrated audio or visual device. At the end of a session, the healthcare provider can view a statistical summary report 600, shown in FIG. 6, and that includes a field for adding clinical notes. FIG. 7 shows a screen 700 of a graphical report that can also be displayed. Either can be displayed on both ends, and can even be remotely printed for the client. All sessions may be dated and stored for retrieval by either party at a later date."



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

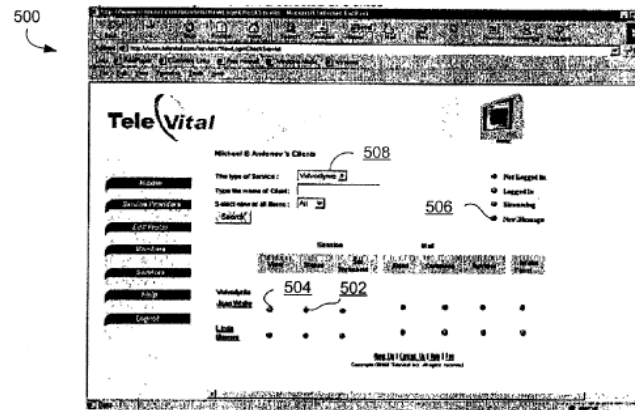


Fig. 5

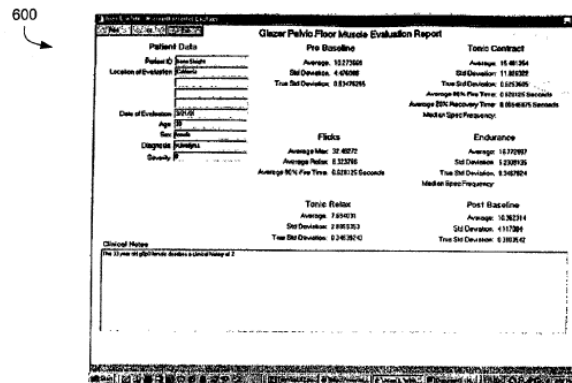


Fig. 6



US20020198473A1 (RELEVANT FOR CLAIMS 1pre, 1a(iv) (partial), 1b, 1c (partial), 1c(i), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 7pre, 7a(ii) (partial), 7b, 7c (partial), 7c(i), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 15pre, 15a(ii) (partial), 15b, 15c (partial), 15c(i), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

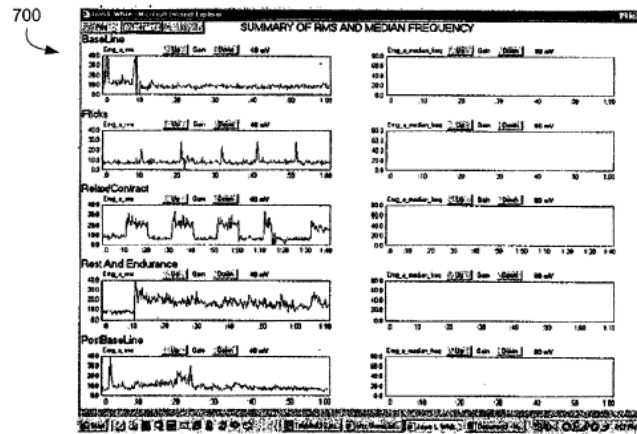


Fig. 7



10. RESULT-6

☆ TWM341495U Hand-held device based remote medical diagnosis platform						
Bibliographic data	Description	Claims	Drawings	Original document	Citations	Legal events
Applicants	ORIENTAL INST TECHNOLOGY [TW] +					
Inventors	LI JIAN-NAN [TW]; CENG HUAN-DA [TW]; ZHU YAO-TANG [TW]; ZHENG LING [TW] +					
Classifications						
IPC	A61B5/00;					
Priorities	TW97206560U-2008-04-17					
Application	TW97206560U-2008-04-17					
Publication	TWM341495U 2008-10-01					

TWM341495U (RELEVANT FOR 1pre, 1a, 1a(i), 1a(iv) (inferential), 1b, 1c (partial), 1c(i) (inferential), 1d, 1d(i), 1d (ii), 1d(iii), 1d(iv), 2 (inferential), 3, 7pre, 7a, 7a(i), 7a(ii)(inferential), 7b, 7c (partial), 7c(i) (inferential), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 12, 15pre, 15a, 15a(i), 15a(ii)(inferential), 15b, 15c (partial), 15c(i) (inferential), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

NOTE: The relevant text for claims is highlighted in GREEN color and the related text is highlighted in ORANGE color.

