

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 January 2005 (13.01.2005)

PCT

(10) International Publication Number
WO 2005/002434 A1

(51) International Patent Classification⁷: **A61B 5/00**

[US/US]; 1450 Andrews Street, San Luis Obispo, CA 93401 (US). **MANNHEIMER, Paul, D.** [US/US]; 4119 Sugar Maple Drive, Danville, CA 94506 (US).

(21) International Application Number:
PCT/US2004/020672

(74) Agents: **KUSHA, Babak** et al.; TOWNSEND AND TOWNSEND AND CREW LLP, Two Embarcadero Center, Eighth Floor, San Francisco, CA 94111-3834 (US).

(22) International Filing Date: 24 June 2004 (24.06.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/606,668 25 June 2003 (25.06.2003) US

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): **NELLCOR PURITAN BENNETT INCORPORATED** [US/US]; 4280 Hacienda Drive, Pleasanton, CA 94588 (US).

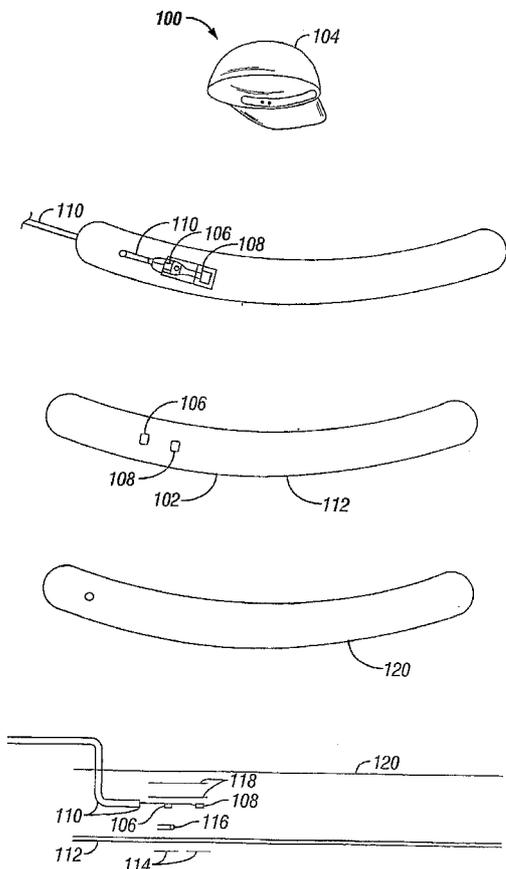
(72) Inventors; and

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

(75) Inventors/Applicants (for US only): **HANNULA, Don**

[Continued on next page]

(54) Title: HAT-BASED OXIMETER SENSOR



(57) Abstract: A method for use and an improved oximeter sensor substrate that is conforming to the shape of the patient's forehead. In one embodiment, the present invention is an oximeter sensor, having a substrate with a shape similar to a shape of at least a portion of a patient's forehead and including a section adapted to substantially fit over a portion of a forehead of a patient; an emitter disposed on the substrate at a position located on the section; and a detector disposed on the substrate at a distance from the emitter. In one embodiment, the substrate includes a hat that holds the emitter and the detector in a spaced-part manner against the patient's forehead.

WO 2005/002434 A1



GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

HAT-BASED OXIMETER SENSOR

BACKGROUND OF THE INVENTION

[0001] The present invention relates to optical oximeter sensors, and in particular to hat-based pulse oximeter sensors.

[0002] Many types of optical sensors are used to measure physiological characteristics of a patient. Typically, an optical sensor provides emitted light which is then scattered through a portion of a patient's tissue and detected. Various characteristics of a patient can be determined from analyzing such light, such as oxygen saturation, pulse rate, tissue bilirubin, etc.

