

Exhibit E-5
Initial Invalidity Claim Chart for U.S. Patent No. 10,984,911 (the “’911 patent”)
U.S. Patent Application Publication 2004/0039272 (“Abdul-Hafiz”)

U.S. Patent Application Publication 2004/0039272 (“Abdul-Hafiz”), which was filed on August 1, 2002 and published on February 26, 2004, is prior art to U.S. Patent No. 10,984,911 (the “’911 patent”) pursuant to at least pre-AIA 35 U.S.C. §§ 102(a), 102(b), and/or 102(e) under the ’911 patent’s proper priority date. Abdul-Hafiz anticipates and/or renders obvious the asserted claims of the ’911 patent under pre-AIA 35 U.S.C. §§ 102 and/or 103.

As set forth in the chart below, all asserted claims of the ’911 patent are anticipated and/or rendered obvious over Abdul-Hafiz under at least the apparent construction of the claims advanced by Masimo based on its Preliminary Infringement Contentions served on May 25, 2023 (the “Infringement Contentions”). The excerpts cited herein are exemplary. For any claim limitation, Apple may rely on excerpts cited for any other limitation and/or additional excerpts not set forth fully herein to the extent necessary to provide a more comprehensive explanation for a reference’s disclosure of a limitation. Where an excerpt refers to or discusses a figure or figure items, that figure and any additional descriptions of that figure should be understood to be incorporated by reference as if set forth fully therein. Apple expressly reserves the right to use the entirety of any reference and otherwise to supplement these contentions to add additional information showing that Abdul-Hafiz invalidates the asserted claims of the ’911 patent.

To the extent that any of the below claim limitations are found to not be expressly disclosed by the below reference, Apple contends that any such limitation would have been obvious, either based on the knowledge of one of ordinary skill in the art or based on any of the art cited for the ’911 patent in Apple’s Initial Invalidity Contentions, which are incorporated herein by reference. In particular, as evidenced by the below and in Apple’s Initial Invalidity Contentions, the ’911 patent is merely a collection of prior art elements that fails to meet the statutory requirement of nonobviousness under § 103, and the factors delineated in *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398 (2007), weigh against a finding of nonobviousness.

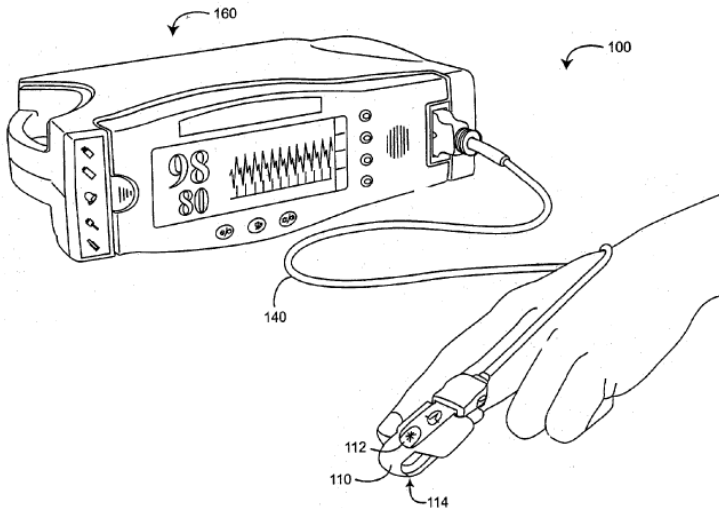
For example, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Abdul-Hafiz with the teachings of the other references charted for the ’911 patent in Apple’s Initial Invalidity Contentions; such references are in the same field of art, and discuss various techniques and improvements that would have been known to yield predictable results when applied to the technology claimed in the ’911 patent, and a person of ordinary skill therefore would have been motivated to so combine them in view of the disclosures therein.

Apple also contends that one of ordinary skill in the art would find such limitation obvious for at least one or more of the following reasons: (1) the combination would unite old elements with no change in their respective function; (2) the combination would have been a predictable variation of a work in the same or a different field of endeavor; (3) the modification would have used a known technique

to improve a similar device in the same way; (4) the modification was a known problem for which there was an obvious solution; (5) the modification would have been “obvious to try”; (6) the modification was known work in one field of endeavor that would have prompted variations of it for use in either the same or different field based on design incentives or other market forces; (7) there was an explicit teaching, suggestion, or motivation in the prior art for the modification.

These Initial Invalidity Contentions are based on Apple’s present understanding of the ’911 patent claims and Masimo’s theories of infringement against Apple. Apple expressly does not agree that, under a correct construction or reading of the claims, that Apple’s accused products meet the limitations of the asserted claims of the ’911 Patent or that the claims satisfy the requirements of 35 U.S.C. § 112. Apple’s contentions herein are not, and should in no way be seen as, admissions as to or adoptions of any particular claim scope or construction, or as an admission that any particular element is met by any accused product in any particular way. Apple therefore objects to any attempt to imply claim construction from this chart. Apple’s Initial Invalidity Contentions do not represent Apple’s agreement or view as to the meaning, definiteness, written description support for, or enablement of any claim contained therein. However, at least under Masimo’s apparent application of the claims for the purposes of infringement (which Apple expressly disagrees with), Abdul-Hafiz would have rendered the asserted claims of the ’911 patent invalid. Except where specifically noted otherwise, this chart applies the apparent constructions of claim terms as used by Masimo in its Infringement Contentions; such use, however, does not imply that Apple adopt or agree with Masimo’s constructions in any way. Apple further reserves the right to supplement these contentions in response to any claim construction orders by the Court.

Apple is investigating this prior art and has not yet completed discovery from third parties who may have information concerning it. Pursuant to Federal Rule of Civil Procedure 26(e), the Local Rules of the District of Delaware, and the Orders of record in this matter Apple reserves the right to modify, amend, and/or supplement these contentions as information becomes available (*e.g.*, witness testimony and/or non-public documentation) and as discovery proceeds.

Claim 1	Prior Art
1[pre] A physiological monitoring device comprising:	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious a physiological monitoring device. For example, Abdul-Hafiz discloses and/or suggests a physiological monitoring device, implemented in a non-limiting example as a pulse oximetry system that measures a patient's blood oxygen saturation level: <i>See, e.g., Abdul-Hafiz at Abstract ("Aspects of the invention include an optical housing including a Substrate having a reflective side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector.")</i>  FIG. 1 (Prior Art) Fig. 1.