[Description] "A remote medical diagnosis platform based on a handheld device mainly includes a remote server, a physiological signal collector and a patient-side handheld device.

The physiological signal capturer is placed on the patient and can capture the patient's physiological signals. The physiological signals are transmitted to the remote server through the patient's handheld device, and the remote server receives and stores the physiological signals from the patient's handheld device.

A doctor-side handheld device can also be provided.

In this way, the doctor can browse the medical information of the remote patient through the display of the remote server or the display screen of the doctor's handheld device after reading the medical information (at least including physiological signals) in the remote server, and conduct remote medical diagnosis."



TWM341495U (RELEVANT FOR 1pre, 1a, 1a(i), 1a(iv) (inferential), 1b, 1c (partial), 1c(i) (inferential), 1d, 1d(i), 1d (ii), 1d(iii), 1d(iv), 2 (inferential), 3, 7pre, 7a, 7a(i), 7a(ii)(inferential), 7b, 7c (partial), 7c(i) (inferential), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 12, 15pre, 15a, 15a(i), 15a(ii)(inferential), 15b, 15c (partial), 15c(i) (inferential), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

[Description] "Currently, remote medical care services are developing towards u-Health, and the development of u-Health in Taiwan can be accomplished through telecommunications networks, that is, using the combination of telecommunications networks and mobile devices to transmit patients' physiological signals, allowing remote medical services to achieve the concept of u-Health.

The data transmission methods include GPRS (General Packet Radio Service) and 3G (3rd Generation). The main reason for using 3G and GPRS is that the patient can transmit information through the telecommunications network regardless of whether he is in the country or abroad.

The present invention mainly utilizes the patient-side handheld device 12 as a platform to achieve the goal of remote medical care u-Health."

[Description] "As shown in FIG. 1, the present invention is a remote medical diagnosis platform based on a handheld device, which mainly includes at least one remote server 14, at least one physiological signal capturer 10 and at least one patient-side handheld device 12.

At least one doctor-side handheld device 16 may also be provided.

In the implementation of this invention, at least one physiological signal capturer 10 is placed on the patient, and the physiological signal capturer 10 captures the patient's physiological signal, and the physiological signal is transmitted to at least one remote server 14 through at least one patient-side handheld device 12; the aforementioned physiological signal can be transmitted via 3G or GPRS communication protocol; the remote server 14 can receive and store the physiological signal from the patient-side handheld device 12. Of course, the remote server 14 has a program and data storage unit, a dynamic memory unit, etc., which can store and calculate various related medical information.

In this way, the doctor can browse the overall medical information of the remote patient through the display 18 of the remote server 14, or through the display screen 16a of the doctor's handheld device 16, after reading the medical information (at least including physiological signals) in the remote server 14, and conduct remote medical diagnosis in real time and effectively."



TWM341495U (RELEVANT FOR 1pre, 1a, 1a(i), 1a(iv) (inferential), 1b, 1c (partial), 1c(i) (inferential), 1d, 1d(i), 1d(ii), 1d(iii), 1d(iv), 2 (inferential), 3, 7pre, 7a, 7a(i), 7a(ii)(inferential), 7b, 7c (partial), 7c(i) (inferential), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 12, 15pre, 15a, 15a(i), 15a(ii)(inferential), 15b, 15c (partial), 15c(i) (inferential), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

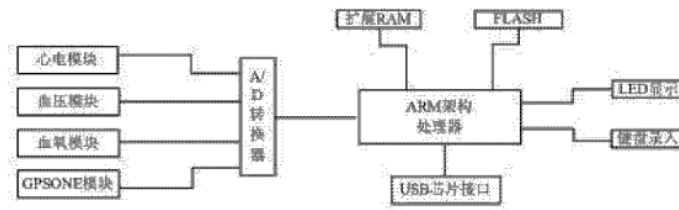


图 1

[Description] “Generally speaking, the physiological signals that can be captured by the physiological signal capturer 10 include body temperature, heartbeat, respiration, and blood pressure.

This creation uses physiological signals of body temperature and heartbeat to design circuits.

For example, if the temperature sensor chip (DS1821) is used to sense body temperature, the 8051 is used to read the memory of the DS1821 and obtain the converted temperature value to display the current temperature.