[0003] Pulse oximetry is typically used to measure various blood flow characteristics including, but not limited to, the blood-oxygen saturation of hemoglobin in arterial blood, the volume of individual blood pulsations supplying the tissue, and the rate of blood pulsations corresponding to each heartbeat of a patient. Measurement of these characteristics has been accomplished by use of a non-invasive sensor which scatters light through a portion of the patient's tissue where blood perfuses the tissue, and photoelectrically senses the absorption of light in such tissue. The amount of light absorbed is then used to calculate the amount of blood constituent being measured.

[0004] The light scattered through the tissue is selected to be of one or more wavelengths that are absorbed by the blood in an amount representative of the amount of the blood constituent present in the blood. The amount of transmitted light scattered through the tissue will vary in accordance with the changing amount of blood constituent in the tissue and the related light absorption. For measuring blood oxygen level, such sensors have typically been provided with a light source that is adapted to generate light of at least two different wavelengths, and with photodetectors sensitive to both of those wavelengths, in accordance with known techniques for measuring blood oxygen saturation.

[0005] Known non-invasive sensors include devices that are secured to a portion of the body, such as a finger, an ear or the scalp. In animals and humans, the tissue of these body portions is perfused with blood and the tissue surface is readily accessible to the sensor.

[0006] Certain types of oximeter sensors are applied to a patient's forehead. To aid in the sensor's proper placement and the proper application of pressure by the sensor to

the forehead site, some forehead sensors are maintained at the forehead site by either the assistance of an adhesive layer and/or a headband. While these approaches are helpful, there is still a need for an improved and easy way of placing, retaining, and locating the sensor on the forehead of its user.

5

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention provides an oximeter sensor which will attach to a patient's forehead in an improved manner. In certain embodiments, the securing of the sensor to the forehead of the patient is achieved by attaching the sensor to the inside of hat which is worn by the patient when the sensor is in use.

10

[0008] In one embodiment, the present invention is an oximeter sensor, having: a substrate having a shape similar to a shape of at least a portion of a patient's forehead and including a section adapted to substantially fit over a portion of a forehead of a patient; an emitter disposed on the substrate at a position located on the section; and a detector disposed on the substrate at a distance from the emitter.

15

[0009] In one embodiment, the substrate is resilient and has a shape conformable to the forehead of a patient.

[0010] In one embodiment, the substrate includes an adhesive layer for adhering to the forehead of a patient.

20

[0011] In one embodiment, a hat is used for holding the sensor against the patient's forehead.

[0012] In one embodiment, the substrate is adhered to the inside of said hat.

[0013] In one embodiment, the substrate is adhesively attached to the inside of the hat. Alternately, the substrate is sewn into the hat.

25

[0014] In another embodiment, the present invention provides a method for determination of a blood characteristic, including: applying an emitter and a detector to spaced-apart positions on a forehead of a patient in the lower forehead region, above the eyebrow, with both the detector and the emitter placed above and predominantly lateral of the iris; securing the emitter and detector to the patient; emitting electromagnetic radiation with the emitter; detecting electromagnetic radiation scattered by the tissues of the forehead by the detector and producing a detector signal; and determining a blood characteristic in the patient from the detector signal.

30

[0015] In one embodiment, the securing of the emitter and the detector to the patient's forehead is achieved by attaching the emitter and the detector to an inside of a hat, and placing the hat on the head of the patient.

[0016] For a further understanding of the nature and advantages of the present invention, reference should be made to the following description in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Fig. 1 is an assembly drawing of an embodiment of the sensor in accordance with the present invention that can be placed within a hat or cap.

[0018] Fig. 2 is a drawing of a stocking hat, with an embodiment of the sensor in accordance with the present invention shown mounted in the hat.

