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(54) **MEDICAL SENSOR**

MEDIZINISCHER SENSOR

CAPTEUR MEDICAL

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to medical devices and, more particularly, to sensors used for sensing physiological parameters of a patient.

[0002] This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present invention, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present invention. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

[0003] In the field of medicine, doctors often desire to monitor certain physiological characteristics of their patients. Accordingly, a wide variety of devices have been developed for monitoring many such characteristics of a patient. Such devices provide doctors and other healthcare personnel with the information they need to provide the best possible healthcare for their patients. As a result, such monitoring devices have become an indispensable part of modern medicine.

[0004] One technique for monitoring certain physiological characteristics of a patient is commonly referred to as pulse oximetry, and the devices built based upon pulse oximetry techniques are commonly referred to as pulse oximeters. Pulse oximetry may be used to measure various blood flow characteristics, such as the blood-oxygen saturation of hemoglobin in arterial blood, the volume of individual blood pulsations supplying the tissue, and/or the rate of blood pulsations corresponding to each heartbeat of a patient. In fact, the "pulse" in pulse oximetry refers to the time varying amount of arterial blood in the tissue during each cardiac cycle.

[0005] Pulse oximeters typically utilize a non-invasive sensor that transmits electromagnetic radiation, such as light, through a patient's tissue and that photoelectrically detects the absorption and scattering of the transmitted light in such tissue. One or more of the above physiological characteristics may then be calculated based upon the amount of light absorbed and scattered. More specifically, the light passed through the tissue is typically selected to be of one or more wavelengths that may be absorbed and scattered by the blood in an amount correlative to the amount of the blood constituent present in the tissue. The measured amount of light absorbed and scattered may then be used to estimate the amount of blood constituent in the tissue using various algorithms.

[0006] Pulse oximetry readings measure the pulsatile, dynamic changes in amount and type of blood constituents in tissue. Other events besides the pulsing of arterial blood may lead to modulation of the light path, direction, and the amount of light detected by the sensor, creating error in these measurements. Pulse oximetry is sensitive to movement, and various types of motion may cause

artifacts that may obscure the blood constituent signal. For example, motion artifacts may be caused by moving a sensor in relation to the tissue, by increasing or decreasing the physical distance between emitters and detectors in a sensor, by changing the direction of emitters or detectors with respect to tissue or each other, by changing the angles of incidence and interfaces probed by the light, by directing the optical path through different amounts or types of tissue, or by expanding, compressing or otherwise altering tissue near a sensor. In the emergency room, critical care, intensive care, and trauma center settings, where pulse oximetry is commonly used for patient monitoring, the wide variety of sources of motion artifacts includes moving of a patient or the sensor by healthcare workers, physical motion of an unanaesthetised or ambulatory patient, shivering, seizures, agitation, response to pain and loss of neural control. These motions oftentimes have similar frequency content to the pulse, and may lead to similar or even larger optical modulations than the pulse.

[0007] Two categories of pulse oximetry sensors in common use may be classified by their pattern of use: the disposable and the reusable sensor. Disposable sensors are typically flexible bandage-type structures that may be attached to the patient with adhesive materials, providing a contact between the patient's skin and the sensor components. Disposable sensors have multiple advantages, including ease of conformation to the patient. The flexible nature of disposable sensors further renders them susceptible to motion artifacts caused by mechanical deformation of the sensor, which changes the amount of light detected. Reusable sensors, often semi-rigid or rigid clip-type devices, are also vulnerable to motion artifacts, such as artifacts caused by partial opening of the clip in response to patient motion. Both categories of sensors may have modulations of detected light induced by the physical motion of the sensor components with respect to each other and the tissue.

[0008] Motion artifacts may sometimes be addressed by signal processing and filtering to mitigate the effects of motion after the motion has occurred. However, it would be desirable to provide a sensor that reduces the occurrence of movement that may lead to motion artifacts.

[0009] EPO898933 describes a measuring sensor comprising detector legs which are tiltable relative to each other around a pivoting axis having detector and emission elements, operating legs attached to the detector legs and a spring element between the operating legs that produce a compressive force between the detector legs.

[0010] WO03001180 discloses a member-illuminating cuff comprising a hinged cuff housing, one or more light sources mounted on a first section of the housing and a disposable inflatable cuff adapted to fit within the cuff housing and around a body member placed herein.

[0011] US20020026109 describes an optical probe having an emitter which transmits optical radiation and

a detector configured to detect the optical radiation transmitted by the emitter. The probe also has a flexible circuit assembly having circuit paths for connection with the emitter and the detector. A substrate forms a surface of the flex circuit assembly between the detector and the emitter.