Use a timing chip (DS1302) to count the time, and after the heartbeat count is completed, the data will be transmitted from 8051 to RS232.

Since the blood concentration of the human body changes synchronously with the heartbeat, the circuit uses an infrared emitting diode (LTM1550-01) to emit infrared light to the finger, which is then reflected to the infrared receiver to sense the signal of blood concentration change. This weak signal is then amplified to record the changes in the heart pulse wave.

In this creation, the remote medical diagnosis platform based on handheld devices can transmit medical information, in addition to the general physiological signals mentioned above, there are many other possibilities, such as: transmitting warning signals, emergency signals, etc., in order to enhance the medical services that can be provided.

That is, in addition to transmitting the daily recorded symptoms to the remote server 14, when the recorded symptoms are dangerous symptoms, the warning message will be transmitted to the remote server 14 for recording and storage to establish a complete medical information.



TWM341495U (RELEVANT FOR 1pre, 1a, 1a(i), 1a(iv) (inferential), 1b, 1c (partial), 1c(i) (inferential), 1d, 1d(i), 1d (ii), 1d(iii), 1d(iv), 2 (inferential), 3, 7pre, 7a, 7a(i), 7a(ii)(inferential), 7b, 7c (partial), 7c(i) (inferential), 7d, 7d(i), 7d(ii), 7d(iii), 7d(iv), 9 (inferential), 12, 15pre, 15a, 15a(i), 15a(ii)(inferential), 15b, 15c (partial), 15c(i) (inferential), 15d, 15d(i), 15d(ii), 15d(iii), 15d(iv), 19 OF '868 PATENT)

For example, when the physiological signal from the patient-side handheld device 12 exceeds the threshold value of the physiological signal, the remote server 14 will send a warning message through the connected display 18 or the display screen 16a of the doctor-side handheld device 16 to prompt the patient-side handheld device 12 of the current status of the patient, so that the doctor can know the patient's current symptoms and help the patient record his or her own symptoms.

Doctors can use the functions of the remote medical diagnosis platform of this invention to review the records of daily symptoms and dangerous symptoms previously sent by the patient at any time; if the patient's symptom records automatically change from daily symptoms to dangerous symptoms, the patient's handheld device 12 can automatically send a warning to the remote server 14, and transmit the patient's physiological signal records, all daily symptom records and patient basic information to the remote server 14."



11. SEARCH HISTORY

11.1 CLASSIFICATIONS

The following classes are identified for the class based searching.

IPC/CPC/US CLASS	DEFINITION
A61B5/0022	Monitoring a patient using a global network, e.g. telephone networks, internet
A61B5/0075	Measuring for diagnostic purposes; Identification of persons using light, e.g. diagnosis by transillumination, diascopy, fluorescence by spectroscopy, i.e. measuring spectra, e.g. Raman spectroscopy, infrared absorption spectroscopy
A61B5/0084	Measuring for diagnostic purposes; Identification of persons using light, e.g. diagnosis by transillumination, diascopy, fluorescence adapted for particular medical purposes for introduction into the body, e.g. by catheters
A61B5/0086	Measuring for diagnostic purposes; Identification of persons using light, e.g. diagnosis by transillumination, diascopy, fluorescence adapted for particular medical purposes for introduction into the body, e.g. by catheters using infrared radiation
A61B5/0088	Measuring for diagnostic purposes; Identification of persons using light, e.g. diagnosis by transillumination, diascopy, fluorescence adapted for particular medical purposes for oral or dental tissue
A61B5/6801	Arrangements of detecting, measuring or recording means, e.g. sensors, in relation to patient specially adapted to be attached to or worn on the body surface
A61B5/7203	Signal processing specially adapted for physiological signals or for diagnostic purposes for noise prevention, reduction or removal
A61B5/7257	Details of waveform analysis characterised by using transforms using Fourier transforms
A61B5/7405	Details of notification to user or communication with user or patient ; user input means using sound



IPC/CPC/US CLASS	DEFINITION
A61B5/742	Details of notification to user or communication with user or patient ; user input means using visual displays
G01J3/00	Spectrometry; Spectrophotometry; Monochromators; Measuring colours
H01S3/302	Lasers, i.e. devices using stimulated emission of electromagnetic radiation in the infrared, visible or ultraviolet wave range using scattering effects, e.g. stimulated Brillouin or Raman effects in an optical fibre



11.3 KEY STRINGS

The following search strings were formed and run on different searching platforms.

