US007438683B2

(12) **United States Patent**
Al-Ali et al.

(10) **Patent No.: US 7,438,683 B2**
(45) **Date of Patent: Oct. 21, 2008**

(54) **APPLICATION IDENTIFICATION SENSOR**

(75) Inventors: **Ammar Al-Ali**, Tustin, CA (US); **Massi E. Kiani**, Laguna Niguel, CA (US); **Walter M. Weber**, Laguna Hills, CA (US)

(73) Assignee: **Masimo Corporation**, Irvine, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 537 days.

(21) Appl. No.: **11/071,875**

(22) Filed: **Mar. 3, 2005**

(65) **Prior Publication Data**

US 2005/0283052 A1 Dec. 22, 2005

Related U.S. Application Data

(60) Provisional application No. 60/549,996, filed on Mar. 4, 2004.

(51) **Int. Cl.**
A61B 5/00 (2006.01)

(52) **U.S. Cl.** **600/309**; 600/323

(58) **Field of Classification Search** 600/310, 600/322, 323; 702/189
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,960,128	A		10/1990	Gordon et al.
5,058,588	A	*	10/1991	Kaestle 600/323
5,163,438	A		11/1992	Gordon et al.
5,337,744	A		8/1994	Branigan
5,431,170	A		7/1995	Mathews
5,452,717	A		9/1995	Branigan et al.
5,482,036	A		1/1996	Diab et al.
5,490,505	A		2/1996	Diab et al.
5,494,043	A		2/1996	O'Sullivan
5,533,511	A		7/1996	Kaspari et al.
5,590,649	A		1/1997	Caro et al.
5,632,272	A		5/1997	Diab et al.
5,638,816	A		6/1997	Kiani-Azarbayjany et al.
5,638,818	A		6/1997	Diab et al.
5,645,440	A		7/1997	Tobler et al.
5,685,299	A		11/1997	Diab et al.
D393,830	S		4/1998	Tobler et al.
5,743,262	A		4/1998	Lepper, Jr. et al.
5,758,644	A		6/1998	Diab et al.
5,760,910	A		6/1998	Lepper, Jr. et al.
5,769,785	A		6/1998	Diab et al.
5,782,757	A		7/1998	Diab et al.
5,785,659	A		7/1998	Caro et al.
5,791,347	A		8/1998	Flaherty et al.
5,810,734	A		9/1998	Caro et al.
5,823,950	A		10/1998	Diab et al.
5,830,131	A		11/1998	Caro et al.
5,833,618	A		11/1998	Caro et al.
5,860,919	A		1/1999	Kiani-Azarbayjany et al.
5,890,929	A		4/1999	Mills et al.
5,904,654	A		5/1999	Wohltmann et al.

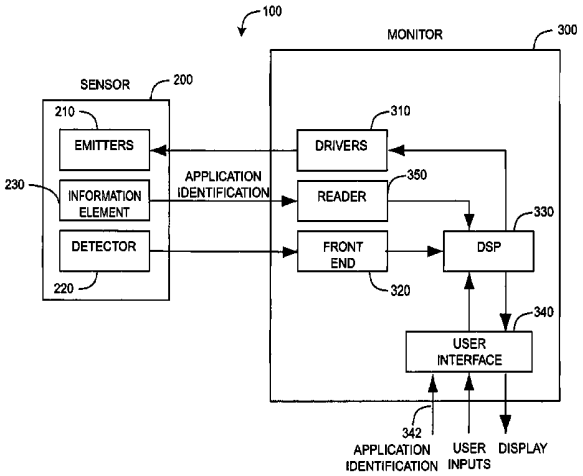
(Continued)

Primary Examiner—Eric F Winakur
Assistant Examiner—Etsub D Berhanu
(74) *Attorney, Agent, or Firm*—Knobbe, Martens, Olson & Bear LLP

(57) **ABSTRACT**

An application identification sensor comprises a plurality of emitters configured to transmit light into a tissue site and a detector configured to receive the light after tissue absorption. The detector generates a signal responsive to the intensity of the light and communicates the signal to a monitor. An information element is readable by the monitor so as to identify a sensor application. The monitor presets at least one user-selectable operational parameter in response to the information element.