SUMMARY

[0012] The present invention is defined in the accompanying independent claims. Some particular features are defined in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Advantages of the invention may become apparent upon reading the following detailed description and upon reference to the drawings in which:

Fig. 1 illustrates a perspective view of an exemplary bandage-style pulse oximetry sensor with a stiffening member on the tissue-contacting side of the sensor body;

Fig. 2 illustrates a perspective view of an exemplary bandage-style pulse oximetry sensor with a brass stiffening member applied to the surface of the sensor body that does not contact a patient's tissue during normal use;

Fig. 3 illustrates a perspective view of an exemplary bandage-style pulse oximetry sensor with two fluid-filled chambers separated by a breakable barrier; and

Fig. 4 illustrates a pulse oximetry system coupled to a multi-parameter patient monitor and a sensor according to embodiments of the present invention.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0014] One or more specific embodiments of the present invention will be described below. In an effort to provide a concise description of these embodiments, not all features of an actual implementation are described in the specification. It should be appreciated that in the development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

[0015] In accordance with the present technique, sensors for pulse oximetry or other applications utilizing spectrophotometry are provided that reduce motion arti-

facts by fixing the optical distance between an emitter and a detector when the sensor is applied to a patient. For example, in one embodiment, a conformable sensor is provided that has a stiffening member adapted to hold the emitter and detector at a fixed optical distance when the sensor is applied to a patient. In another embodiment, an annular or partially annular sensor is provided that maintains a fixed optical distance between an emitter and a detector when the sensor is applied to a patient's digit. Further, in an additional embodiment, a clip-style sensor is provided that holds the emitter and detector at a fixed optical distance.

[0016] Motion artifacts in pulse oximetry are often generated by the movement of the pulse oximetry sensor relative to the optically probed tissue, which is typically caused by patient movement. Because pulse oximetry is often used in settings where it is difficult to prevent patient motion, it is desirable to provide a mechanism for reducing the effects of motion on the pulse oximetry measurement. Generally, sensors are vulnerable to motion artifacts when the optical distance between a sensor's emitter and detector varies due to an undesired mechanical change in the conformation of the sensor while in use.

[0017] A change in optical distance may include any change in position or geometry of the emitter and/or the detector relative to the tissue or relative to each other. More specifically, a change in optical distance may involve a change in the path length, a change in the angle of the emitter or detector relative to one another, and/or a change in the angle of the emitter or detector relative to the tissue. For example, a tapping or pressing motion by a patient may serve to compress a flexible bandage sensor, decreasing the path length between the emitter and detector. Alternatively, a tapping or pressing motion may partially open a clip-type sensor through pressure on the clip spring, thus increasing the path length between the emitter and detector. For both a bandage and a clip-style sensor, a jerking or flexing motion may separate the emitter and detector, thus increasing the optical path length. Additionally, any of the above motions may twist or bend the sensor, causing the angle of the emitter and/or the detector to change relative to the sensor and each other. As sensors do not typically emit nor detect light omnidirectionally; any motions that lead to variations in angle of sensor components may alter the amount of light detected, and may force detected light through different portions of tissue. In any case, variability in the optical path length due to motion can cause motion artifacts and obscure the desired pulse oximetry signal. Thus, it is desirable that a sensor's emitter and detector are held at a substantially fixed optical distance with respect to one another.

[0018] By holding a sensor's emitter and detector at a substantially fixed optical position with respect to one another, the sensors provided herein limit the modulations of detected light that may occur and the resulting measurement errors. These sensors substantially reduce the

occurrence of motion artifacts by reducing the change in position of the sensing components of the sensor with respect to each other and the tissue.

[0019] Keeping in mind the preceding points, the following exemplary sensor designs are provided as examples of sensors that reduce motion artifacts by maintaining a fixed optical distance between an emitter and a detector of a sensor 10. It should be appreciated that a sensor 10 according to the present teachings may be adapted for use on any digit, and may also be adapted for use on a forehead, earlobe, or other sensor site. For example, a sensor 10 may be a clip-style sensor, appropriate for a patient earlobe or digit. Alternatively, a sensor 10 may be a bandage-style or wrap-style sensor for use on a digit or forehead. Further, it should be appreciated that a sensor 10 may also include adhesives to facilitate securing of the sensing elements to the tissue. In certain embodiments, the adhesives may include an adhesive coating on the tissue-contacting surface of the sensor 10.