CLAIMS	SEARCH STRINGS	NUMBER OF HITS
GOOGLE PATENT SEARCH		
All claims	(CONTROL SYSTEM) (WAVELENGTH) (HOST) (CONTROL) (USER) BEFORE:PRIORITY:20020903	
All claims	(GESTURE CONTROL) (MEDICAL DEVICES) BEFORE:PRIORITY:20020903	
LITERATURE SEARCH QUERIES		
GOOGLE		
All claims	(HEALTH MONITORING SYSTEM)	
All claims	(MEASUREMENT DEVICE) (SEMICONDUCTOR SOURCES) (PDA) (MEDICAL APP)	
All claims	PORTABLE HEALTH MONITORING DEVICE	
All claims	WEARABLE DEVICE + HEALTH MONITORING + LEDS + ARTIFICIAL INTELLIGENCE	
GOOGLE SCHOLAR		
All claims	REMOTE HEALTH MONITORING + SERVER + "PDA" + "APP" + "NON-INVASIVE"	
All claims	REMOTE HEALTH MONITORING + MULTIPLEXED SIGNAL	
All claims	OPTICAL SENSOR + LIGHT + "MULTIPLEX" + "APP" + "PDA" + SERVER	
All claims	"OPTICAL SENSOR"+ "APP" + "PDA" + SERVER + REMOTE MONITORING	
All claims	NON-INVASIVE BLOOD + "APP" + "PDA" + SERVER + REMOTE MONITORING	
All claims	MONITOR + "PHYSIOLOGICAL DATA" + WIRELESS + SERVER	

CLAIMS	SEARCH STRINGS	NUMBER OF HITS
All claims	ECG MONITORING DEVICE + PDA	
All claims	WEARABLE HEALTH MONITORING + PHYSIOLOGICAL DATA	
All claims	IN-HOME + WIRELESS MONITORING	
WAYBACK MACHINE		
All claims	GLUCOWATCH	
All claims	DIASENSOR 1000	
All claims	POLAR ELECTRO HEART RATE MONITORS	
All claims	PENDRA	
All claims	FITSENSE WEARABLE DEVICES	
ORBIT		
All claims	((DIAGNOS+ OR MEDICAL+ OR HEALTH+ OR CHECK_UP? OR CLINICAL+ OR SURGICAL+) 3D (DEVICE? OR INSTRUMENT? OR SYSTEM? OR EQUIPMENT? OR APPARATUS OR MACHIN+ OR APPLIANCE?))/TI/AB/TX AND (+DIODE? OR ?LED? OR LASER? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?)/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)))/TI/AB/TX AND ((HEALTH+ OR FITNESS+ OR MEDICAL+ OR EMERGENCY+ OR MONITOR+ OR DIAGNOS+) 5D (APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE OR "GUI" OR "UI" OR INTERFACE?))/TI/AB/TX AND ((PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)) 5D (SEND+ OR TRANSMIT+ OR STOR+ OR SYNC+ OR PROCESS) 8D (HOST? OR SERVER?	51



CLAIMS	SEARCH STRINGS	NUMBER OF HITS
	OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))/TI/AB/TX AND (EPRD < 2002-09-03)	
All claims	((DIAGNOS+ OR MEDICAL+ OR HEALTH+ OR CHECK_UP? OR CLINICAL+ OR SURGICAL+) 3D (DEVICE? OR INSTRUMENT? OR SYSTEM? OR EQUIPMENT? OR APPARATUS OR MACHIN+ OR APPLIANCE?)))/TI/AB/TX AND ((+DIODE? OR ?LED? OR LASER? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?) P (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)))/TI/AB/TX AND (APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE? OR "GUI" OR "UI" OR INTERFACE?)/TI/AB/TX AND ((PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+) 8D (VOICE+ OR AUDIO+ OR SPEECH? OR MICROPHONE?)))/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))/TI/AB/TX AND (A61B-005+)/IPC/CPC AND (EPRD < 2002-09-03)	165
All claims	((DIAGNOS+ OR MEDICAL+ OR HEALTH+ OR CHECK_UP? OR CLINICAL+ OR SURGICAL+) 3D (DEVICE? OR INSTRUMENT? OR SYSTEM? OR EQUIPMENT? OR APPARATUS OR MACHIN+ OR APPLIANCE?)))/TI/AB/TX AND (+DIODE? OR ?LED? OR LASER? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+ OR ENERGY?) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA? OR SPECTRUM OR EMIT+ OR UNIT? OR MODULE? OR GENERAT+)))/TI/AB/TX AND ((MULTIPLEX+ OR COMBIN+ OR "MUX" OR POLARI+ OR FUSION? OR MIX+ OR INTEGRAT+ OR MERG+) 4D (LIGHT+ OR WAVELENGTH? OR FREQUENC+ OR RAY? OR BEAMS? OR OPTIC+)))/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)))/TI/AB/TX AND (WAVEGUIDE? OR FIBER? OR GUIDE? OR PATH? OR CHANNEL? OR OPTIC_FIBER? OR CONDUIT?)/TI/AB/TX AND ((PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+) 8D (VOICE+ OR AUDIO+ OR	77



