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(54) **Pulse oximeter sensor with widened strip**

Pulsoximetersensor mit einem breiteren Band

Capteur de sphymo-oxymètre comprenant une bande élargie

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(73) Proprietor: **MALLINCKRODT INC.**
Hazelwood, MO 63042 (US)

(72) Inventor: **Chin, Rodney**
Oakland, CA 94611 (US)

(74) Representative: **Docherty, Andrew John et al**
Marks & Clerk LLP
Aurora
120 Bothwell Street
Glasgow
G2 7JS (GB)

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to pulse oximeter sensors, and in particular to techniques for shielding against ambient light and preventing delamination of flexible, disposable sensors.

[0002] A type of pulse oximeter sensor that is commonly used is a flexible, disposable sensor. It typically has multiple layers, with white layers on the outside visible to the user. The white gives the image of cleanliness and sterility, and also is opaque to certain wavelengths of light over the range of the photodetector's sensitivity. An example of a sensor referring to a white opaque layer is set forth in Patent No. 4,865,038.

[0003] A number of these sensors include metalized layers which can be either a conductive shield or a shield from ambient light. See, for example. Patent Nos. 4,928,691; 5,246,003; 5,094,240; 5,054,488; and 4,964,408. Patent No. 4,928,691 refers to the use of a red layer to avoid ambient light.

[0004] EPA-0 127 947 discloses a pulse oximeter sensor having a sequential construction wherein photo-active elements are fastened with the inactive side down to an opaque vinyl strip having an adhesive surface. Likewise, a porous, flexible adhesive tape overlies the opaque vinyl strip and a porous flexible tape layer having an adhesive side. The tape is elongate and formed in a butterfly design. A second rectangular opaque vinyl tape is placed over the photo-active elements. This tape has a downwardly exposed adhesive layer and effects capture of the light source substrate and the photo-sensor substrate. Apertures in the second tape allow light to pass.

[0005] Ambient light can interfere with the operation of a pulse oximeter, especially under the bright lights of surgery or in outdoor, daylight conditions. While the use of a metal layer has been effective to shield from such ambient light, there is also a competing desire to have transparency in order to observe how a sensor is attached. In addition, the introduction of additional layers into the sensor is susceptible to sensor failure by delamination.

[0006] Accordingly, it would be desirable to have a sensor which would shield against ambient light, be resistant to delamination and have some transparency.

SUMMARY OF THE INVENTION

[0007] The present invention provides a pulse oximeter sensor as defined in claim 1. The sensor comprises non-transparent strips to shield from ambient light. The non-transparent strips have a widened portion in the area around the light detector.

[0008] The widened portion of the strips, resist delamination stresses.

[0009] It is preferred that the wires connecting to the emitter take an angular path, preferably crossing over from one side of the detector, across a center line between the emitter and detector, to an opposite side of the emitter. This angular path. as opposed to a straight path, disperses stresses caused by the wires. further inhibiting delamination or separation of the layers of the sensor.

[0010] In a preferred embodiment, the widened area of the non-transparent strips has a semi-circular profile around the photodetector. Other profiles are defined in the dependent claims.

[0011] For a further understanding of the nature and advantages of the invention, reference should be made to the following description taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is an exploded view of a sensor according to the present invention showing the different layers.

DESCRIPTION OF THE SPECIFIC EMBODIMENTS

[0013] Fig. 1 illustrates a sensor 10 according to the invention. The sensor includes a transparent layer 12 which is wider than a white layer 14 mounted on top of it. On top of white layer 14, is mounted a correspondingly-shaped metalized layer 16. On metalized layer 16 is mounted another white layer 18 having holes 20 and 22 allowing light to pass fromito the emitter and detector. The emitter and detector are mounted on metalized layer 16. Adhesives may be used between the layers for mounting.

[0014] As can be seen, metalized layer 16 includes a widened region defined by a curved perimeter 26. Similar widened regions 28 and 30 are found on white strips 18 and 14, respectively. This widened area surrounds the photodetector 32. Such a widened area prevents ambient light from reaching the photodetector and disturbing its readings. At the same time, by only widening a portion of the strip, other areas of transparent layer 12 allow viewing of the patient when the sensor is attached. This allows, fer example, an examination of how tightly the sensor is secured to the patient by looking through transparent layer 12.