[0020] In accordance with some embodiments of the present technique, sensors for pulse oximetry or other applications utilizing spectrophotometry are provided having a stiffening member to reduce variability in the optical distance between an emitter and a detector. For example, Fig. 1 illustrates an exemplary transmission-type bandage sensor appropriate for use on a patient digit. As shown in Fig. 1, a sensor 10A may have a stiffening member 12 that is applied to a conformable sensor body 14. The stiffening member 12 may be applied to a tissue-contacting surface 16, adhesively or otherwise. As the stiffening member 12 may come into contact with a patient's tissue, it may be generally constructed to have no sharp edges in order to avoid patient discomfort. The stiffening member 12 may have windows or other openings (not shown) suitably sized to accommodate an emitter 18 and a detector 20. The stiffening member 12 may be applied such that the windows or openings are in-line with the emitter and the detector to allow for normal light emitting and photodetecting function. The sensor 10A may optionally include an optically transparent adhesive layer 22 for affixing the sensor to the digit. The adhesive layer 22 may be generally sized and shaped to cover the tissue-contacting surface 16 of the conformable sensor body 22. When the sensor 10A is applied to a patient's digit, the stiffening member is bent or otherwise shaped to conform to the digit. The sensor 10A is applied such that the emitter 18 and the detector 20 lie on opposing side of the digit. After application of the sensor 10A, the emitter 18 and the detector 20 are substantially resistant to movement relative to one another.

[0021] The stiffening member 12 (and stiffening members 36 and 42, below) may be constructed from any suitable material that functions to hold the emitter and the detector of a sensor at a substantially fixed optical distance when the sensor 10A is applied to a patient. For example, a suitable stiffening member 12 may be metal, plastic or polymeric, or cardboard. In certain embodiments, suitable metals include aluminum or brass. The

stiffening member 12 may be in the shape of a strip, wire, or mesh that can be easily adapted for use with a conformable sensor body 14. The stiffening member 12 may be adapted to be easily bent, shaped, activated, or applied to a conformable sensor body 14 in order to hold an emitter and a detector at a substantially fixed optical distance. The stiffening member 12 may be sized to substantially cover a majority of the tissue-contacting surface 16, or for reasons related to cost or total sensor weight, may be sized to form a strip that is generally in the area surrounding the emitter 18 and the detector 20.

[0022] In certain embodiments, it may be advantageous to apply a stiffening member to a sensor surface that does not contact a patient's tissue during normal use. For example, certain patients may be sensitive to metals, and thus in certain circumstances it may be desirable to limit the amount of skin contact with a metal stiffening member. For those patients, a sensor 10B as shown in Fig. 2 may be appropriate. Fig. 2 shows an embodiment of a sensor 10B in which a brass stiffening member 24 is applied to a surface 26 that does not contact the tissue during normal use of the sensor 10B. The brass stiffening member 24 is applied to the surface 26 along an imaginary axis connecting an emitter 28 and a detector 30. When the sensor 10B is applied to a patient's digit, the brass stiffening member 24 is bent to conform to the digit without coming in contact with the patient's tissue. In an alternate embodiment (not shown), the sensor 10B is adapted to operate in reflectance mode. The emitter 28 and detector 30 are positioned on the sensor body such that they lie side-by-side when applied to a patient's digit.

[0023] An embodiment in which a fluid-containing stiffening member may be activated upon application of the sensor to a patient is illustrated in Fig. 3. Fig. 3 depicts a sensor 10H with a first chamber 78 filled with a first material 80, and second chamber 82 filled with a second material 84. A barrier 86 separates the first chamber 78 and second chamber 82. The barrier 86 is capable of being broken upon applying the sensor 82 to a patient. After the breaking of the barrier 86, the first material 80 and the second material 84 will mix and form a composition that is capable of hardening, thus stabilizing the optical distance between the emitter 88 and detector 90. For example, the first material 80 may be cement or plaster, and the second material 84 may be water. In another embodiment, the first material 80 may be epoxy. In another embodiment, the first material 80 may be one part of a two-part epoxy in which a first part of the epoxy, such as the base, is the first materials 80, and a second part of the epoxy, such as the catalyst or hardener, is the second material 84. Two part epoxies that may be used with a sensor 10H include Loctite® 30680 (available from Henkel, Rocky Hill, CT), Blu-Mousse® (available from Parkell, Inc., Farmindale, NY), LuxaCore® Smartmix dual from DMG (available from DMG, Englewood, NJ), and Exaflex (available from GC America, Inc., Alsip, IL).

[0024] In alternate embodiments, a stiffening member

may be conditionally activated when exposed to air or light, placed in contact with skin, attached to the sensor site, conformed to fit to the sensor site, subjected to a specific environmental condition (e.g. when exposed to body or room temperatures), subjected to a specific chemical reaction, programmed by software, or subjected to external force, (e.g. from the tissue being probed by the sensor). For example, a conditionally activated stiffening member may be a vacuum-packed polymer that forms a rigid precipitate upon exposure to oxygen or water vapor. In other embodiments, the stiffening member may include a light curing adhesive such as Loctite® Flashcure-4305 (available from Henkel, Rocky Hill, CT). In another embodiment, the stiffening member may include a material undergoes a chemical hardening, such as a crystallization upon exposure to a crystal seed. One such material is supersaturated sodium acetate solution that is exposed to a sodium acetate crystal. Other suitable materials for forming conditionally activated stiffening members include polyurethane and polystyrene foams that, for example, may expand and stiffen upon exposure to air.