[0019] Fig. 3 is an assembly drawing of an embodiment of the sensor of Figs. 1 or 2.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The embodiments of the present invention are directed towards configuring a reflectance-type oximeter sensor for placement in a hat in order to provide a relatively easy means of placing, retaining, and locating the sensor on the forehead of the user. With regard to the location of the sensor on the patient's forehead, it is preferred to have the sensor be located on the lower forehead region, above the eyebrow, with the sensor optics (emitter and detector) located above and predominantly lateral to or centered over the iris. The oximeter sensor can be attached to the inside band of a hat. The precise location of the reflectance sensor in the hat allows appropriate placement of the sensor in the optimal forehead location by a user not skilled in sensor placement. It has been found that the placement of a reflectance forehead sensor is a factor in the accurate determination of a blood flow characteristic, due to the vasculature of the forehead. In addition, it has been shown that having a certain amount of pressure on the forehead sensor can reduce the incidence of venous pulsations effects on the oximeter reading. The placement of the sensor in the band of the hat would minimize these issues, as the placement of a hat is fairly repeatable and predictable. A hat-based oximeter sensor as embodied by the present invention can be used on patients in clinical settings, or by athletes, soldiers, firemen, or in any environment where information related to a physiological parameter, such as heart rate or oxygen saturation information is desired.

[0021] Fig. 1 is an assembly drawing of an embodiment of the sensor in accordance with the present invention that can be placed within a hat or cap. This figure shows an oximeter sensor placed on a substrate 102 that can be placed or adhered to the inside of a hat 104. In the hat-based embodiment, the sensor uses an emitter 106 containing two discrete wavelengths and a detector 108 placed more than 2 mm away, and ideally 10mm – 15mm from the emitter. The surface 102 can be black in order to minimize any shunting of light between sensor and patient skin. The sensor in a hat could be used in conjunction with a small, portable oximeter to allow mobility of the user during activities. Similarly, the sensor could be incorporated into a headband. Alternately, it may be desirable to provide a sensor with adhesive backing that would allow the user to place the sensor in a hat of their choice. Also shown in Fig. 1 is a cable 110 for providing drive current to the LED and for providing the detector signal to the oximeter. The cable provides the electrical connection to the monitor; it also provides power for the emitter, signal carrying conductors from the detector, and shielding to protect the small signals from the detector against external electrical interference.

[0022] The sensor is shown in a multi-layer structure having a face portion 112. The face 112 is the surface that is placed against the patient's skin. The face material may have an adhesive layer such as an acrylic or synthetic rubber adhesive, or it may be without adhesive, and typically made from a foam PVC or foam polyurethane material. The face 112 component is preferably black so as to minimize the incidence of reflected light that does not go through the tissue. Below the face layer 112 are two windows 114. The windows 114 are generally a clear component, such as for example, a thin film or a clear molded plastic component that makes contact with the skin. The thin film window may be a polyurethane or an acrylic adhesive on a polyester film. The intent of the window 114 is to provide an efficient optical coupling mechanism between the optical components (emitter and detector) and the skin. Located above the face 114, is a Faraday shield 116. The Faraday shield 116 is a conductive material, for example, a copper film or copper mesh, that is electrically connected to the monitor ground to help shield the detector from extraneous electrical interference while passing light to the detector. Next located are the LED 106 and the detector 108. Above the LED and the detector is a mask layer, which may include more than one mask layer. The mask layer 118 is generally a thin film that is intended to block light from entering the back side of the sensor, or from traveling directly from emitter to detector (shunt light). The purpose of the mask 118 is to ensure that all of the light reaching the detector is light from the emitter that has traveled through the capillary bed. Above the

mask layer 118 is the back layer 120. The back or the top layer is the non-tissue contacting surface of the sensor. This layer may include a cosmetic finish for the sensor, which can be white with some printed artwork identifying the sensor. Typical materials may be Velcro loop, or soft PVC foam. In a case where the sensor is mounted inside a hat or cap, the top layer is sometimes referred to as the back layer. In this case, the back layer may include a double stick adhesive so that it can be mounted inside the hat.