CLAIMS	SEARCH STRINGS	NUMBER OF HITS
	SPEECH? OR MICROPHONE?))/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))/TI/AB/TX AND (A61B-005+)/IPC/CPC AND (EPRD < 2002-09-03)	
All claims	(PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+)/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)))/TI/AB/TX AND (H01S-003/302+ OR A61B-005/0084+ OR A61B-005/0075+)/IPC/CPC AND (EPRD < 2002-09-03)	75
All claims	(((((REMOTE+ OR DISTANT+ OR TELE OR VIRTUAL+ OR WIRELESS+) 4D (MONITOR+ OR EXAM+ OR HEALTH+ OR FITNESS+ OR MEDICAL+ OR EMERGENCY+ OR PATIENT? OR DIAGNOS+ OR MEDIC+)) P (PORTABLE_DIGITAL_ASSISTANT? OR PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+)/TI/AB/TX AND ((+DIODE? OR ?LED? OR LASER? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+ OR PUMP) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?) P (MULTIPLEX+ OR "MUX"))/TI/AB/TX AND ((APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE? OR "GUI" OR "UI" OR INTERFACE?) P (PORTABLE_DIGITAL_ASSISTANT? OR PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+)/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)))/TI/AB/TX AND ((A61B-005+)/IPC/CPC) AND (EPRD < 2002-09-03))	39



CLAIMS	SEARCH STRINGS	NUMBER OF HITS
All claims	(((((REMOTE+ OR DISTANT+ OR TELE OR VIRTUAL+ OR WIRELESS+) 4D (MONITOR+ OR EXAM+ OR HEALTH+ OR FITNESS+ OR MEDICAL+ OR EMERGENCY+ OR PATIENT? OR DIAGNOS+ OR MEDIC+)) P (PORTABLE_DIGITAL_ASSISTANT? OR PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+))/TI/AB/TX AND ((+DIODE? OR ?LED? OR LASER? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+ OR PUMP) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?) P (MULTIPLEX+ OR "MUX"))/TI/AB/TX AND ((APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE? OR "GUI" OR "UI" OR INTERFACE?) P (PORTABLE_DIGITAL_ASSISTANT? OR PDA? OR DEVICE? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+))/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+)))/TI/AB/TX) AND (EPRD < 2002-09-03))	253
All claims	(((((DIAGNOS+ OR MEDICAL+ OR HEALTH+ OR CHECK_UP? OR CLINICAL+ OR SURGICAL+) 3D (DEVICE? OR INSTRUMENT? OR SYSTEM? OR EQUIPMENT? OR APPARATUS OR MACHIN+ OR APPLIANCE?))/TI/AB/TX AND ((SENSOR?) P (+DIODE? OR ?LED? OR LASER? OR "WDM" OR OPTICAL_MULTIPLEX+ OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?))/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+ OR INFO+)))/TI/AB/TX AND (((HEALTH+ OR FITNESS+ OR MEDICAL+ OR EMERGENCY+ OR MONITOR+ OR DIAGNOS+) 5D (APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE OR "GUI" OR "UI" OR INTERFACE?)) P (PDA? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+))/TI/AB/TX AND ((PHYSIOLOG+	52