[0025] A sensor, illustrated generically as a sensor 10, may be used in conjunction with a pulse oximetry monitor 140, as illustrated in FIG. 4. It should be appreciated that the cable 142 of the sensor 10 may be coupled to the monitor 140 or it may be coupled to a transmission device (not shown) to facilitate wireless transmission between the sensor 10 and the monitor 140. The monitor 140 may be any suitable pulse oximeter, such as those available from Nellcor Puritan Bennett Inc. Furthermore, to upgrade conventional pulse oximetry provided by the monitor 140 to provide additional functions, the monitor 140 may be coupled to a multi-parameter patient monitor 144 via a cable 146 connected to a sensor input port or via a cable 148 connected to a digital communication port.

[0026] The sensor 10 includes an emitter 150 and a detector 152 that may be of any suitable type. For example, the emitter 150 may be one or more light emitting diodes adapted to transmit one or more wavelengths of light in the red to infrared range, and the detector 152 may one or more photodetectors selected to receive light in the range or ranges emitted from the emitter 150. Alternatively, an emitter 150 may also be a laser diode or a vertical cavity surface emitting laser (VCSEL). An emitter 150 and detector 152 may also include optical fiber sensing elements. An emitter 150 may include a broadband or "white light" source, in which case the detector could include any of a variety of elements for selecting specific wavelengths, such as reflective or refractive elements or interferometers. These kinds of emitters and/or detectors would typically be coupled to the rigid or rigidified sensor via fiber optics. Alternatively, a sensor 10 may sense light detected from the tissue is at a different wavelength from the light emitted into the tissue. Such sensors may be adapted to sense fluorescence, phosphorescence, Raman scattering, Rayleigh scattering and multi-photon events or photoacoustic effects. For

pulse oximetry applications using either transmission or reflectance type sensors the oxygen saturation of the patient's arterial blood may be determined using two or more wavelengths of light, most commonly red and near infrared wavelengths. Similarly, in other applications, a tissue water fraction (or other body fluid related metric) or a concentration of one or more biochemical components in an aqueous environment may be measured using two or more wavelengths of light, most commonly near infrared wavelengths between about 1,000 nm to about 2,500 nm. It should be understood that, as used herein, the term "light" may refer to one or more of , infrared, visible, ultraviolet, gamma ray or X-ray electromagnetic radiation, and may also include any wavelength within the, infrared, visible, ultraviolet, or X-ray spectra.

[0027] The emitter 150 and the detector 152 may be disposed on a sensor body 154, which may be made of any suitable material, such as plastic, foam, woven material, or paper. Alternatively, the emitter 150 and the detector 152 may be remotely located and optically coupled to the sensor 10 using optical fibers. In the depicted embodiments, the sensor 10 is coupled to a cable 142 that is responsible for transmitting electrical and/or optical signals to and from the emitter 150 and detector 152 of the sensor 10. The cable 142 may be permanently coupled to the sensor 10, or it may be removably coupled to the sensor 10 -- the latter alternative being more useful and cost efficient in situations where the sensor 10 is disposable.

[0028] The sensor 10 may be a "transmission type" sensor. Transmission type sensors include an emitter 150 and detector 152 that are typically placed on opposing sides of the sensor site. If the sensor site is a fingertip, for example, the sensor 10 is positioned over the patient's fingertip such that the emitter 150 and detector 152 lie on either side of the patient's nail bed. In other words, the sensor 10 is positioned so that the emitter 150 is located on the patient's fingernail and the detector 152 is located 180° opposite the emitter 150 on the patient's finger pad. During operation, the emitter 150 shines one or more wavelengths of light through the patient's fingertip and the light received by the detector 152 is processed to determine various physiological characteristics of the patient. In each of the embodiments discussed herein, it should be understood that the locations of the emitter 150 and the detector 152 may be exchanged. For example, the detector 152 may be located at the top of the finger and the emitter 150 may be located underneath the finger. In either arrangement, the sensor 10 will perform in substantially the same manner.

[0029] Reflectance type sensors also operate by emitting light into the tissue and detecting the light that is transmitted and scattered by the tissue. However, reflectance type sensors include an emitter 150 and detector 152 that are typically placed on the same side of the sensor site. For example, a reflectance type sensor may be placed on a patient's fingertip or forehead such that the emitter 150 and detector 152 lie side-by-side. Re-

flectance type sensors detect light photons that are scattered back to the detector 152. A sensor 10 may also be a "transflectance" sensor, such as a sensor that may subtend a portion of a baby's heel.