[0023] Fig. 2 shows a stocking hat, with an embodiment of the sensor in accordance with the present invention shown mounted in the hat. This alternate embodiment of the present invention, is directed towards the placement of a small reflectance sensor 202 in a stocking cap or beanie 204. Fig. 2 shows the sensor carrier layer 202 holding an LED 206 and a detector 208 and a cable 210, similar to the ones described above in conjunction with Fig. 1. This embodiment may be used for neonates. This embodiment would allow easy placement of a sensor on the forehead of a patient while applying a predictable pressure on the sensor. The sensor in a hat also resolves a concern about the cosmetic appearance of having a sensor on the forehead of the patient. A sensor in a stocking cap is much more acceptable to a parent than having a sensor located on the forehead. Depending on the tension of the stocking cap, provided by its own stretchiness or by an adjustable integral headband strap, the sensor may have a light tack adhesive, or no adhesive at all. The lack of an adhesive layer is a desirable feature, especially on neonates as adhesives may sometimes leave visible damage to the fragile skin of a neonate.

[0024] Fig. 3 is an assembly drawing for an embodiment of the sensor of Figs. 1 or 2. Fig. 3 shows that the sensor portion generally includes a face layer 302, a top layer 304 and a flex circuit 306 that is placed between the face and top layers. Also shown in Fig. 3 is a multi-layer unassembled view showing the relative positions of the face 302, flex circuit 306, a cable 308 and the top layer 304. The flex circuit layer 306 holds the emitter (LED) 310 and the detector 312 as well as the mask layer 314 and Faraday shield as described above. The flex circuit 306 also has several holes 316 to allow for electrical connections between the leads in the cable and the LED and the detector.

[0025] As will be understood by those skilled in the art, the present invention may be embodied in other specific forms without departing from the essential characteristics thereof. For example, the sensor may include adhesive layers for adhering to the inside of a hat or the user's skin, or that that the sensor may be sewn into the hat. These other embodiments are intended to be included within the scope of the present invention, which is set forth in the following claims.

WHAT IS CLAIMED IS:

- 1 1. An oximeter sensor, comprising:
2 a substrate having a shape similar to a shape of at least a portion of a patient's
3 forehead and including a section adapted to substantially fit over a portion of a forehead of a
4 patient;
5 an emitter disposed on said substrate at a position located on said section; and
6 a detector disposed on said substrate at a distance from said emitter.
- 1 2. The sensor of claim 1 wherein said substrate is resilient and has a
2 shape conformable to the forehead of a patient.
- 1 3. The sensor of claim 1 wherein said substrate comprises an adhesive
2 layer for adhering to the forehead of a patient.
- 1 4. The sensor of claim 1 wherein said substrate comprises a darkened
2 layer so as to minimize the incidence of reflected light that does not go through the tissue of a
3 patient onto said detector.
- 1 5. The sensor of claim 1 further comprising leads connected to said
2 emitter and said detector, said leads extending along said substrate away from one of the top
3 or a side of a patient's forehead.
- 1 6. The sensor of claim 1 further comprising a hat for holding said
2 substrate against the patient's forehead.
- 1 7. The sensor of claim 6 wherein said substrate is adhered to the inside of
2 said hat.
- 1 8. The sensor of claim 7 wherein said substrate is adhesively adhered to
2 the inside of said hat.
- 1 9. The sensor of claim 1 wherein said substrate comprises a plurality of
2 laminated layers.
- 1 10. An oximeter sensor, comprising:

2 a substrate having a shape similar to a shape of at least a portion of a patient's
3 forehead and including a section adapted to substantially fit over a portion of a forehead of a
4 patient;

5 an emitter disposed on said substrate at a position located on said section;
6 a detector disposed on said substrate at a distance from said emitter; and
7 a hat for holding said substrate against the patient's forehead.