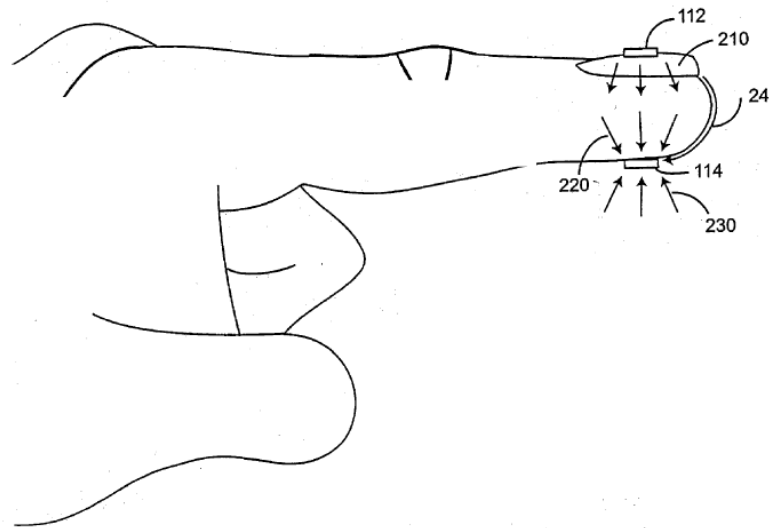


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, Claim 17 (“17. An optical housing comprising:

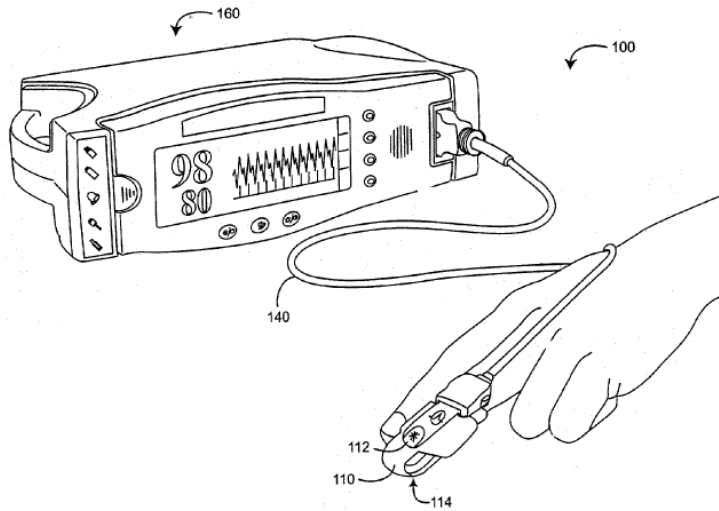
a light reflecting cover means for shielding against ambient light;

a base means for blocking piped light, said base means adjoining said cover means,

a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and

an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”)

To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success

	in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
1[a] at least three LEDs recessed into a cavity, the at least three LEDs configured to emit light of at least three different wavelengths;	Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious at least three LEDs recessed into a cavity, the at least three LEDs configured to emit light of at least three different wavelengths. For example, Abdul-Hafiz discloses and/or suggests at least two LEDs recessed into a cavity, the cavity comprising a portion of a sensor 110, and where the at least two LEDs are configured to emit light of at least two different wavelengths corresponding to wavelengths for red and infrared light being emitted from each of two LEDs, respectively: <i>See, e.g., Abdul-Hafiz at Fig. 1:</i>  FIG. 1 (Prior Art)

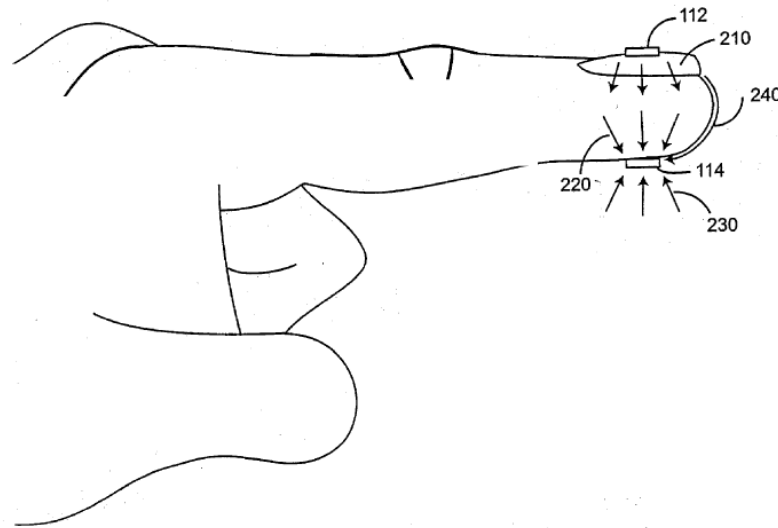


FIG. 2 (Prior Art)

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Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

	SUMMARY OF THE INVENTION [0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. And incorporated by reference herein.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
1[b] at least one detector configured to detect at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious at least one detector configured to detect at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has been attenuated by tissue, the at least one detector configured to output at least one signal responsive to the detected light. For example, Abdul-Hafiz discloses and/or suggests at least one detector, implemented in a non-limiting example as a photodiode, where the at least one detector is configured to detect at least a portion of the light emitted from the at least two LEDs after at least a portion of the light has been attenuated by tissue of a patient’s finger, and where the at least one detector is configured to output at least one signal responsive to the detected light, where the outputted at least one signal may be relied upon to measure the saturation level of arterial blood:

been attenuated by tissue, the at least one detector configured to output at least one signal responsive to the detected light;

See, e.g., Abdul-Hafiz at Fig. 1:

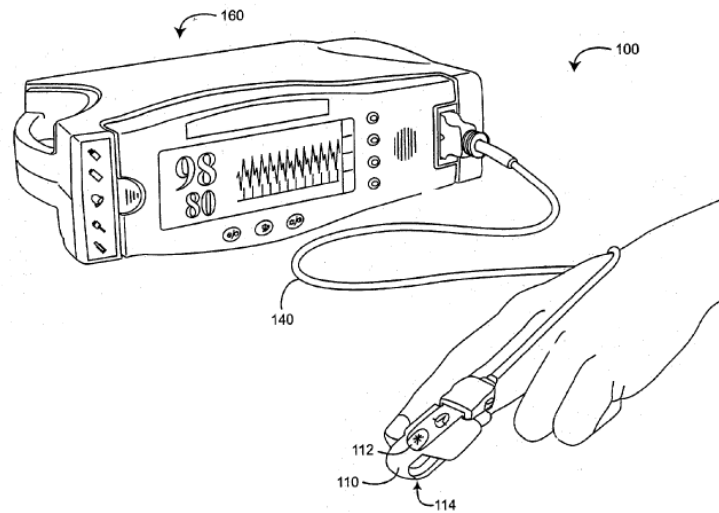


FIG. 1 (Prior Art)

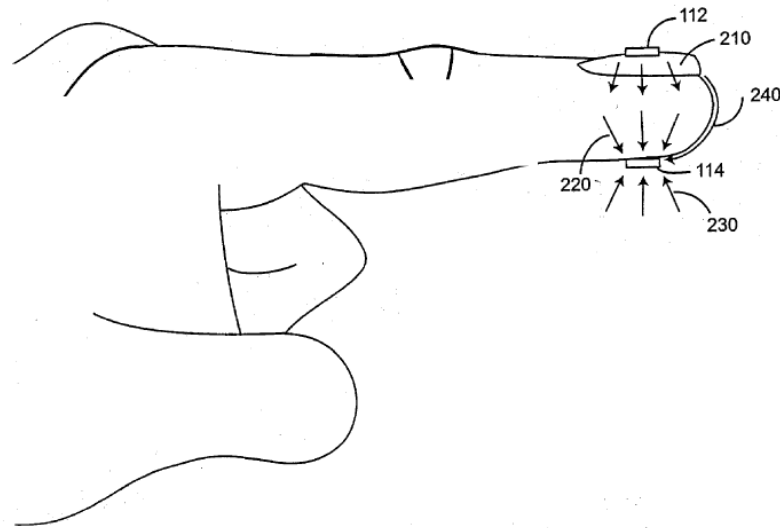


FIG. 2 (Prior Art)

Fig. 2.