[0030] While the invention may be susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and have been described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Indeed, the present techniques may not only be applied to measurements of blood oxygen saturation, but these techniques may also be utilized for the measurement and/or analysis of other blood and/or tissue constituents using principles of pulse oximetry. For example, using the same, different, or additional wavelengths, the present techniques may be utilized for the measurement and/or analysis of carboxyhemoglobin, methemoglobin, total hemoglobin, fractional hemoglobin, intravascular dyes, and/or water content.

Claims

1. A sensor comprising: an emitter (88) and a detector (90) disposed on a conformable sensor body (64), a fluid containing stiffening member that has a first chamber (78) disposed on or in the sensor body comprising a first material (80) and a second chamber (82) disposed on or in the sensor body comprising a second material (84), wherein the first chamber (78) and the second chamber (82) are coupled by a breakable barrier and the first material hardens upon exposure to the second material to form a stiffening member adapted to hold the emitter and the detector at a substantially fixed optical distance, wherein the emitter and the detector are adapted to operate in a transmission mode or a reflectance mode.
2. The sensor, as set forth in claim 1, wherein the sensor comprises at least one of a blood constituent sensor or a tissue constituent sensor.
3. The sensor, as set forth in any of the preceding claims, wherein the sensor comprises at least one of a pulse oximetry sensor or a sensor for measuring a water fraction.
4. The sensor, as set forth in any of the preceding claims, wherein the sensor comprises at least one of a carboxyhemoglobin sensor or a methemoglobin sensor.
5. The sensor, as set forth in any of the preceding claims, wherein the sensor is adapted for intrauterine use.
6. The sensor, as set forth in any of the preceding

claims, wherein the emitter comprises at least one light emitting diode.

7. The sensor, as set forth in any of the preceding claims, wherein the detector comprises at least one photodetector.
8. The sensor, as set forth in any of the preceding claims, wherein the first material (80) comprises cement or plaster and the second material (84) comprises water.
9. The sensor, as set forth in any of the preceding claims, wherein the first material (80) comprises one part of a two-part epoxy.
10. A pulse oximetry system comprising: a pulse oximetry monitor; and a pulse oximetry sensor according to any one of the preceding claims adapted to be operatively coupled to the monitor.
11. A method of manufacturing a pulse oximetry sensor, comprising: providing a sensor body on which an emitter and a detector are disposed, wherein the sensor body is adapted to hold the emitter and the detector at a substantially fixed optical distance, wherein the sensor body is conformable; and forming a first and a second chamber of a fluid containing stiffening member, wherein the first and the second chamber are disposed on or in the sensor body and are coupled by a breakable barrier; and filling the first chamber with a first material and the second chamber with a second material, wherein the first material hardens upon exposure to the second material to form a stiffening member, further wherein the stiffening member is adapted to hold the emitter and the detector at the substantially fixed optical distance.

Patentansprüche

1. Sensor, umfassend: einen Emittter (88) und einen Detektor (90), welche auf einem anpassbaren Sensorkörper (64) angeordnet sind, ein Fluid enthaltendes Versteifungselement, welches eine erste auf dem oder in dem Sensorkörper angeordnete Kammer (78), welche ein erstes Material (80) umfasst, und eine zweite auf dem oder in dem Sensorkörper angeordnete Kammer (82) aufweist, welche ein zweites Material (84) umfasst, wobei die erste Kammer (78) und die zweite Kammer (82) mittels einer brechbaren Barriere verbunden sind und das erste Material durch Exposition gegenüber dem zweiten Material aushärtet, sodass es ein Versteifungselement bildet, welches zum Tragen des Emitters und des Detektors in einem im Wesentlichen festen optischen Abstand geeignet ist, wobei der Emittter und

der Detektor so ausgebildet sind, dass sie in einem Übertragungsmodus oder in einem Reflektionsmodus arbeiten.