1 11. A method for determination of a blood characteristic, comprising:
2 applying an emitter and a detector to spaced-apart positions on a forehead of a
3 patient in the lower forehead region, above the eyebrow, with both the detector and the
4 emitter placed lateral of the iris;
5 securing said emitter and detector to said patient;
6 emitting electromagnetic radiation with said emitter;
7 detecting electromagnetic radiation scattered by the forehead by said detector
8 and producing a detector signal; and
9 determining a blood characteristic in the patient from said detector signal.

1 12. The method of claim 11 wherein said blood characteristic is oxygen
2 saturation.

1 13. The method of claim 11 wherein said securing comprises placing a hat
2 over said emitter and said detector.

1 14. The method of claim 11 wherein said securing comprises securing said
2 emitter and said detector to the patient by attaching said emitter and said detector to an inside
3 of a hat, and placing said hat on the head of the patient.

1 15. The method of claim 11 comprising detecting light reflected from the
2 forehead of the patient with said detector.

1 16. A method for determination of a blood characteristic, comprising:
2 applying an emitter and a detector to spaced-apart positions on a forehead of a
3 patient in the lower forehead region, above the eyebrow, with both the detector and the
4 emitter placed lateral of the iris;
5 securing said emitter and detector to said patient, by attaching said emitter and
6 said detector to an inside of a hat, and placing said hat on the head of the patient;

7 emitting electromagnetic radiation with said emitter;
8 detecting electromagnetic radiation scattered by the forehead by said detector
9 and producing a detector signal; and
10 determining a blood characteristic in the patient from said detector signal.

1 17. The method of claim 16 wherein said blood characteristic is oxygen
2 saturation.