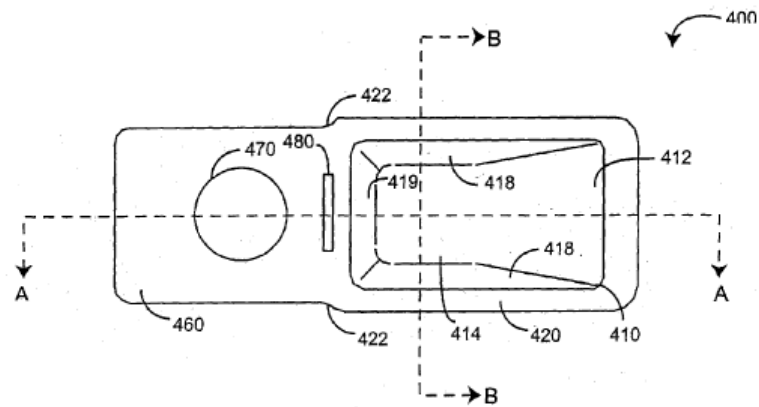
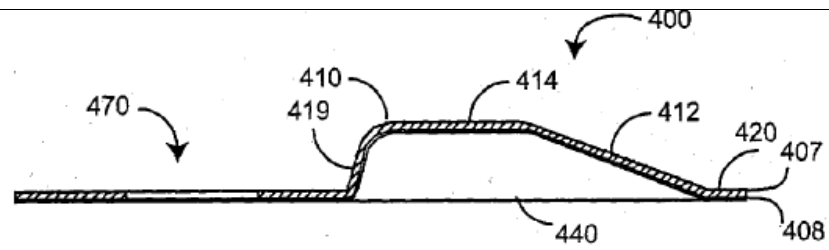


FIG. 4A

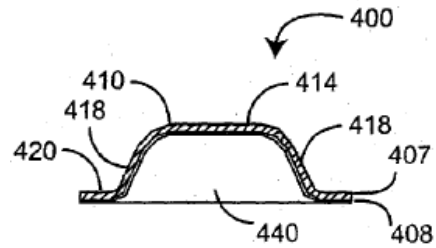
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

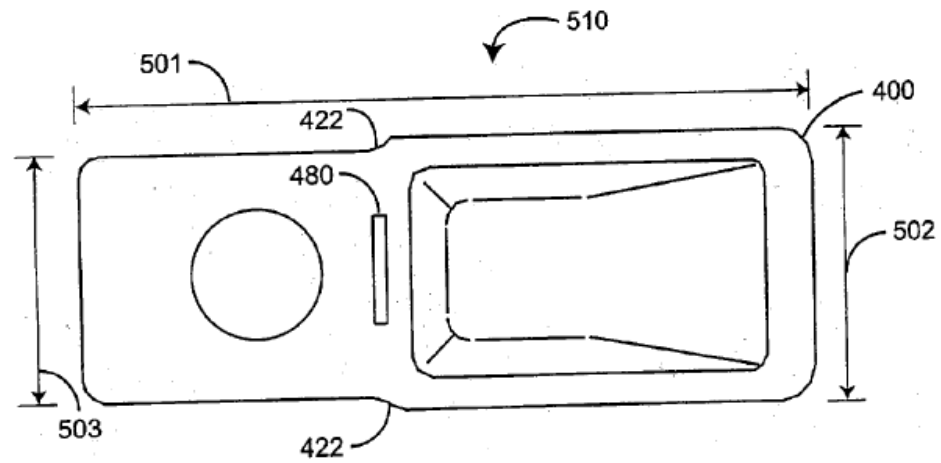


FIG. 5A

Fig. 5A.

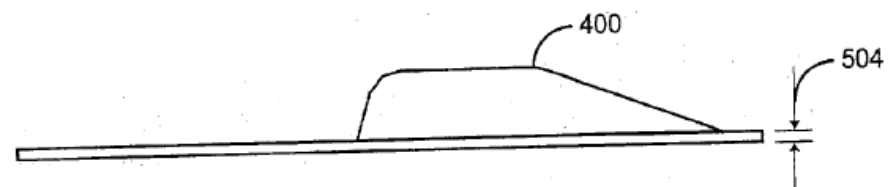


FIG. 5B

Fig. 5B.

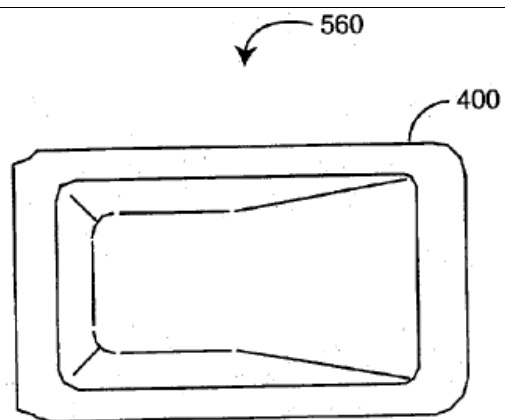


FIG. 5C

Fig. 5C.

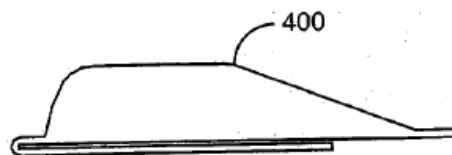


FIG. 5D

Fig. 5D.

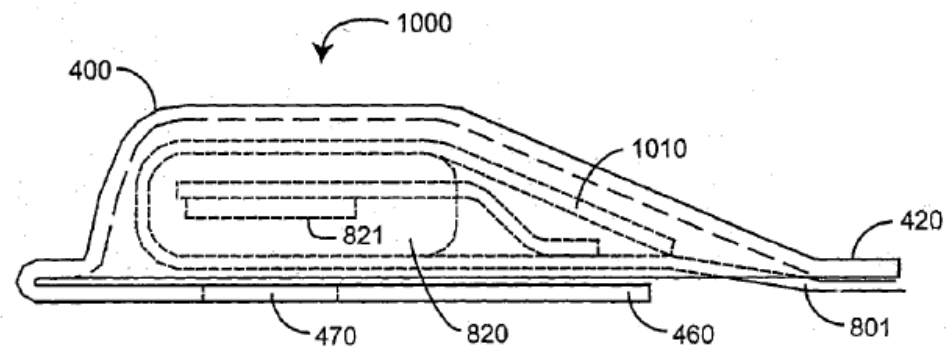


FIG. 6A

Fig. 6A.

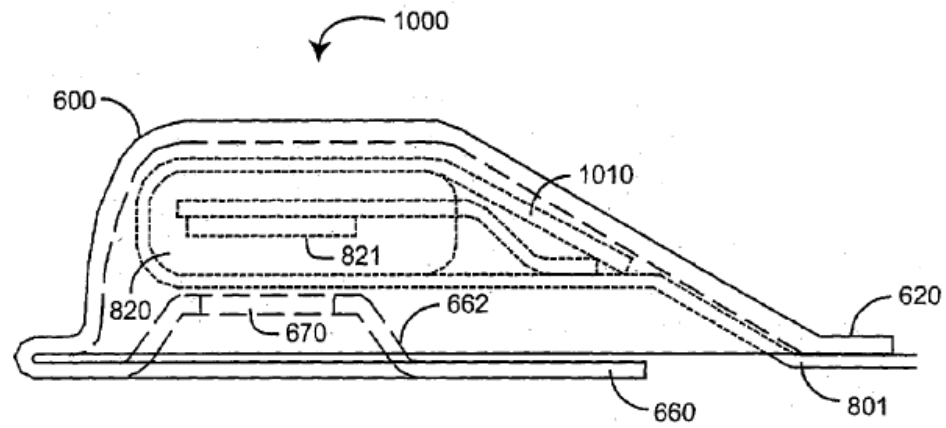
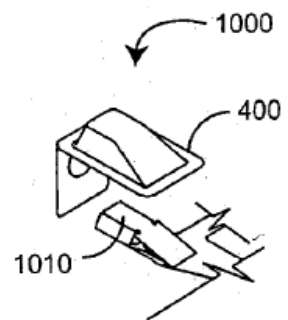