17 Claims, 1 Drawing Sheet



U.S. PATENT DOCUMENTS

5,919,134	A		7/1999	Diab
5,934,925	A		8/1999	Tobler et al.
5,940,182	A		8/1999	Lepper, Jr. et al.
5,995,855	A		11/1999	Kiani et al.
5,997,343	A		12/1999	Mills et al.
6,002,952	A		12/1999	Diab et al.
6,011,986	A		1/2000	Diab et al.
6,027,452	A		2/2000	Flaherty et al.
6,036,642	A		3/2000	Diab et al.
6,044,283	A	*	3/2000	Fein et al. 600/310
6,045,509	A		4/2000	Caro et al.
6,067,462	A		5/2000	Diab et al.
6,081,735	A		6/2000	Diab et al.
6,088,607	A		7/2000	Diab et al.
6,110,522	A		8/2000	Lepper, Jr. et al.
6,151,516	A		11/2000	Kiani-Azarbayjany et al.
6,152,754	A		11/2000	Gerhardt et al.
6,157,850	A		12/2000	Diab et al.
6,165,005	A		12/2000	Mills et al.
6,184,521	B1		2/2001	Coffin, IV et al.
6,206,830	B1		3/2001	Diab et al.
6,229,856	B1		5/2001	Diab et al.
6,236,872	B1		5/2001	Diab et al.
6,256,523	B1		7/2001	Diab et al.
6,263,222	B1		7/2001	Diab et al.
6,278,522	B1		8/2001	Lepper, Jr. et al.
6,280,213	B1		8/2001	Tobler et al.
6,285,896	B1		9/2001	Tobler et al.
6,334,065	B1		12/2001	Al-Ali et al.
6,349,228	B1		2/2002	Kiani et al.
6,360,114	B1		3/2002	Diab et al.
6,371,921	B1		4/2002	Caro et al.
6,377,829	B1		4/2002	Al-Ali
6,388,240	B2		5/2002	Schulz et al.
6,397,091	B2		5/2002	Diab et al.
6,430,525	B1		8/2002	Weber et al.
6,463,311	B1		10/2002	Diab
6,470,199	B1		10/2002	Kopotic et al.
6,501,975	B2		12/2002	Diab et al.
6,515,273	B2		2/2003	Al-Ali
6,525,386	B1		2/2003	Mills et al.
6,526,300	B1		2/2003	Kiani et al.
6,541,756	B2		4/2003	Schulz et al.
6,542,764	B1		4/2003	Al-Ali et al.
6,580,086	B1		6/2003	Schulz et al.
6,584,336	B1		6/2003	Ali et al.
6,591,123	B2	*	7/2003	Fein et al. 600/323
6,597,933	B2		7/2003	Kiani et al.
6,606,511	B1		8/2003	Ali et al.
6,632,181	B2		10/2003	Flaherty et al.
6,640,116	B2		10/2003	Diab
6,643,530	B2		11/2003	Diab et al.
6,650,917	B2		11/2003	Diab et al.
6,654,624	B2		11/2003	Diab et al.
6,658,276	B2		12/2003	Kianl et al.
6,671,531	B2		12/2003	Al-Ali et al.
6,678,543	B2		1/2004	Diab et al.
6,684,090	B2		1/2004	Ali et al.
6,697,656	B1		2/2004	Al-Ali
6,697,658	B2		2/2004	Al-Ali
RE38,476	E		3/2004	Diab et al.
6,699,194	B1		3/2004	Diab et al.
6,714,804	B2		3/2004	Al-Ali et al.
RE38,492	E		4/2004	Diab et al.
6,725,075	B2		4/2004	Al-Ali
6,745,060	B2		6/2004	Diab et al.
6,760,607	B2		7/2004	Al-Ali
6,770,028	B1		8/2004	Ali et al.
6,771,994	B2		8/2004	Klani et al.
6,792,300	B1		9/2004	Diab et al.
6,813,511	B2		11/2004	Diab et al.
6,816,741	B2		11/2004	Diab
6,822,564	B2		11/2004	Al-Ali
6,826,419	B2		11/2004	Diab et al.
6,830,711	B2		12/2004	Mills et al.
6,850,787	B2		2/2005	Weber et al.
6,850,788	B2		2/2005	Al-Ali
6,852,083	B2		2/2005	Caro et al.
6,861,639	B2		3/2005	Al-Ali