1/3

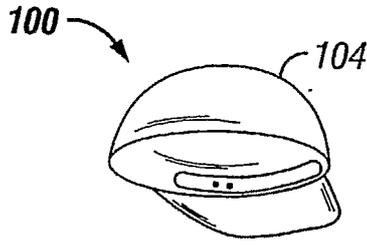


FIG. 1A

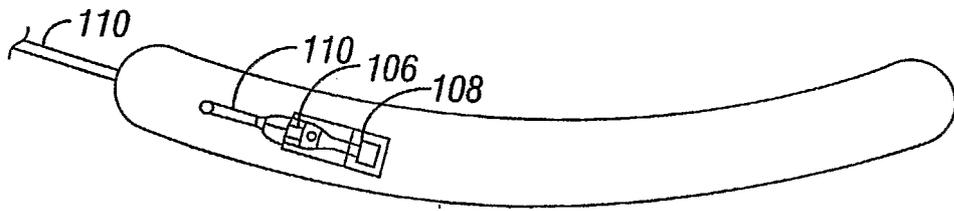


FIG. 1B

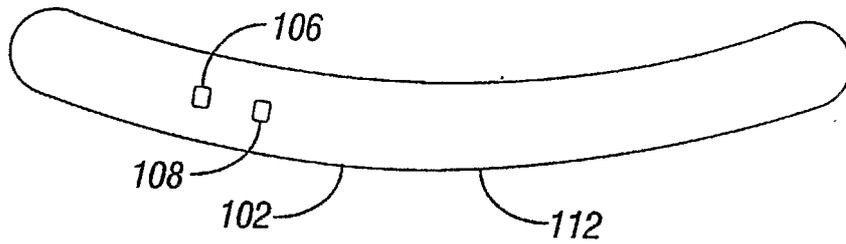


FIG. 1C

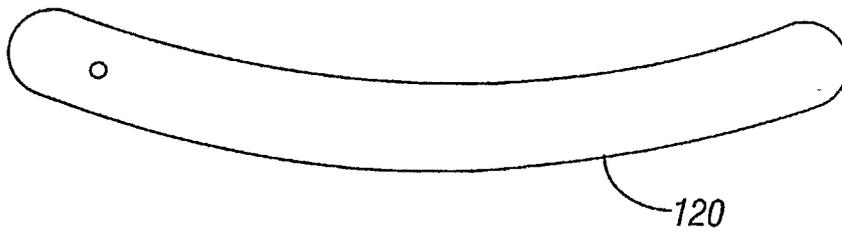


FIG. 1D

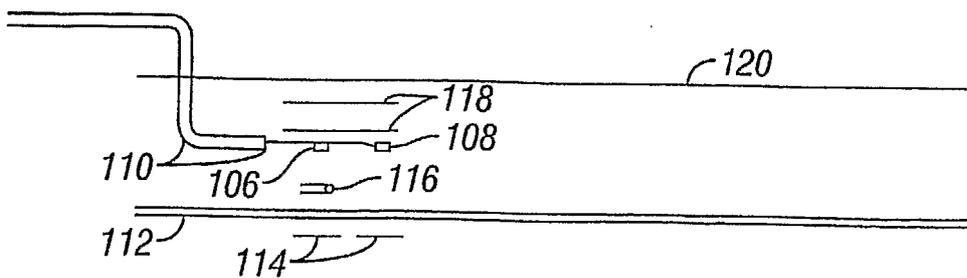


FIG. 1E

2/3

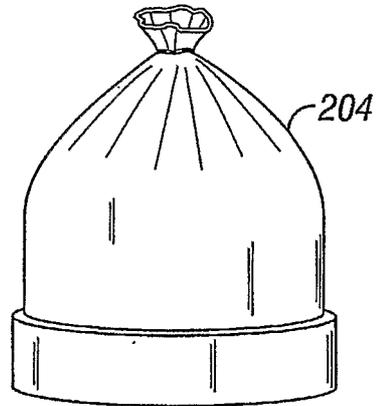


FIG. 2A

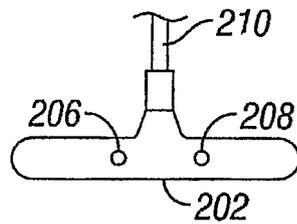


FIG. 2B

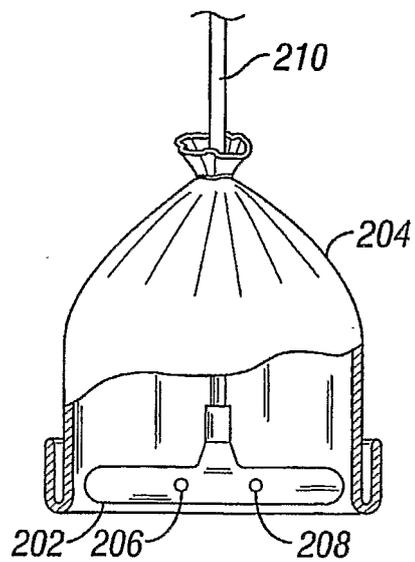


FIG. 2C

3/3

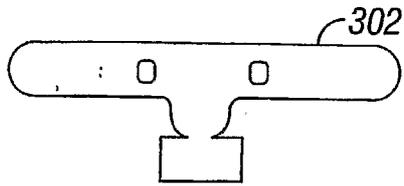


FIG. 3A

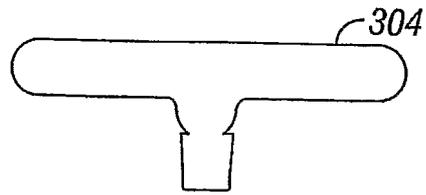


FIG. 3B

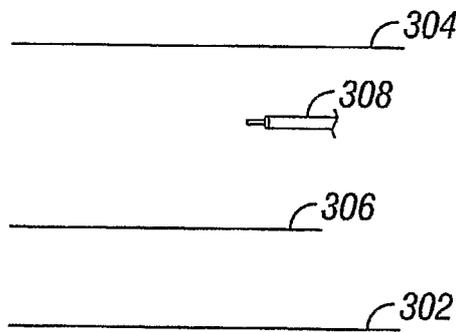


FIG. 3C



FIG. 3D

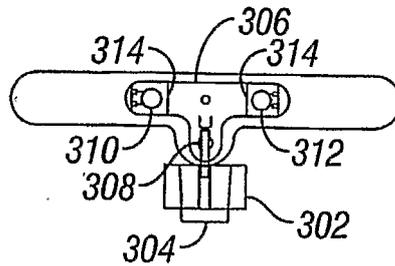


FIG. 3E

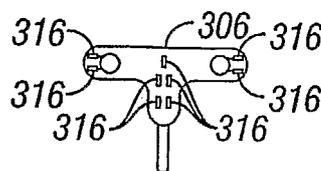


FIG. 3F

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/020672

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 A61B5/00				
According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED				
Minimum documentation searched (classification system followed by classification symbols) IPC 7 A61B				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched				
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
X	US 5 995 857 A (MARSH ROBERT C ET AL) 30 November 1999 (1999-11-30) column 4, lines 39-65; figures 1-4 column 5, line 53 - column 6, line 9 -----	1-17		
X	US 5 779 631 A (CHANCE BRITTON) 14 July 1998 (1998-07-14) column 4, lines 17-19 column 6, lines 29-45 column 12, line 65 - column 13, line 10 figures 3,5,13 -----	1,2, 10-17		
Y	-----	3,5,8,9		