2. Sensor nach Anspruch 1, wobei der Sensor zumindest einen von einem Blutbestandteilsensor und einem Gewebebestandteilsensor umfasst. 5
3. Sensor nach einem der vorhergehenden Ansprüche, wobei der Sensor zumindest einen von einem Puls-oxymetrie-Sensor und einem Wasseranteilmess-sensor umfasst. 10
4. Sensor nach einem der vorhergehenden Ansprüche, wobei der Sensor zumindest einen von einem Karboxyhämoglobinsensor oder einem Methämoglobinsensor umfasst. 15
5. Sensor nach einem der vorhergehenden Ansprüche, wobei der Sensor zum intrauterinen Einsatz geeignet ist. 20
6. Sensor nach einem der vorhergehenden Ansprüche, wobei der Emitter zumindest eine lichtemittierende Diode umfasst. 25
7. Sensor nach einem der vorhergehenden Ansprüche, wobei der Detektor zumindest einen Photodetektor umfasst. 30
8. Sensor nach einem der vorhergehenden Ansprüche, wobei das erste Material (80) Zement oder Gipsputz und das zweite Material (84) Wasser umfasst. 35
9. Sensor nach einem der vorhergehenden Ansprüche, wobei das erste Material (80) einen Teil eines zweiteiligen Epoxids umfasst. 40
10. Pulsoxymetrie-System, umfassend: einen Pulsoxymetrie-Monitor; und einen Pulsoxymetrie-Sensor nach einem der vorhergehenden Ansprüche, welcher zum betriebsmäßigen Verbinden mit dem Monitor geeignet ist. 45
11. Verfahren zum Herstellen eines Pulsoxymetrie-Sensors, umfassend: Bereitstellen eines Sensorkörpers, auf dem ein Emitter und ein Detektor angeordnet sind, wobei der Sensorkörper zum Tragen des Emitters und des Detektors in einem im Wesentlichen festen optischen Abstand geeignet ist, wobei der Sensorkörper anpassbar ist; und das Herstellen einer ersten und zweiten Kammer eines Fluid enthaltenden Versteifungselements, wobei die erste und die zweite Kammer auf dem oder innerhalb des Sensorkörpers angeordnet und mittels einer brechbaren Barriere verbunden sind; und Füllen der ersten Kammer mit einem ersten Material und der zweiten Kammer mit einem zweiten Material, wobei das erste 50

Material durch Exposition gegenüber dem zweiten Material aushärtet, sodass es ein Versteifungselement bildet, ferner wobei das Versteifungselement zum Tragen des Emitters und des Detektors in einem im Wesentlichen festen optischen Abstand geeignet ist.

Revendications

1. Capteur, comprenant : un émetteur (88) et un détecteur (90) agencés sur un corps de capteur (64) adaptable, un élément de rigidification contenant un fluide, qui présente une première chambre (78) agencée sur ou dans le corps de capteur et comprenant un premier matériau (80) et une deuxième chambre (82) agencée sur ou dans le corps de capteur et comprenant un deuxième matériau (84), dans lequel la première chambre (78) et la deuxième chambre (82) sont couplées grâce à une barrière cassable et le premier matériau durcit lorsqu'il est exposé au deuxième matériau afin de former un élément de rigidification conçu pour maintenir l'émetteur et le détecteur à une distance optique essentiellement fixe, l'émetteur et le détecteur étant conçus pour fonctionner en un mode d'émission ou en mode de réflexion.
2. Capteur selon la revendication 1, dans lequel le capteur comprend au moins un parmi un capteur de composant sanguin ou un capteur de composant tissulaire.
3. Capteur selon l'une quelconque des revendications précédentes, dans lequel le capteur comprend au moins un parmi un capteur d'oxymétrie de pouls ou un capteur permettant de mesurer une fraction aqueuse.
4. Capteur selon l'une quelconque des revendications précédentes, dans lequel le capteur comprend au moins un parmi un capteur de carboxyhémoglobine ou un capteur de méthémoglobine.
5. Capteur selon l'une quelconque des revendications précédentes, dans lequel le capteur est conçu pour un usage intra-utérin.
6. Capteur selon l'une quelconque des revendications précédentes, dans lequel l'émetteur comprend au moins une diode électroluminescente.
7. Capteur selon l'une quelconque des revendications précédentes, dans lequel le détecteur comprend au moins un photo-détecteur.
8. Capteur selon l'une quelconque des revendications précédentes, dans lequel le premier matériau (80) comprend du ciment ou du plâtre et le deuxième ma-

tériau (84) comprend de l'eau.