* cited by examiner

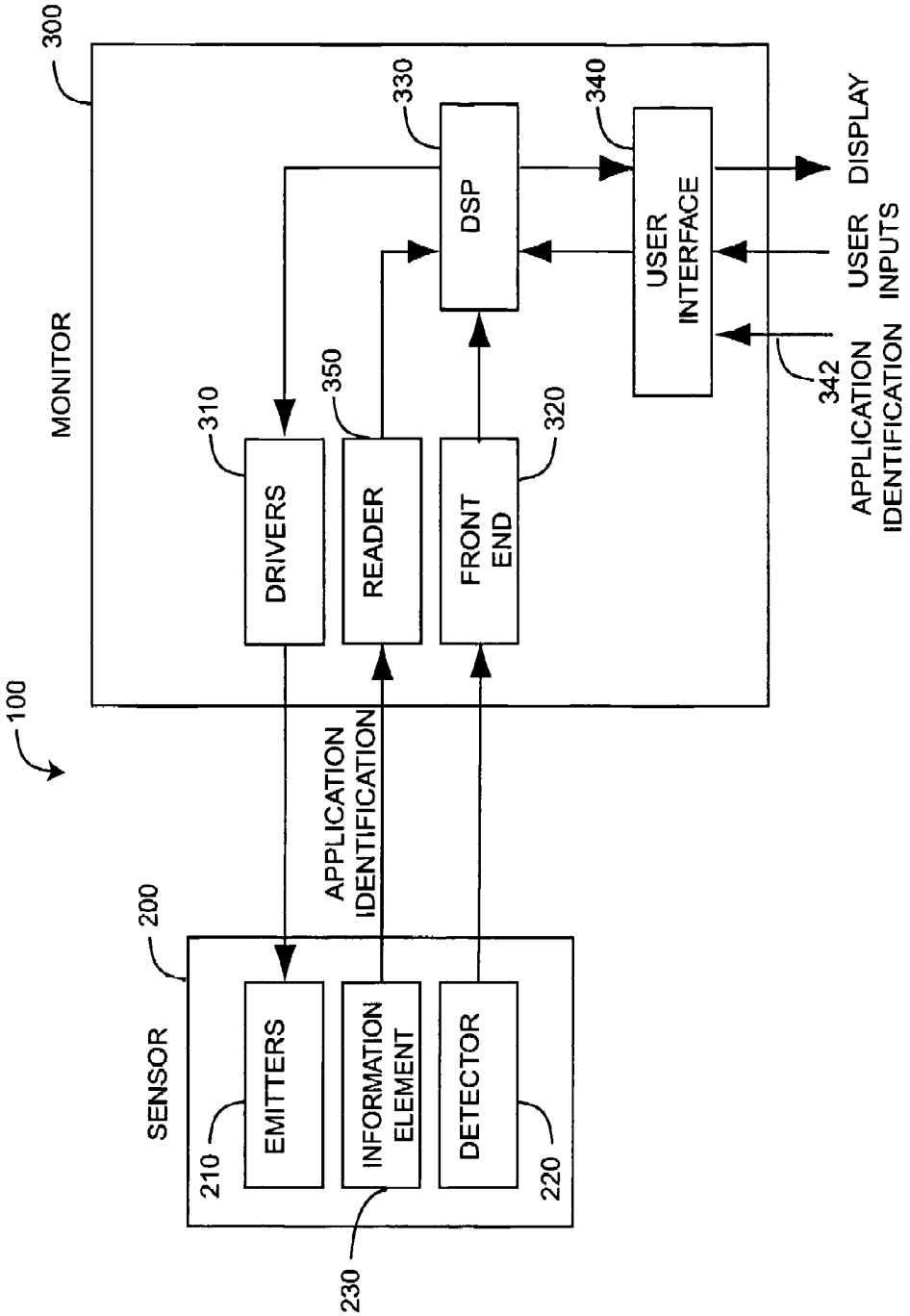

100
300
MONITOR
DRIVERS
310
READER
350
FRONT END
320
DSP
330
USER INTERFACE
340
DISPLAY
USER INPUTS
APPLICATION IDENTIFICATION
342
APPLICATION IDENTIFICATION
SENSOR
200
EMITTERS
210
INFORMATION ELEMENT
230
DETECTOR
220