Y	US 5 054 488 A (MUZ EDWIN) 8 October 1991 (1991-10-08) column 1, lines 21-36; figures 1,5 column 3, lines 24-50 -----	3,5,8,9		
-/--				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C.				
<input checked="" type="checkbox"/> Patent family members are listed in annex.				
° Special categories of cited documents :				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family </td> </tr> </table>			*A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family
A document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family			
Date of the actual completion of the international search <p style="text-align: center;">1 November 2004</p>	Date of mailing of the international search report <p style="text-align: center;">08/11/2004</p>			
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center;">Jonsson, P.O.</p>			

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/020672

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 987 351 A (CHANCE BRITTON) 16 November 1999 (1999-11-16) column 6, lines 34-40; figure 4 column 11, lines 33-39 column 12, lines 12-20 column 16, lines 18-25 -----	1,2,4,6, 7,10-17
X	GB 2 135 074 A (UNIV DUKE) 22 August 1984 (1984-08-22) page 1, line 105 - page 2, line 13 page 2, lines 98-128; figure 15 -----	1-4,6,7, 10-13,15
X	WO 97/20494 A (NON INVASIVE TECHNOLOGY INC ; CHANCE BRITTON (US)) 12 June 1997 (1997-06-12) page 5, lines 1-10; figures 1,5,6 page 16, lines 17-24 -----	1,2,4,6, 7,10,11, 16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/020672