9. Capteur selon l'une quelconque des revendications précédentes, dans lequel le premier matériau (80) comprend une partie d'une résine époxy en deux parties. 5
10. Système d'oxymétrie de pouls comprenant : un moniteur d'oxymétrie de pouls ; et un capteur d'oxymétrie de pouls selon l'une quelconque des revendications précédentes conçu pour être couplé de manière fonctionnelle audit moniteur. 10
11. Procédé de fabrication d'un capteur d'oxymétrie de pouls, comprenant les étapes consistant à : fournir un corps de capteur sur lequel sont agencés un émetteur et un détecteur, dans lequel le corps de capteur est conçu pour maintenir l'émetteur et le détecteur à une distance optique essentiellement fixe, dans lequel le corps de capteur est adaptable ; et former des première et deuxième chambres d'un élément de rigidification contenant un fluide, dans lequel les première et deuxième chambres sont agencées sur ou dans le corps de capteur et sont couplées grâce à une barrière cassable ; et remplir la première chambre avec un premier matériau et la deuxième chambre avec un deuxième matériau, dans lequel le premier matériau durcit lorsqu'il est exposé au deuxième matériau afin de former un élément de rigidification, et en outre dans lequel l'élément de rigidification est conçu pour maintenir l'émetteur et le détecteur à ladite distance optique essentiellement fixe. 15
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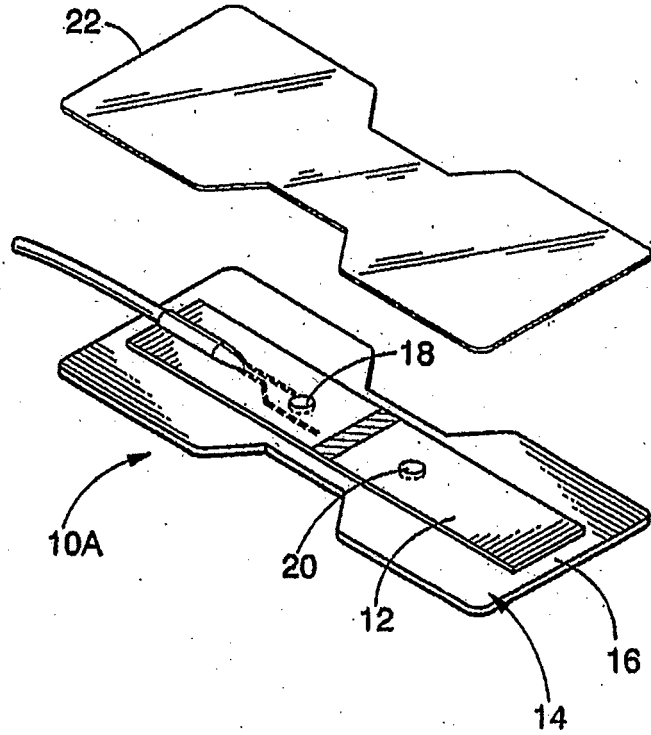