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

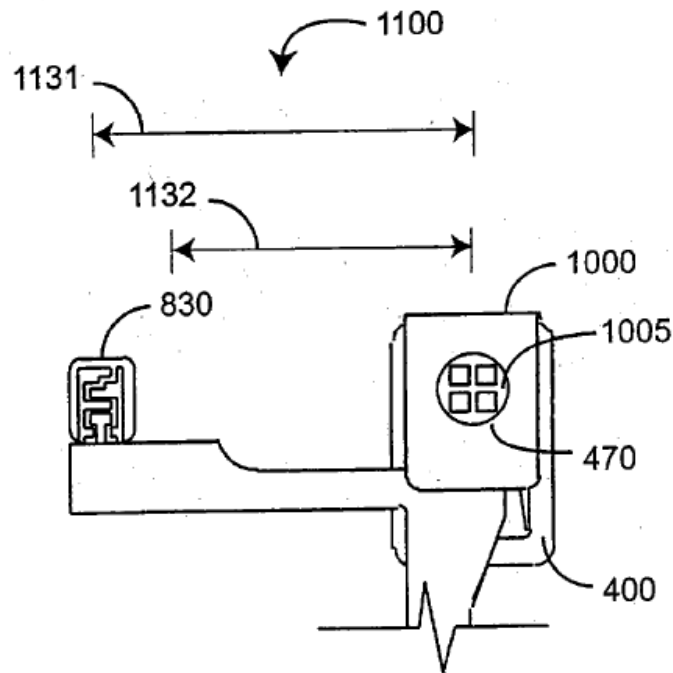


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140

connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical "noise" that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled "Low Noise Optical Probe," which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”). Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a
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	reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines a pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B). [0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5AB) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the
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	base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width 502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5AD, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below. [0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping. [0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector so as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled “Circuit Board Based Cable Connector,” which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein. [0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S.
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patent application Ser. No. 10/137,942, filed May 2, 2002, entitled “Flex Circuit Shielded Optical Sensor,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit So as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with similar structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”).

	Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”). Abdul-Hafiz, Claim 17 (“17. An optical housing comprising: a light reflecting cover means for Shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
1[c-1] a light block surrounding the at least one detector, the light block comprising a shoebox structure	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious a light block surrounding the at least one detector, the light block comprising a shoebox structure configured to recess the at least one detector into the shoebox structure, wherein the shoebox structure is at least partially formed of a black material, wherein a top of the shoebox structure includes only one opening through which light is configured to pass, the opening comprising an area smaller than a detection surface area of the at least one detector. For example, Abdul-Hafiz discloses and/or suggests a light block surrounding the at least one detector, where the light block in a non-limiting example is implemented as a low noise optical housing that is configured to form an

configured to recess the at least one detector into the shoebox structure, wherein the shoebox structure is at least partially formed of a black material, wherein a top of the shoebox structure includes only one opening through which light is configured to pass,

optical enclosure for the detector, and where, at least under the apparent construction based on Masimo's Infringement Contentions, the low noise optical housing or light block comprises a shoebox structure configured to recess the at least one detector into the shoebox structure, wherein the shoebox structure is at least partially formed of a black material, implemented in a non-limiting example as an inner black layer or black substrate, and wherein a top of the shoebox structure such as a spacer that defines an aperture or opening or window includes only one opening through which light is configured to pass to reach the detector:

See, e.g., Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a Substrate having a reflective Side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector.”)

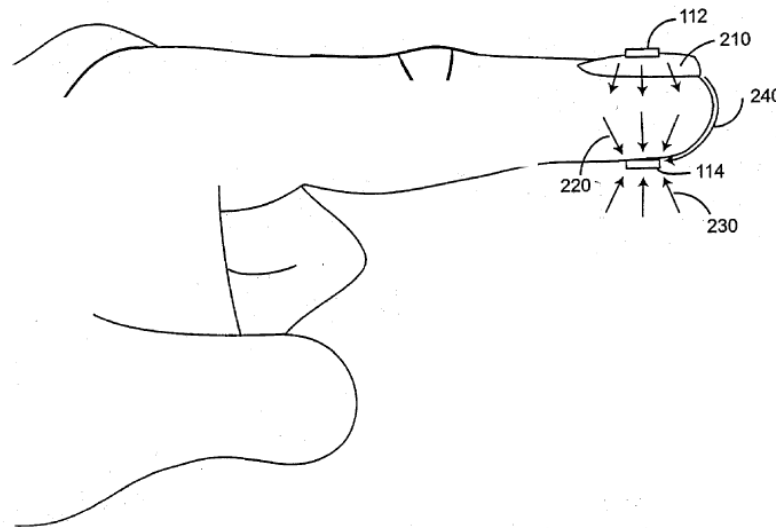


FIG. 2 (Prior Art)

Fig. 2.

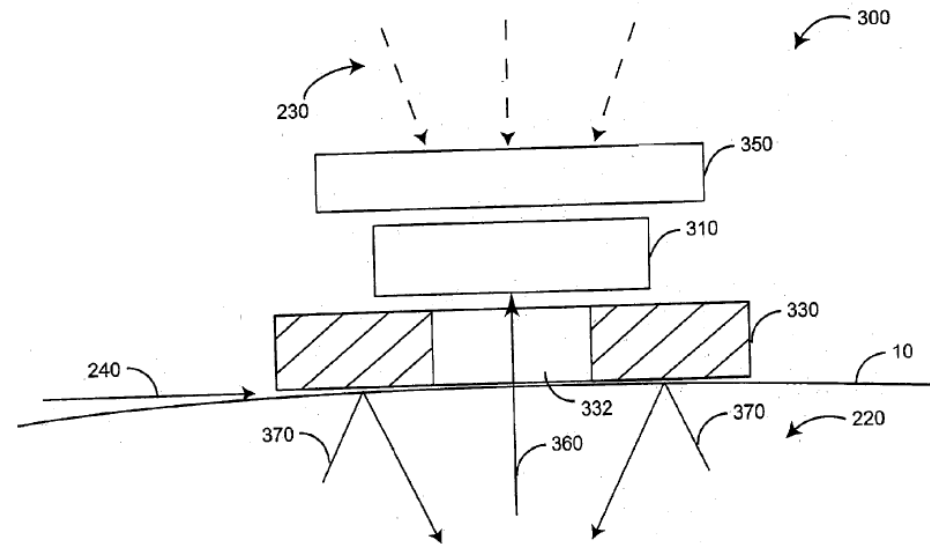


FIG. 3 (Prior Art)

Fig. 3.