[0015] Widened area 26 and corresponding widened areas 28 and 30 also resist delamination. As opposed to a straight line strip, these areas are curved such that when the sensor is wrapped around a user's finger or other appendage, the stresses are dispersed rather than being focused on a line. Accordingly, it has been found that this design resists delamination and has fewer failures than a straight strip.

[0016] Another stress that can result in delamination is the stress induced by the wires 34 which connect to the emitter or light emitting diode (LED) 36. It is possible to reduce the stresses by providing an angular path of wires 34 between cable 38 and photo emitter or LEDs

36. In prior devices, the wires were laid out in a straight line, which was found to contribute to delamination. The angular path where the wires start out beside photodetector 32 and cross the center line between the photodetector and emitter, then above emitter 36 reduces the stresses.

[0017] In addition, the wires circle around and attach to photo emitter 36 from the backside, as in previous devices. Also, as in previous devices, photodetector 32, which attached to a coaxial cable 40 inside cable 38. is mounted closer to cable 38 so that the coaxial cable extends onto less of the sensor.

[0018] Preferably, metalized layer 16 is a layer of aluminized mylar having a thickness of less than 1 mm. The curved area 26 preferably extends for at least three-quarters of an inch, more preferably slightly more than one inch along the length of strip 16. It preferably extends outward from the straight edge of strip 16 by at least one-eighth of an inch, more preferably approximately one-quarter inch.

[0019] Fig. 1 also shows a Faraday shield 42 which wraps around photodetector 32. It is shown partially open in Fig. 1. The Faraday shield is preferably a piece of copper which is solid metal, except for a mesh portion directly above photodetector 32. In one embodiment, part of Faraday shield 42 attaches directly to metal layer 16.

[0020] As will be understood by those of skill in the art, the present invention may be embodied in other specific forms without departing from the essential characteristics thereof. For example, the widened area could be any shape, not just semi-circular. It could be more of an oval shape, square, trapezoidal, etc. Additionally, the metalized layer need not extend the entire length of the sensor, but could simply be in the area around the photodetector, or around the photodetector and photo emitter. Additionally, wires 34 could take any other angular path between the emitter and detector. Also, the strips themselves could be other shapes, with the transparent strip 12 in particular having other patterns for the portion which is viewable. Parts (layers) may have translucent layered components as well as transparent layered components. Layer 16 could be a metalized translucent layer. Layer 12 can be transparent. Layer 18 can be reflective white layer. Layer 24 is not used in a preferred embodiment. Layer 24 can be added if delamination is a problem. In one embodiment there are adhesive layers between each of layers 12, 14 16, and 18.

[0021] Accordingly, the foregoing description is intended to be illustrative, but not limiting, of the scope of the invention which is set forth in the following claims.

Claims

1. A pulse oximeter sensor (10) comprising:

a first non-transparent strip (16) having a wider portion;

a light emitter (36) mounted on a first side of said first non-transparent strip (16) to emit light away from said first non-transparent strip (16);

a light detector (32) mounted on said first side of said first non-transparent strip (16) adjacent said wider portion of said first non-transparent strip;

said first non-transparent strip (16) extending at least from said emitter to said detector;

a second non-transparent strip (18) mounted over said light emitter and said detector, said second non-transparent strip (18) having holes over said light emitter (36) and detector (32), said second non-transparent strip (18) having a wider portion matching the shape of said wider portion of said first non-transparent strip (16); and

an adhesive layer disposed on said second non-transparent strip.

2. The pulse oximeter sensor (10) according to claim 1 wherein the wider portion of the second opaque layer has semi-circular shape.

3. The pulse oximeter sensor (10) according to claim 1 wherein the wider portion of the second opaque layer has an oval shape.

4. The pulse oximeter sensor (10) according to claim 1 wherein the wider portion the second opaque layer has a square shape.

5. The pulse oximeter sensor (10) according to claim 1 wherein the wider portion of the second opaque layer has a trapezoidal shape.