FIG. 1

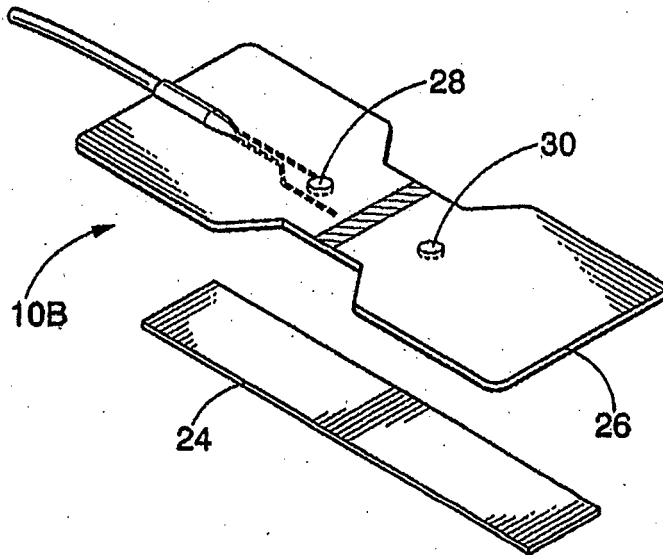


FIG. 2

FIG. 3

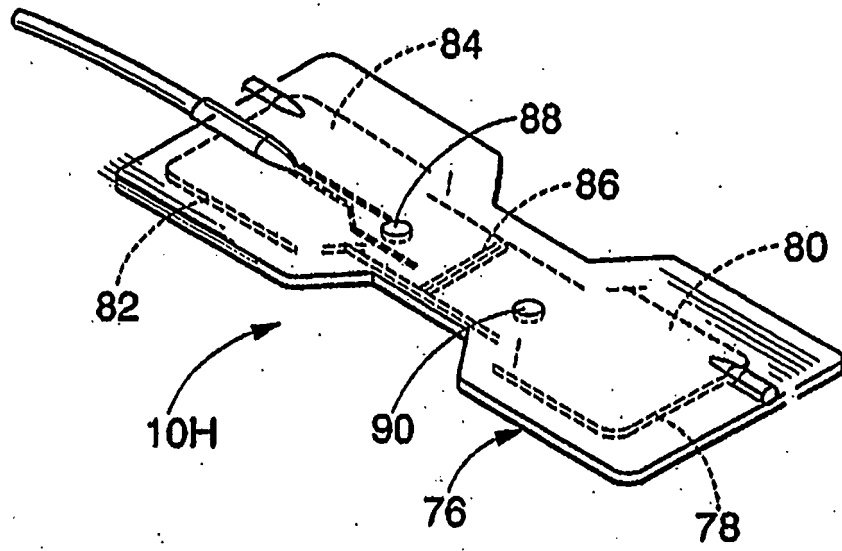
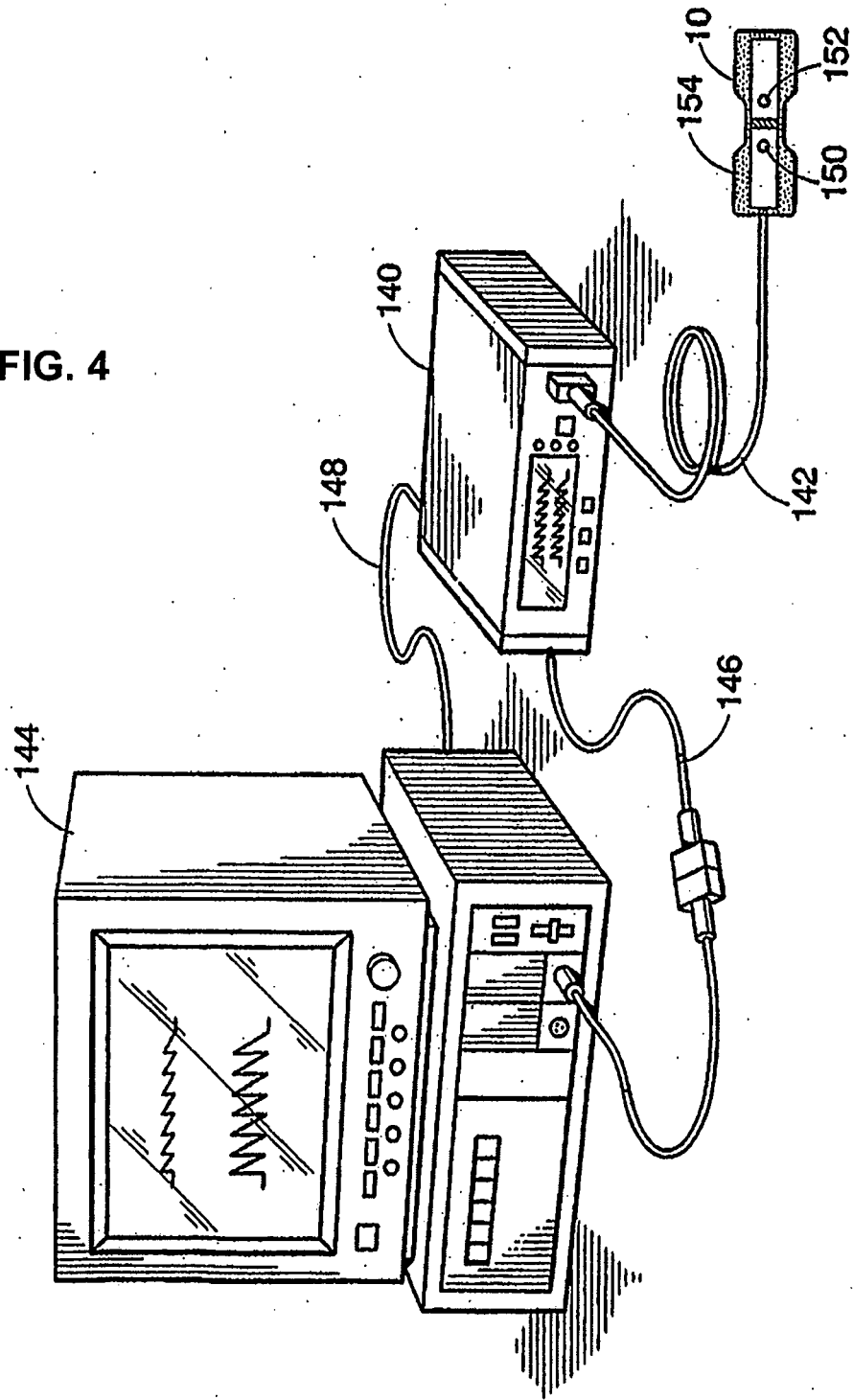


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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专利名称(译)	医疗传感器		
公开(公告)号	EP1928303B1	公开(公告)日	2016-04-20
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优先权	11/241375 2005-09-29 US		
其他公开文献	EP1928303A1		
外部链接	Espacenet		

摘要(译)

用于脉搏血氧测定法或利用分光光度法的其他应用的传感器可以适于通过固定发射器和检测器之间的光学距离来减少运动伪影。柔性传感器设置有加强构件，以在应用于患者时将传感器的发射器和检测器保持在相对固定的位置。此外，环形或部分环形传感器适于在应用于患者时将传感器的发射器和检测器保持在相对固定的位置。夹式传感器设有间隔器，用于控制发射器和检测器之间的距离。