CLAIMS	SEARCH STRINGS	NUMBER OF HITS
	OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+))) 5D (SEND+ OR TRANSMIT+ OR STOR+ OR SYNC+ OR PROCESS) 8D (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?))))/TI/AB/TX) AND (EPRD < 2013-06-10))	
All claims	(((OPTICAL? OR LIGHT?) 2D SENSOR?) P (+DIODE? OR ?LED? OR LED? OR LASER? OR "WDM" OR OPTICAL_MULTIPLEX+ OR PHOTODETECTOR? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?)/TI/AB/TX AND (PHYSIOLOG+ OR PULSE+ OR HEART_RATE? OR HEART+ OR CARDIAC+ OR OPTICAL_HEART_RATE? OR VITAL_STATUS OR ((BLOOD) 2D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+ OR INFO+)))/TI/AB/TX AND ((HEALTH+ OR FITNESS+ OR MEDICAL+ OR EMERGENCY+ OR MONITOR+ OR DIAGNOS+) 5D (APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE OR "GUI" OR "UI" OR INTERFACE?)/TI/AB/TX AND ((LIGHT? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR LED? OR OPTIC+ OR EMIT+) 10D (MULTIPLEX+ OR "MUX")/TI/AB/TX AND ((HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?)))) 7D (STOR+ OR COLLECT+ OR RECORD+ OR DATABASE OR REPOSITORY)/TI/AB/TX) AND (EPRD < 2013-06-10))	95
All claims	(((NON) 2D (INVASIVE+)) OR ((OPTICAL+ OR LIGHT+ OR INFRARED+ OR MICROWAVE? OR PHOTO+ OR ELECTROMAGNETIC+ OR "IR" OR "NIR") 4D (SPECTROSCOP+ OR SENSOR? OR EMIT+ OR DETECT+ OR TRANSDUCER? OR DIODE?))) 15D (PHYSIOLOG+ OR VITAL_STATUS OR ((BLOOD OR PULSE+ OR HEART+ OR CARDIAC+ OR OPTICAL_HEART) 3D (PRESSURE OR PROPERT+ OR PARAMETER? OR DATA OR MEASURE+ OR INFO+ OR VOLUME OR RATE? OR LEVEL?))))/TI/AB/TX AND ((APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE OR "GUI" OR "UI" OR INTERFACE?) P (PDA? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+)/TI/AB/TX AND ((HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR	126



CLAIMS	SEARCH STRINGS	NUMBER OF HITS
	CENTER OR CENTRE?))) 7D (STOR+ OR COLLECT+ OR RECORD+ OR DATABASE OR REPOSITORY))/TI/AB/TX AND ((LIGHT? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR LED? OR OPTIC+ OR EMIT+ OR WAVELENGTH+ OR FREQUENC+) 10D (MULTIPLEX+ OR "MUX"))/TI/AB/TX) AND (EPRD < 2013-06-10))	
All claims	(((((OPTICAL? OR LIGHT?) 2D SENSOR?) P (+DIODE? OR ?LED? OR LED? OR LASER? OR "WDM" OR OPTICAL_MULTIPLEX+ OR PHOTODETECTOR? OR ((OPTICAL+ OR LIGHT+ OR ILLUMINAT+) 2D (SOURCE? OR BEAM? OR RAY? OR SPECTRA OR SPECTRUM OR EMIT+)) OR PHOTO_DETECTOR?))/TI/AB/TX AND (((MULTIPL+ OR MANY OR SEVERAL OR VARIOUS OR MORE_THAN_ONE) 3D (SIGNAL? OR RAY? OR LIGHT? OR BEAM? OR SPECTRA OR SPECTRUM OR EMIT+ OR DIODE?)) 5D (MULTIPLEX+ OR COMBIN+ OR "MUX" OR MERG+) 5D ((ONE OR SINGLE) 3D (SIGNAL? OR RAY? OR LIGHT? OR BEAM? OR SPECTRA OR SPECTRUM OR EMIT+ OR DIODE?))/TI/AB/TX AND ((APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE OR "GUI" OR "UI" OR INTERFACE?) P (PDA? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+))/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?))/TI/AB/TX) AND (EPRD < 2013-06-10))	134
All claims	(((((PHOTOPLETHYSMOGRAPH+ OR OXIMETER? OR SPECTROSCOP+ OR ((OPTICAL+ OR PPG OR LIGHT) 2D (SENSOR? OR DETECTOR? OR DIODE?))/TI/AB/CLMS AND ((APP? OR SOFTWARE+ OR PROGRAM+ OR APPLICATION? OR PLATFORM? OR USER_INTERFACE OR "GUI" OR "UI" OR INTERFACE?) P (PDA? OR MOBILE+ OR SMART_PHONE+ OR HAND_SET+ OR PHONE+ OR TABLET+ OR HAND_HELD+))/TI/AB/TX AND (HOST? OR SERVER? OR "CLOUD" OR ((CENTRAL OR MAIN OR MANAGEMENT) 2D (STATION? OR SERVER? OR CENTER OR CENTRE?))/TI/AB/TX AND ((SIGNAL? OR RAY? OR LIGHT? OR BEAM? OR SPECTRA OR SPECTRUM OR EMIT+ OR DIODE?) 5D (MULTIPLEX+ OR "MUX") 5D (ONE OR SINGLE) 3D (SIGNAL? OR RAY? OR LIGHT? OR BEAM? OR SPECTRA OR SPECTRUM))/TI/AB/TX) AND (G01J-003+ OR A61B-005+)/IPC/CPC) AND (EPRD < 2013-06-10))	27