FIG. 1

APPLICATION IDENTIFICATION SENSOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application relates to and claims the benefit of prior U.S. Provisional Application No. 60/549,996 titled "Application Identification Sensor," filed Mar. 4, 2004 and incorporated by reference herein.

BACKGROUND OF THE INVENTION

Pulse oximetry is a widely accepted noninvasive procedure for measuring the oxygen saturation level of arterial blood, an indicator of a person's oxygen supply. A typical pulse oximetry system has a sensor, a monitor and a patient cable providing a communication path between the sensor and monitor. The sensor is adapted to attach to a tissue site, such as a patient's finger, and respond to hemaglobin constituents of pulsatile blood. The monitor is adapted to receive a physiological signal from the sensor and provide a numeric readout of the patient's oxygen saturation and pulse rate.

SUMMARY OF THE INVENTION

A conventional pulse oximetry monitor processes the physiological signal from the sensor based upon sensor calibration data, internal algorithm parameters and user-selectable operational parameters. The sensor may have an information element that is readable by the monitor and that identifies one or more characteristics of the sensor. These characteristics may relate to sensor components, such as emitter wavelength, or the sensor type, such as adult, pediatric or neo-natal. The monitor may select calibration data and internal parameters accordingly. An information element may be a passive device, such as a resistor, or an active device, such as a transistor network, a logic device or a memory chip. An information element is described in U.S. Pat. No. 5,758,644 entitled Manual and Automatic Probe Calibration, which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

One aspect of an application identification sensor comprises a plurality of emitters configured to transmit light into a tissue site and a detector configured to receive the light after tissue absorption. The detector generates a signal responsive to the intensity of the light and communicates the signal to a monitor. An information element is readable by the monitor so as to identify a sensor application. The monitor presets at least one user-selectable operational parameter in response to the information element. In one embodiment, the application relates to emergency care and the user-selectable operational parameter is selected from the set of sensitivity and averaging time.

Another aspect of an application identification sensor is a method where a sensor is attached to a monitor and an information element is read. Data from the information element is associated with an application, and user-selectable parameters corresponding to the application are preset. In one embodiment, the application is identified as emergency related. In a particular embodiment, maximum sensitivity and minimum averaging time are selected for processing a signal from the sensor.

An aspect of an application identification apparatus comprises a sensor configured to generate a physiological signal and a monitor capable of processing the physiological signal so as to measure a physiological parameter responsive to a constituent of pulsatile blood. The monitor has an application identification input. User-selectable operational parameters for said monitor have values responsive to the application identification input. In one embodiment, the application identification input is provided by an information element associated with the sensor and readable by the monitor. In another embodiment, the application identification input is provided by a user-actuated button associated with the monitor.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram a pulse oximetry system utilizing an application identification sensor or an application identification user input or both.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** illustrates a pulse oximetry system **100** incorporating an application identification sensor **200** and a monitor **300** adapted to recognize the sensor **200** accordingly. The sensor **200** has emitters **210** adapted to transmit light into a tissue site and a detector **220** adapted to receive light after absorption by the tissue site and to generate a detector signal in response, as is well known in the art. The monitor **300** has drivers **310** that activate the emitters **210** and a front-end **320** that conditions and digitizes the detector signal for input into a digital signal processor (DSP) **330**, as is also well known in the art. The DSP **330** computes oxygen saturation and pulse rate and provides the results on a display. A user interface **340** allows a user to input selected operational parameters for the DSP **330**. A pulse oximeter monitor is described in U.S. Pat. No. 6,699,194 entitled Signal Processing Apparatus and Method and U.S. Pat. No. 6,650,917 entitled Signal Processing Apparatus, which are assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein. A user interface is described in U.S. Pat. No. 6,658,276 entitled Pulse Oximeter User Interface, which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