Patentansprüche

1. Pulsoximetersensor (10), umfassend:

einen ersten undurchsichtigen Streifen (16) mit einem breiteren Abschnitt;

einen Lichtemitter (36), der auf einer ersten Seite des ersten undurchsichtigen Streifens (16) angebracht ist, um Licht von dem ersten undurchsichtigen Streifen (16) weg zu emittieren;

einen Lichtdetektor (32), der auf der ersten Seite des ersten undurchsichtigen Streifens (16) angrenzend an den breiteren Abschnitt des ersten undurchsichtigen Streifens angebracht ist;

wobei sich der erste undurchsichtige Streifen (16) mindestens vom Emitter zum Detektor erstreckt;

einen zweiten undurchsichtigen Streifen (18), der über dem Lichtemitter und dem Detektor angebracht ist, wobei der zweite undurchsichtige Streifen (18) Löcher über dem Lichtemitter (36)

und dem Detektor (32) aufweist, wobei der zweite undurchsichtige Streifen (18) einen breiteren Abschnitt aufweist, der der Form des breiteren Abschnitts des ersten undurchsichtigen Streifens (16) entspricht; und
eine Klebeschicht, die auf dem zweiten undurchsichtigen Streifen angeordnet ist.

2. Pulsoximetersensor (10) nach Anspruch 1, wobei der breitere Abschnitt der zweiten lichtundurchlässigen Schicht halbkreisförmig ist.

3. Pulsoximetersensor (10) nach Anspruch 1, wobei der breitere Abschnitt der zweiten lichtundurchlässigen Schicht ovalförmig ist.

4. Pulsoximetersensor (10) nach Anspruch 1, wobei der breitere Abschnitt der zweiten lichtundurchlässigen Schicht quadratförmig ist.

5. Pulsoximetersensor (10) nach Anspruch 1, wobei der breitere Abschnitt der zweiten lichtundurchlässigen Schicht trapezförmig ist.

Revendications

1. Capteur d'oximètre de pouls (10), comprenant:

une première bande non transparente (16) avec une partie large;
un émetteur de lumière (36), monté sur un premier côté de ladite première bande non transparente (16) pour émettre une lumière s'éloignant de ladite première bande non transparente (16);
un détecteur de lumière (32), monté sur ledit premier côté de ladite première bande non transparente (16) à proximité de ladite portion large de ladite première bande non transparente;
ladite première bande non transparente (16) s'étendant au moins depuis ledit émetteur vers ledit détecteur;
une deuxième bande non transparente (18) montée au-dessus dudit émetteur de lumière et dudit détecteur, ladite deuxième bande non transparente (18) comportant des trous au-dessus dudit émetteur de lumière (36) et dudit détecteur (32), ladite deuxième bande non transparente (18) comportant une partie large correspondant à la forme de ladite partie large de ladite première bande non transparente (16); et
une couche adhésive disposée sur ladite deuxième bande non transparente.

2. Capteur d'oximètre de pouls (10) selon la revendication 1, dans lequel la partie large de la deuxième couche opaque a une forme semi-circulaire.

3. Capteur d'oximètre de pouls (10) selon la revendication 1, dans lequel la partie large de la deuxième couche opaque a une forme ovale.

4. Capteur d'oximètre de pouls (10) selon la revendication 1, dans lequel la partie large de la deuxième couche opaque a une forme carrée.

5. Capteur d'oximètre de pouls (10) selon la revendication 1, dans lequel la partie large de la deuxième couche opaque a une forme trapézoïdale.