11.3 KEY WORDS

The following keywords are identified for the keyword-based searching. Synonyms are included to keep the search broad and exhaustive.

KEYWORDS	RELATED WORDS
LIGHT BEAMS	LASER, LEDs, light emitting diodes, semiconductor light sources, photodiodes, OLEDs, optical transmitter, optical source
MULTIPLEX	Polarizer, WDM, optical multiplexing, multiplexer, MUX
WAVEGUIDES	Optical fiber, fiber/fibre optics, optical telecommunication, fiber-optic communication, optical network, optic cables, waveguides, light fibre, optical device/assembly/apparatus/system, fiber optic, light waveguide, optical cable, optical waveguide, optical wires
PHYSIOLOGICAL INFORMATION	Biological data, physiological parameters, body metrics, health, fitness, metabolism, vital status, heart rate, pulse pressure, respiration rate, lactic threshold, blood pressure, blood metabolite level, blood oxygen level
VOICE CONTROL	Voice input, speech recognition, voice command, speech-enabled, voice activation, audio
HOST	Cloud, server, remote station/computer/PC
SOFTWARE APPLICATION	App, software, program, application, platform, user interface, GUI, UI, program interface, software platform



12. FILE HISTORY ANALYSIS

Publication No. US9055868B2

File History Analysis

[Allowable Subject Matter]

REASONS FOR ALLOWANCE

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

The cited prior art does not teach or suggest the whole combination of elements set forth by claims 21-28 and 30-41. For example, there is no teaching or suggestion in the prior art for combining:

a plurality of semiconductor diodes with light beams; a multiplexer capable of combining the plurality of semiconductor diode light beams and generating at least a multiplexed light beam comprising one or more wavelengths; one or more waveguide structures configured to receive at least a portion of the one or more wavelengths and to communicate at least the portion of the one or more wavelengths to an output end of the one or more waveguide structures to form an output beam; and a lens system configured to receive at least a portion of the output beam and to communicate at least the portion of the output beam onto a part of a user's body comprising blood to perform a measurement on a use;

Wherein the combination above used with:

a software application capable of generating data based at least in part on the measurement on the user, wherein the data represents at least in part physiological information associated with the user; the software application capable of operating on a control system adapted to receive, store and process at least a portion of the physiological information, the control system having a touch-screen, a proximity sensor,



and a wireless transceiver to transmit wireless data over a wireless link, the wireless data comprising at least a part of the physiological information, wherein the control system is further capable of receiving voice input signals and manually entered input signals; and a host comprising: a digital file for receiving and storing at least a portion of the wireless data; control logic at the host to process at least the portion of the wireless data to generate a status of the user; a memory storage device for recording the status; and an output for communicating at least a portion of the status or associated information over a communication link to one or more display output devices, wherein the one or more display output devices are located remotely from the host.



13. DISCLAIMER

The Search offers only a technical analysis of the evaluated results. It is hereby, emphasized that an independent analysis of the search results may be carried out to verify the results.

Content of this report does not constitute any legal advice and contents presented in the report above is only "information".

iCuerious use all caution possible in selecting information sources/Databases and carrying out the search. However, we cannot guarantee you the correctness or completeness of the data we receive. The search is a result of an online search and analysis of the data. We have no other ways of ascertaining the veracity of data apart from online methods. The search results have been compiled based on documents which have already been published.