Also shown in FIG. **1**, the application identification sensor **200** also has an information element **230**, and the monitor has a corresponding information element reader **350**. Advantageously, the sensor **200** is manufactured with an information element **230** that identifies a particular application to the monitor **300**. The monitor **300** presets one or more user-selectable operational parameters accordingly. This reduces or eliminates the need for user input of operational parameters specific to a particular application. In an alternative embodiment, the monitor **300** has an application identification button, switch or other user-actuated device **342** that causes the monitor **300** to preset one or more user-selectable operational parameters.

In one particularly advantageous embodiment, the application identification sensor **200** is manufactured, packaged and/or labeled for use in a trauma or emergency care situation, and the information element **230** is configured to identify that application or use to the monitor **300** accordingly. For example, when such a sensor **200** is connected to the monitor **300**, the monitor **300** may select maximum sensitivity and minimum averaging time, providing hands-off optimum settings for these user-selectable operational parameters for a trauma care application. In an alternative embodiment, the monitor **300** has an application identification button **342** that is labeled for use in trauma or emergency care situations and that, when actuated, causes the monitor **300** to set user-selectable operational parameters accordingly.

For various applications, an application identification sensor **200** may indicate other user-selectable operational param-

eters relating to monitor alarms, displays, outputs and general characteristics to name a few. Alarm parameters may include alarm limits, delay and volume, for example. Display parameters may regard numeric, plethysmograph and trend formats to name a few. Output parameters may include, for instance, the analog output and alarm output types and digital output data formats. General characteristics may include operational modes such as maximum sensitivity and minimum averaging time cited above. General characteristics may also include averaging mode, such as described in U.S. Pat. No. 6,430,525 entitled Variable Mode Averager, which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein. General characteristics may further include, for example, user key lock-out and password entry to enable user keys and other monitor functions.

An application identification sensor has been disclosed in detail in connection with various embodiments. These embodiments are disclosed by way of examples only and are not to limit the scope of the claims that follow. For example, although an application identification sensor has been described with respect to a pulse oximetry system, a sensor having an information element that identifies an application to a monitor can be utilized in systems capable of measuring physiological parameters other than or in addition to oxygen saturation and pulse rate. One of ordinary skill in art will appreciate many other variations and modifications.

What is claimed is:

1. An application identification sensor comprising:

a plurality of emitters configured to transmit light into a tissue site;

a detector configured to receive said light after tissue absorption, said detector generating a signal responsive to the intensity of said light and communicating said signal to a monitor; and

an information element readable by said monitor so as to identify a sensor application, said monitor presetting at least one user-selectable operational parameter in response to said information element.

2. The application identification sensor according to claim **1** wherein:

said application relates to emergency care, and

said user-selectable operational parameter is selected from the set of sensitivity and averaging time.

3. An application identification sensor method comprising the steps of:

attaching a sensor to a monitor;

reading an information element corresponding to said sensor;

associating data from said information element with an application; and

presetting user-selectable parameters in said monitor corresponding to said application.

4. The application identification sensor method according to claim **3** wherein said associating step comprises the substep of identifying said application as emergency related.

5. The application identification sensor method according to claim **4** wherein said presetting step comprises the substep of selecting maximum sensitivity and minimum averaging time for processing a signal from said sensor.

6. An oximeter system capable of pre-configuring itself for differing operational conditions, the oximeter system comprising:

a noninvasive optical sensor configured to generate an intensity signal indicative of one or more physiological parameters responsive to a constituent of pulsatile blood of a patient being monitored;

an information element; and

a processor responsive to said intensity signal to determine measurements of said parameters, said processor also responsive to said information element to pre-configure one or more of a plurality of user-selectable configurations.

7. The oximeter system of claim **6**, wherein said user-selectable configurations include configuration of alarm characteristics.