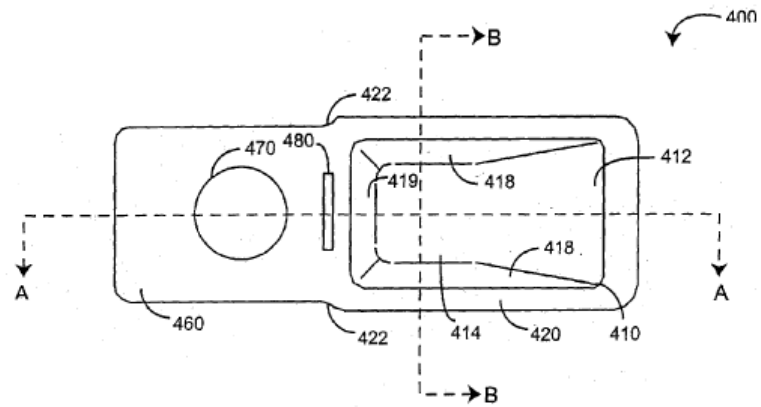
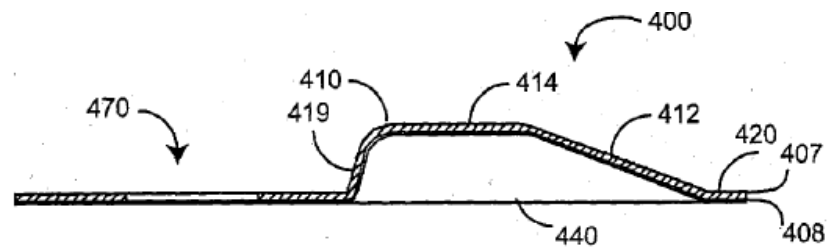


FIG. 4A

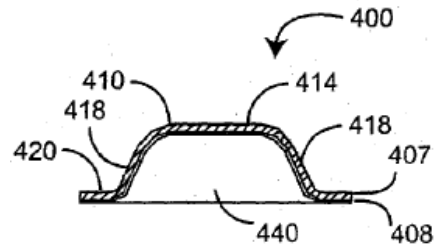
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

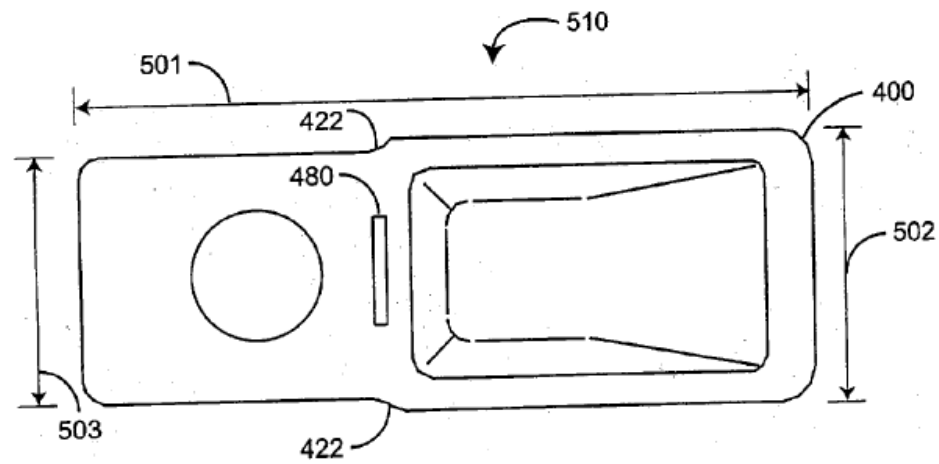


FIG. 5A

Fig. 5A.

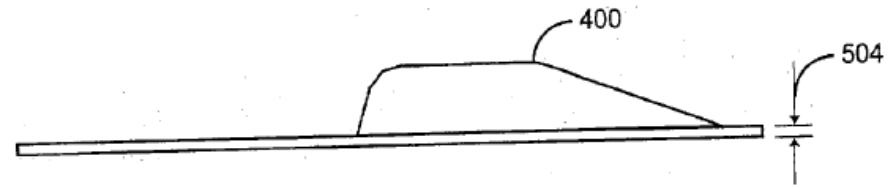


FIG. 5B

Fig. 5B.

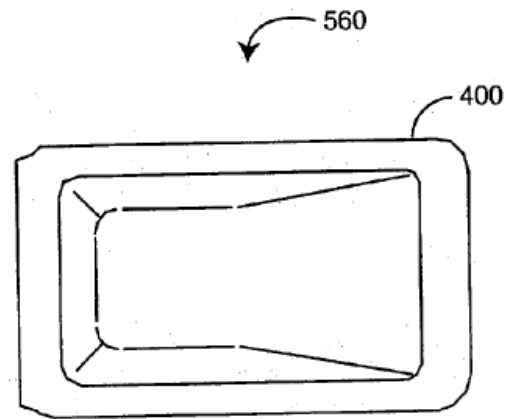


FIG. 5C

Fig. 5C.

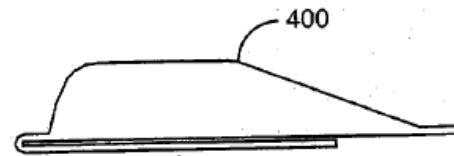


FIG. 5D

Fig. 5D.

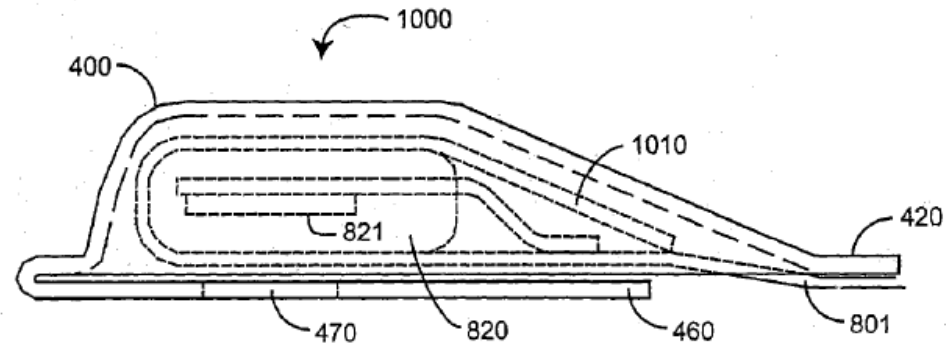


FIG. 6A

Fig. 6A.

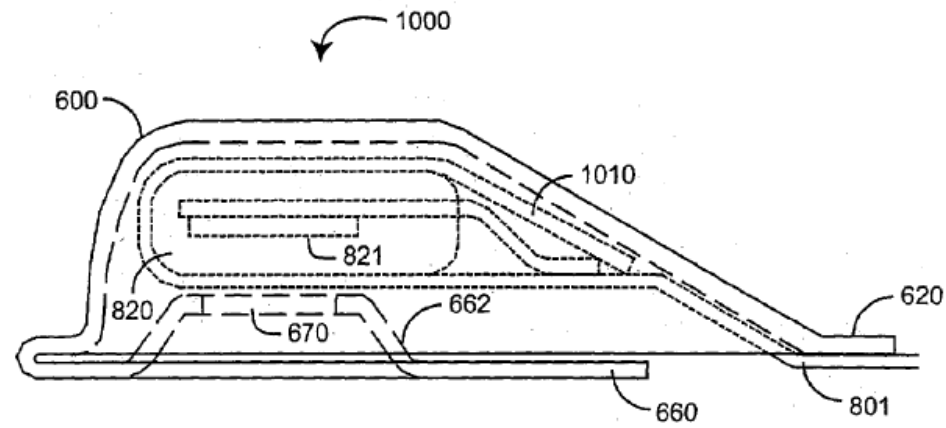
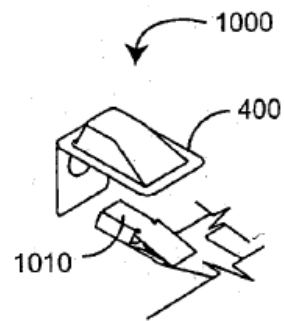