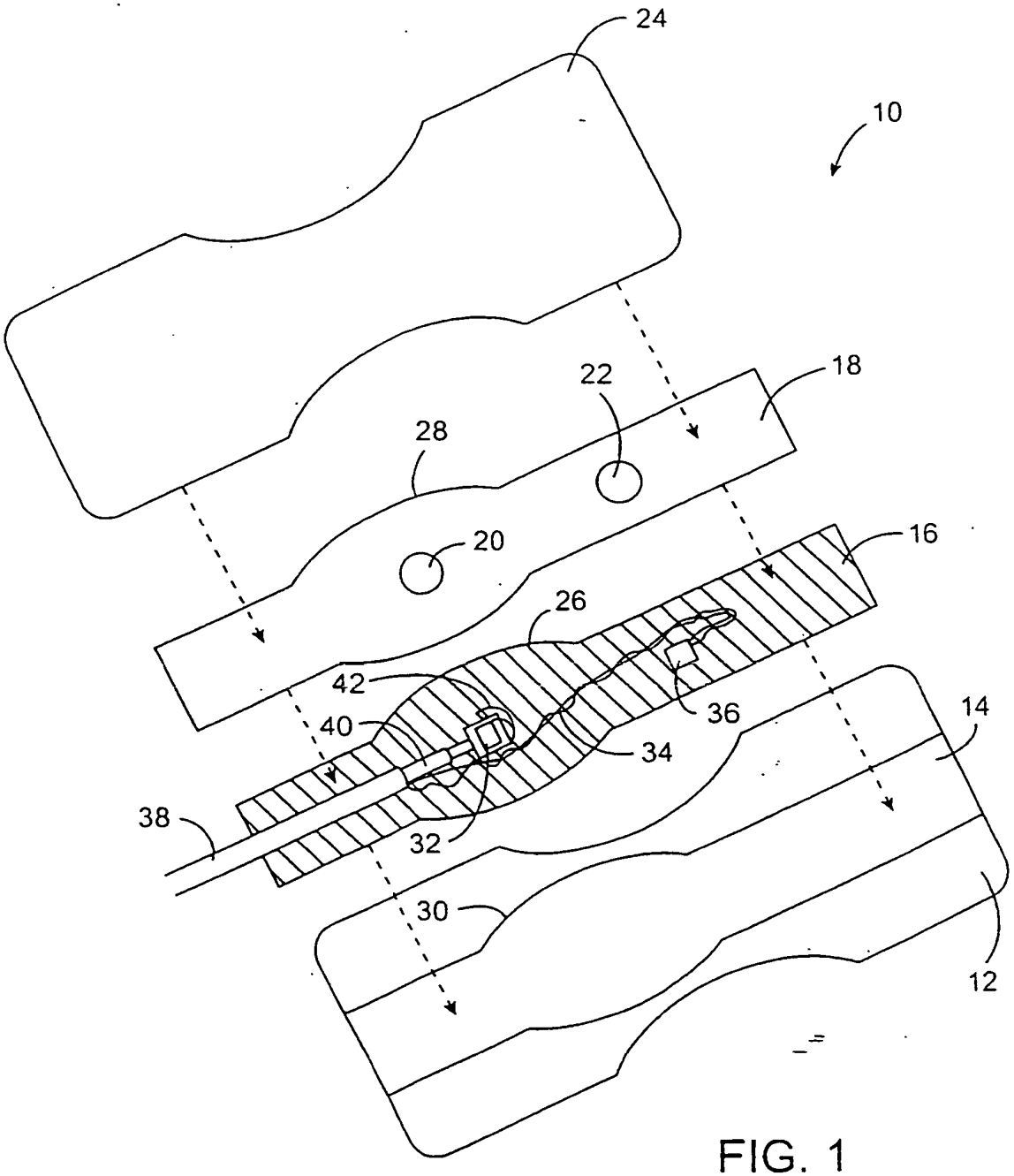

FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4865038 A **[0002]**
- US 4928691 A **[0003]**
- US 5246003 A **[0003]**
- US 5094240 A **[0003]**
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- US 4964408 A **[0003]**

专利名称(译)	脉冲血氧计传感器带加宽带		
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[标]申请(专利权)人(译)	马林克罗特公司		
申请(专利权)人(译)	马林克罗特INC.		
当前申请(专利权)人(译)	马林克罗特INC.		
[标]发明人	CHIN RODNEY		
发明人	CHIN, RODNEY		
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摘要(译)

一种脉冲血氧计传感器，具有不透明的金属化层（16）以屏蔽环境光，以及粘合剂层（24.金属化层（16）围绕光检测器（32）的区域并且具有邻近于光检测器（32）的较宽部分。光探测器（32。

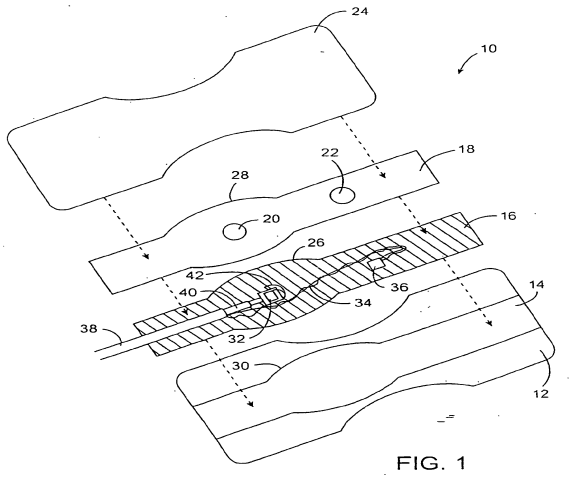

FIG. 1