8. The oximeter system of claim **7**, wherein said alarm characteristics comprise at least one of alarm limits, alarm delays, and alarm volume.

9. The oximeter system of claim **6**, wherein said user-selectable configurations include configuration of display characteristics.

10. The oximeter system of claim **9**, wherein said display characteristics comprise at least one of numerical indicia of a display, plethysmographic indicia of said display, and trend indicia of said display.

11. The oximeter system of claim **6**, wherein said user-selectable configurations include configuration of output characteristics.

12. The oximeter system of claim **11**, wherein said output characteristics comprise at least one of analog and digital output.

13. The oximeter system of claim **6**, wherein said user-selectable configurations include configuration of operational modes.

14. The oximeter system of claim **13**, wherein said operational modes include a sensitivity.

15. The oximeter system of claim **13**, wherein said operational modes include an averaging mode.

16. The oximeter system of claim **6**, wherein said user-selectable configurations include general monitor characteristics.

17. The oximeter system of claim **16**, wherein said general monitor characteristics comprise user key configurations or lock-outs based on operator authentication.

* * * * *

US007438683C1

(12) EX PARTE REEXAMINATION CERTIFICATE (9923rd)

United States Patent

Al-Ali et al.

(10) Number: US 7,438,683 C1

(45) Certificate Issued: Nov. 6, 2013

(54) APPLICATION IDENTIFICATION SENSOR

(75) Inventors: **Ammar Al-Ali**, Tustin, CA (US); **Massi E. Kiani**, Laguna Niguel, CA (US); **Walter M. Weber**, Laguna Hills, CA (US)

(73) Assignee: **Masimo Corporation**, Irvine, CA (US)

Reexamination Request:
No. 90/012,546, Oct. 25, 2012

Reexamination Certificate for:

Patent No.:	**7,438,683**
Issued:	**Oct. 21, 2008**
Appl. No.:	**11/071,875**
Filed:	**Mar. 3, 2005**

Related U.S. Application Data

(60) Provisional application No. 60/549,996, filed on Mar. 4, 2004.

(51) **Int. Cl.**
A61B 5/00 (2006.01)

(52) **U.S. Cl.**
USPC **600/309**; 600/323

(58) **Field of Classification Search**
None
See application file for complete search history.

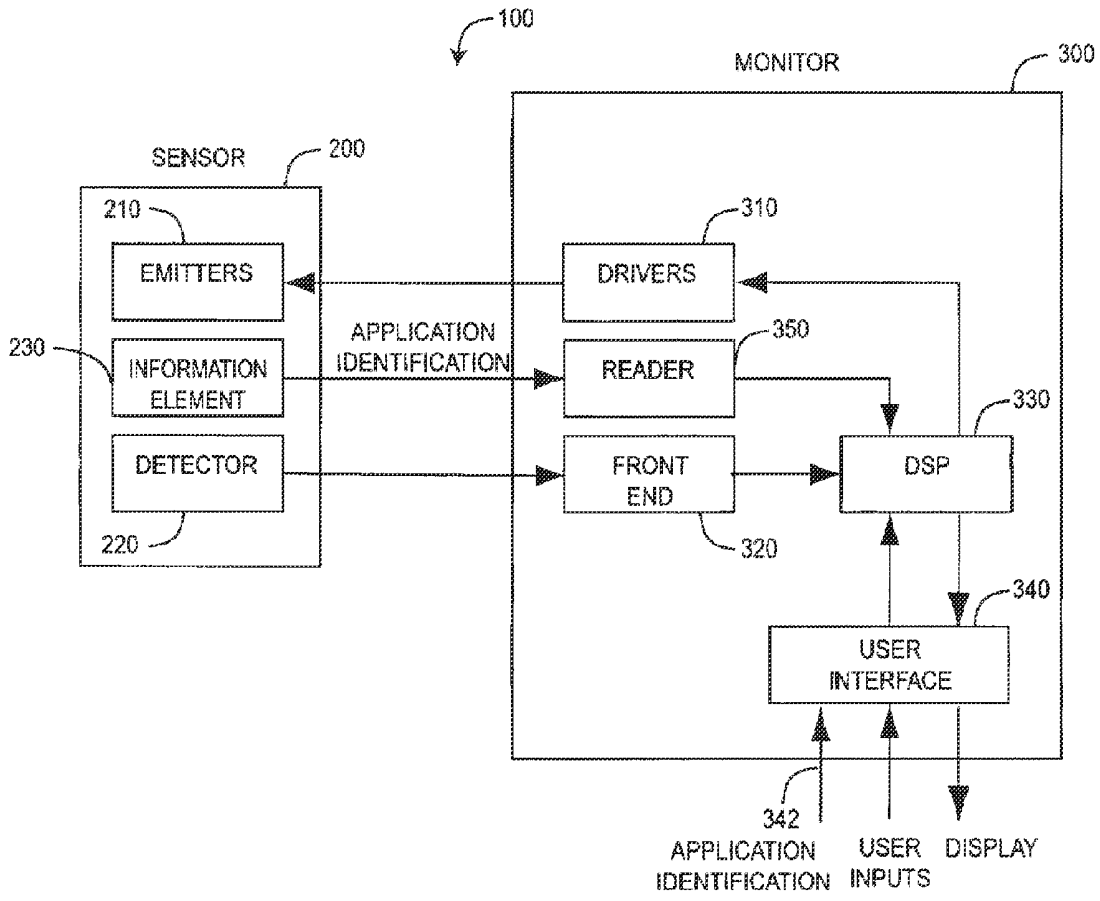
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/012,546, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Robert Nasser