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

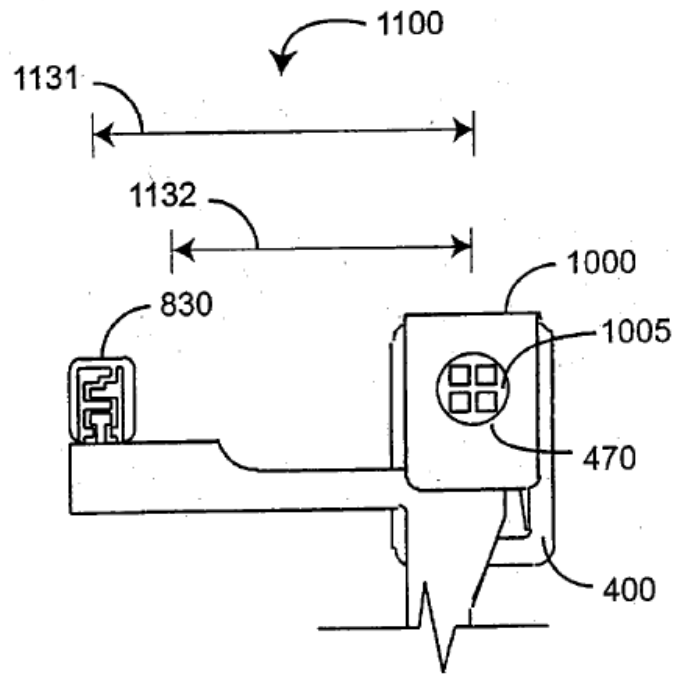


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable

140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described
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	below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B). [0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5AB) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width
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	502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5AD, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below. [0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger spacing between the detector 820 and a tissue site, further reducing the effects of light piping. [0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector So as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled "Circuit Board Based Cable Connector," which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein. [0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S. patent application Ser. No. 10/137,942, filed May 2, 2002, entitled "Flex Circuit Shielded Optical Sensor," assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.
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[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”)

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit so as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with Similar Structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”)

Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”).

	Abdul-Hafiz, Claims 6, 9, 17 (“6. The optical housing according to claim 1 wherein said substrate comprises a laminate having a generally white layer corresponding to said reflective side and a generally black layer corresponding to said absorptive side. 9. The optical housing method according to claim 8 wherein said providing step comprises the substep of laminating a white layer and a black layer. 17. An optical housing comprising: a light reflecting cover means for shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
1[c-2] the opening comprising an area smaller than a detection surface area of the at least one detector; and	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the opening comprising an area smaller than a detection surface area of the at least one detector. For example, Abdul-Hafiz discloses and/or suggests wherein an area of the opening is smaller than a detection surface area of the at least one detector, implemented as a low noise sensor for which there is a spacer that defines an aperture that allows a transmitted portion of propagated light to reach the detector so as to reduce the intensity

of the piped light, where the surface area of the opening of the aperture through which light passes is smaller than the surface area of the detection surface of the at least one detector:

See, e.g., Abdul-Hafiz at Fig. 3:

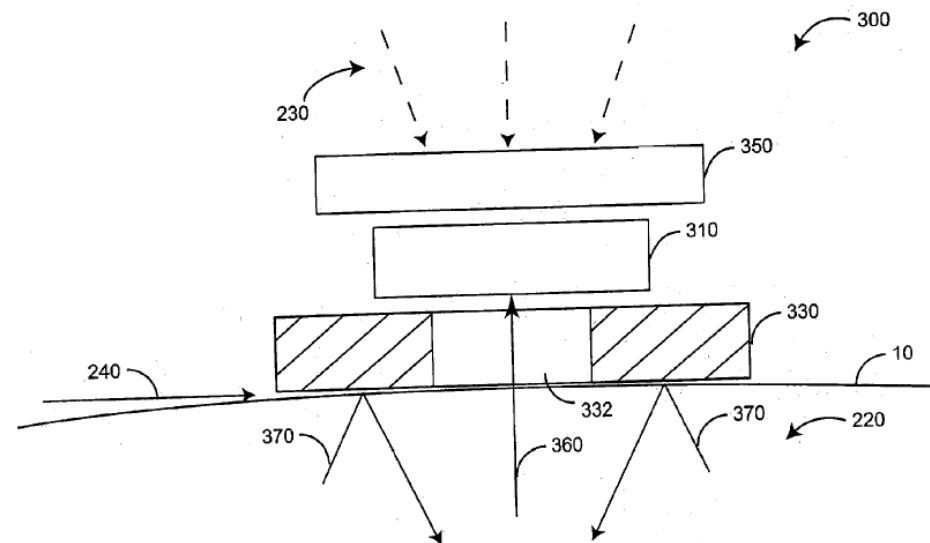


FIG. 3 (Prior Art)

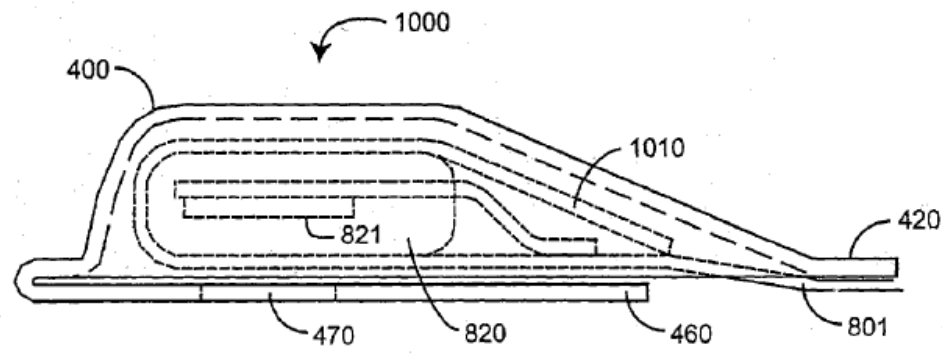


FIG. 6A

Fig. 6A.

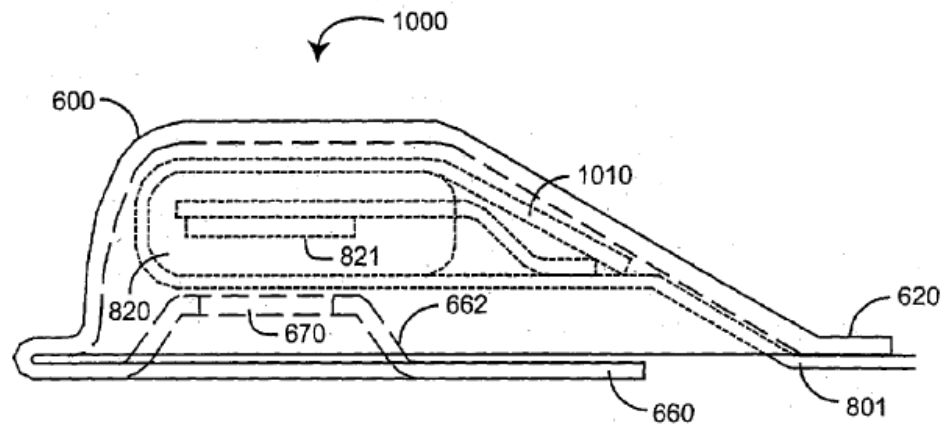


FIG. 6B

Fig. 6B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

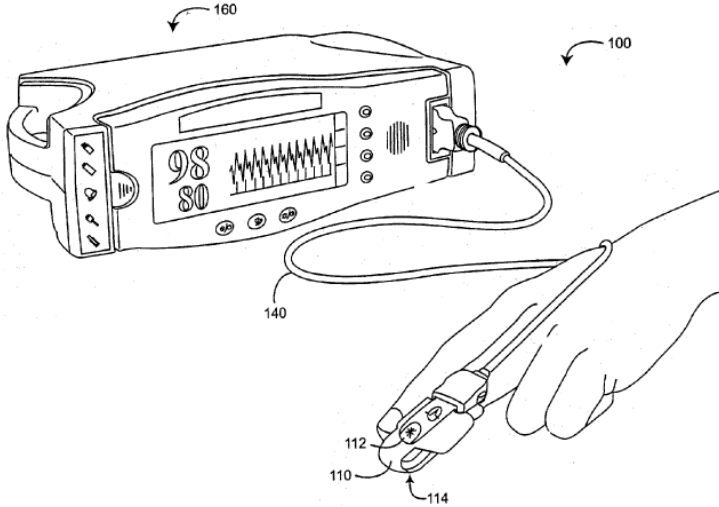
[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light