Patent document cited in search report		Publication date	Patent family member(s)	Publication date	
US 5995857	A	30-11-1999	AU WO	5040898 A 9800058 A1	21-01-1998 08-01-1998
US 5779631	A	14-07-1998	US	5873821 A	23-02-1999
			US	6549795 B1	15-04-2003
			US	2002161290 A1	31-10-2002
			US	6397099 B1	28-05-2002
			US	5782755 A	21-07-1998
			US	6493565 B1	10-12-2002
			CA	2103166 A1	26-11-1992
			DE	69229554 D1	12-08-1999
			DE	69229554 T2	10-02-2000
			EP	0591289 A1	13-04-1994
			HK	1014352 A1	20-04-2001
			JP	6510920 T	08-12-1994
			WO	9220273 A2	26-11-1992
			CA	1331483 C	16-08-1994
			DE	68928348 D1	30-10-1997
			DE	68928348 T2	16-04-1998
			EP	0441791 A1	21-08-1991
			JP	2603350 B2	23-04-1997
			JP	4502563 T	14-05-1992
			WO	9004941 A1	17-05-1990
			US	5167230 A	01-12-1992
			US	6134460 A	17-10-2000
US 5054488	A	08-10-1991	DE	3912993 A1	25-10-1990
US 5987351	A	16-11-1999	US	5596987 A	28-01-1997
			US	2004054290 A1	18-03-2004
			US	6526309 B1	25-02-2003
			CA	2239552 A1	12-06-1997
			CN	1208333 A	17-02-1999
			DE	69627477 D1	22-05-2003
			DE	69627477 T2	18-03-2004
			EP	0808124 A1	26-11-1997
			EP	0906052 A1	07-04-1999
			JP	10511875 T	17-11-1998
			US	6618614 B1	09-09-2003
			WO	9720494 A1	12-06-1997
			US	2004064052 A1	01-04-2004
			CA	2209240 A1	11-07-1996
			WO	9620638 A1	11-07-1996
GB 2135074	A	22-08-1984	US	4510938 A	16-04-1985
			AU	563806 B2	23-07-1987
			AU	1290983 A	26-07-1984
			AU	517433 B2	30-07-1981
			CA	1192416 A1	27-08-1985
			DE	3313601 A1	26-07-1984
			FR	2482443 A1	20-11-1981
			FR	2539613 A1	27-07-1984
			GB	2075668 A , B	18-11-1981
			JP	3020248 B	19-03-1991
			JP	59141932 A	14-08-1984
			US	4223680 A	23-09-1980
			US	4321930 A	30-03-1982
			US	4380240 A	19-04-1983

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/020672

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2135074	A	US 4281645 A	04-08-1981
WO 9720494	A	12-06-1997	
		US 5596987 A	28-01-1997
		CA 2209240 A1	11-07-1996
		DE 69627477 D1	22-05-2003
		DE 69627477 T2	18-03-2004
		EP 0808124 A1	26-11-1997
		EP 0906052 A1	07-04-1999
		JP 10511875 T	17-11-1998
		US 6618614 B1	09-09-2003
		WO 9620638 A1	11-07-1996
		WO 9720494 A1	12-06-1997
		US 2004054290 A1	18-03-2004
		US 6526309 B1	25-02-2003
		US 5987351 A	16-11-1999
		CA 2239552 A1	12-06-1997
		CN 1208333 A	17-02-1999
		EP 0796057 A1	24-09-1997
		JP 10510626 T	13-10-1998
		US 6058324 A	02-05-2000
		US 2004073101 A1	15-04-2004
		US 5820558 A	13-10-1998
		EP 0797404 A1	01-10-1997
		JP 10511568 T	10-11-1998
		US 6493565 B1	10-12-2002
		US 2004064052 A1	01-04-2004

专利名称(译)	基于帽子的血氧计传感器		
公开(公告)号	EP1635701A1	公开(公告)日	2006-03-22
申请号	EP2004756238	申请日	2004-06-24
[标]申请(专利权)人(译)	内尔科尔普里坦贝内特公司		
申请(专利权)人(译)	NELLCOR PURITAN BENNETT INCORPORATED		
当前申请(专利权)人(译)	NELLCOR PURITAN BENNETT LLC		
[标]发明人	HANNULA DON MANNHEIMER PAUL D		
发明人	HANNULA, DON MANNHEIMER, PAUL, D.		
IPC分类号	A61B5/00		
CPC分类号	A61B5/6833 A61B5/14552 A61B5/14553 A61B5/6804 A61B5/6814 A61B2503/06		
代理机构(译)	GRUBERT , ANDREAS		
优先权	10/606668 2003-06-25 US		
外部链接	Espacenet		

摘要(译)

一种使用方法和改进的血氧计传感器基板，其符合患者前额的形状。在一个实施例中，本发明是一种血氧计传感器，其具有基板，该基板的形状类似于患者前额的至少一部分的形状，并且包括适于基本上装配在患者前额的一部分上的部分；发射器，设置在基板上位于该部分上的位置；探测器设置在距离发射器一定距离的基板上。在一个实施例中，基板包括帽子，该帽子以间隔开的方式将发射器和检测器保持在患者的前额上。