(57) **ABSTRACT**

An application identification sensor comprises a plurality of emitters configured to transmit light into a tissue site and a detector configured to receive the light after tissue absorption. The detector generates a signal responsive to the intensity of the light and communicates the signal to a monitor. An information element is readable by the monitor so as to identify a sensor application. The monitor presets at least one user-selectable operational parameter in response to the information element.



EX PARTE REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **6-17** is confirmed.

Claims **1-5** and **18-20** are cancelled.

New claim **21** is added and determined to be patentable.

21. An application identification sensor method pre-configuring an oximeter system for differing operational conditions, the oximeter system including a noninvasive optical sensor, an information element, and a monitor including a signal processor, the method comprising the steps of:

attaching said noninvasive optical sensor to said monitor, the sensor configured to generate an intensity signal indicative of one or more physiological parameters responsive to a constituent of pulsatile blood of a patient being monitored;

reading said information element corresponding to said sensor;

using said signal processor of said monitor, determining measurements of said physiological parameters, said measurements responsive to said intensity signal;

associating data from said information element with an application, said application being one of said differing operational conditions; and

presetting user-selectable parameters in said processor of said monitor corresponding to said application to pre-configure said monitor for said one of said differing operational conditions.

* * * * *

专利名称(译)	应用识别传感器		
公开(公告)号	US7438683	公开(公告)日	2008-10-21
申请号	US11/071875	申请日	2005-03-03
[标]申请(专利权)人(译)	AL ALI AMMAR Kiani曾MASSIê WEBER WALTER中号		
申请(专利权)人(译)	AL-ALI AMMAR Kiani曾MASSIê WEBER WALTER中号		
当前申请(专利权)人(译)	Masimo公司		
[标]发明人	AL ALI AMMAR KIANI MASSI E WEBER WALTER M		
发明人	AL-ALI, AMMAR KIANI, MASSI E. WEBER, WALTER M.		
IPC分类号	A61B5/00		
CPC分类号	A61B5/14551 A61B2562/08 A61B2505/01 A61B2560/02 A61B2560/0487 G06F3/002 G16H40/40 G16H40/63		
优先权	60/549996 2004-03-04 US		
其他公开文献	US20050283052A1		
外部链接	Espacenet USPTO		

摘要(译)

应用识别传感器包括：多个发射器，被配置为将光传输到组织部位;以及检测器，被配置为在组织吸收之后接收光。检测器响应光的强度产生信号并将信号传送给监视器。监视器可读取信息元素以识别传感器应用程序。监视器响应于信息元素预设至少一个用户可选择的操作参数。