	240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above. [0005] One aspect of a low noise optical housing is a substrate having a reflective side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the substrate, securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0037 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously
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	incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the
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	flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B).)” Abdul-Hafiz, ¶0039 (“[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.”) Abdul-Hafiz, ¶0046 (“[0046] FIGS. 10A-C illustrate a shielded detector assembly 1000 configured for the neonate flexible circuit assembly 801 (FIGS. 8A, 9A-B) as shown, or, similarly, for the adult flexible circuit assembly 851 (FIGS. 8B, 9C-D). As shown in FIG. 10A, inside pressure sensitive adhesive (PSA) 1020 and top PSA 1030 are removed from a foldable shield 1010, and bottom PSA 1040 is removed from a fixed shield 1005 (not visible). As shown in FIG. 10B, the shield 1010 is next folded toward the detector 820. As shown in FIG. 10C, the shield 1010 is then folded over the back and sides of the detector 820, enclosing the detector 820. The inside PSA 1020 adheres to the detector 820, maintaining the foldable shield 1010 in place. Next, the EMI shielded detector 820 is placed into the optical housing 400. The top PSA 1030 adheres to the inside surface of the optical housing 400, which defines a pocket 440 (FIGS. 4BC) as described above. The bottom PSA 1040 adheres to the optical housing base 410 (FIGS. 4A-C), maintaining the detector 820 in place within the optical housing cover 410 (FIGS. 4AC), aligned with the aperture 470 (FIG. 4A), and maintaining the optical housing 400 in the closed position 560 (FIGS. 5C-D).”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial
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	Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
1[d] a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of a user responsive to the one or more signals.	Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of a user responsive to the one or more signal. For example, Abdul-Hafiz discloses and/or suggests a pulse oximetry system including a monitor that receives and processes through a patient cable one or more signals responsive to the outputted at least one signal from the detector in order to determine a physiological parameter of a user such as an oxygen saturation level of arterial blood responsive to the one or more signals. <i>See, e.g., Abdul-Hafiz at Fig. 1.</i>  FIG. 1 (Prior Art) Fig. 1.

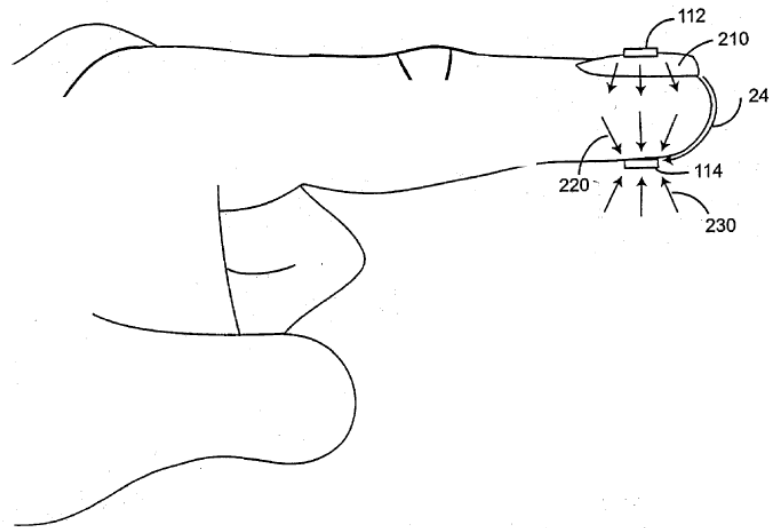


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0042 (“[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit So as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C).

	One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with similar structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 2	Prior Art
2. The device of claim 1, wherein the at least three LEDs comprises at least eight LEDs.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 1. <i>See, e.g., Claim 1.</i> To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 3	Prior Art

3. The device of claim 2, wherein the at least eight LEDs comprises at least two LEDs of the same wavelength.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 2. <i>See, e.g., Claim 2.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least eight LEDs comprises at least two LEDs of the same wavelength. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 4	Prior Art
4. The device of claim 1, wherein the at least three LEDs comprises at least twelve LEDs.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 1. <i>See, e.g., Claim 1.</i> To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 5	Prior Art
5. The device of claim 1, wherein at least two LEDs of the at	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 1. <i>See, e.g., Claim 1.</i>

least three LEDs are configured for concurrent activation.	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein at least two LEDs of the at least three LEDs are configured for concurrent activation. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 8	Prior Art
8. The device of claim 1, wherein the opening provides an optical path from the tissue to the at least one detector.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 1. <i>See, e.g., Claim 1.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the opening provides an optical path from the tissue to the at least one detector. For example, Abdul-Hafiz discloses and/or suggests wherein, as a non-limiting example, the opening provides an optical path from the tissue of the finger to the at least one detector, implemented as the light path from the tissue, through the aperture, and to the detector: <i>See, e.g., Abdul-Hafiz at Fig. 2:</i>

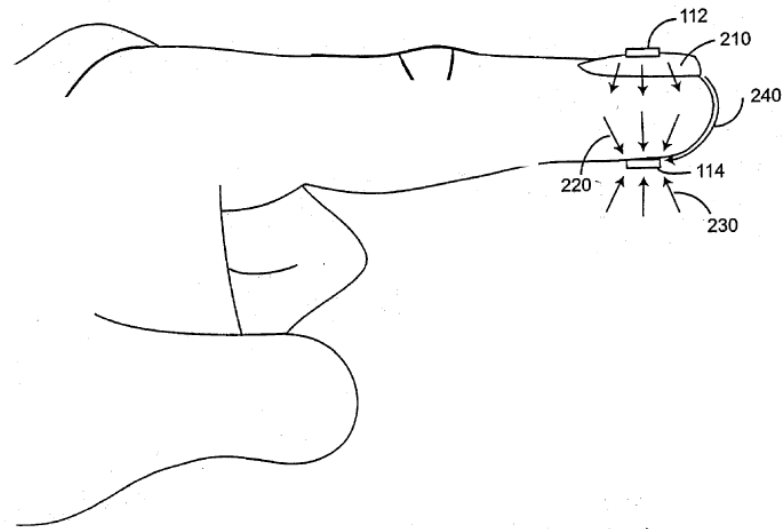


FIG. 2 (Prior Art)

Fig. 2.

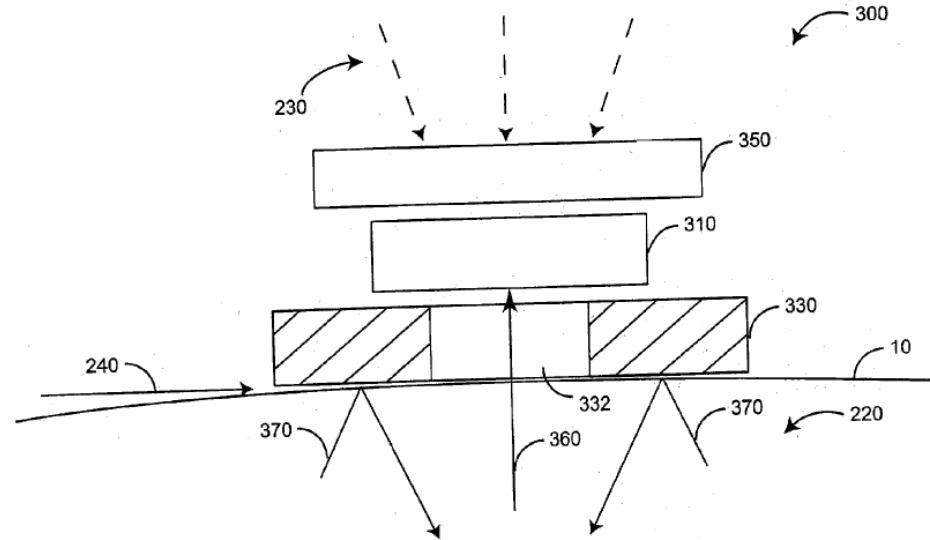


FIG. 3 (Prior Art)

Fig. 3.

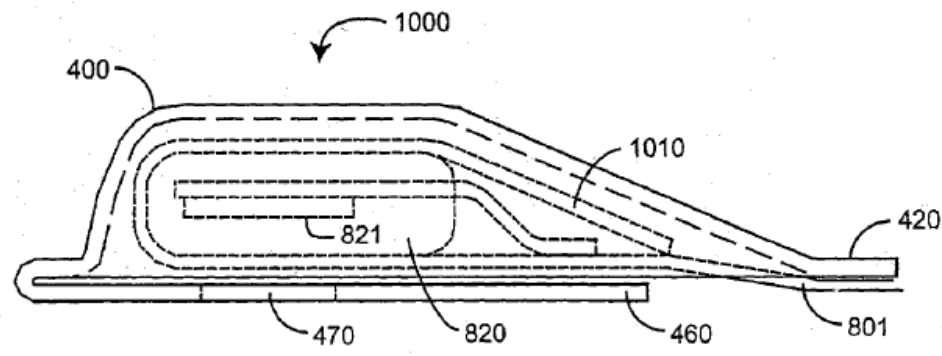


FIG. 6A

Fig. 6A.

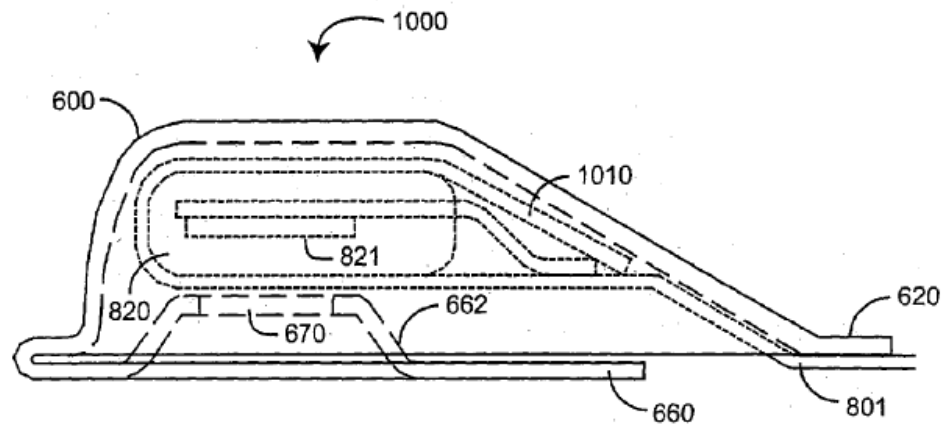


FIG. 6B

Fig. 6B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light

	240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above. [0005] One aspect of a low noise optical housing is a substrate having a reflective side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the substrate, securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0037 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously
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	incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the
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flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B).)”

Abdul-Hafiz, ¶0039 (“[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.”)

Abdul-Hafiz, ¶0046 (“[0046] FIGS. 10A-C illustrate a shielded detector assembly 1000 configured for the neonate flexible circuit assembly 801 (FIGS. 8A, 9A-B) as shown, or, similarly, for the adult flexible circuit assembly 851 (FIGS. 8B, 9C-D). As shown in FIG. 10A, inside pressure sensitive adhesive (PSA) 1020 and top PSA 1030 are removed from a foldable shield 1010, and bottom PSA 1040 is removed from a fixed shield 1005 (not visible). As shown in FIG. 10B, the shield 1010 is next folded toward the detector 820. As shown in FIG. 10C, the shield 1010 is then folded over the back and sides of the detector 820, enclosing the detector 820. The inside PSA 1020 adheres to the detector 820, maintaining the foldable shield 1010 in place. Next, the EMI shielded detector 820 is placed into the optical housing 400. The top PSA 1030 adheres to the inside surface of the optical housing 400, which defines a pocket 440 (FIGS. 4BC) as described above. The bottom PSA 1040 adheres to the optical housing base 410 (FIGS. 4A-C), maintaining the detector 820 in place within the optical housing cover 410 (FIGS. 4AC), aligned with the aperture 470 (FIG. 4A), and maintaining the optical housing 400 in the closed position 560 (FIGS. 5C-D).”)

Abdul-Hafiz, Claim 17 (“17. An optical housing comprising:

a light reflecting cover means for shielding against ambient light;

a base means for blocking piped light, said base means adjoining said cover means,

	a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”) To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 10	Prior Art
10[pre] A physiological monitoring device comprising:	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious a physiological monitoring device. For example, Abdul-Hafiz discloses and/or suggests a physiological monitoring device, implemented in a non-limiting example as a pulse oximetry system that measures a patient’s blood oxygen saturation level: <i>See, e.g.,</i> Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a Substrate having a reflective side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with

the detector in the closed position so as to pass light through to the detector.”)

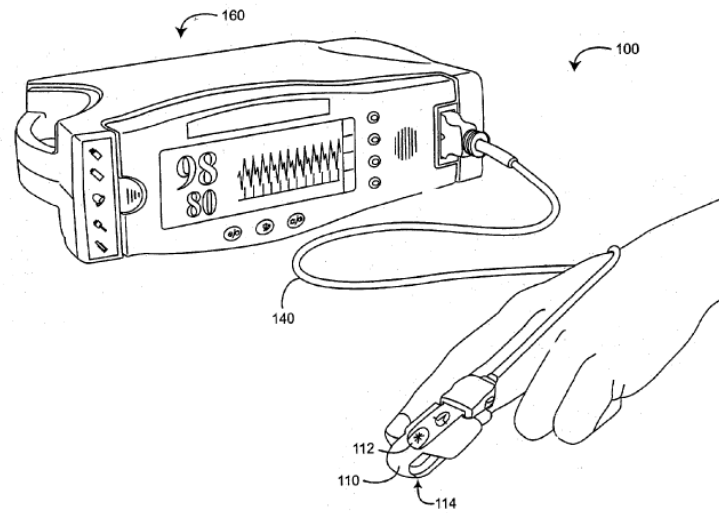


FIG. 1 (Prior Art)

Fig. 1.

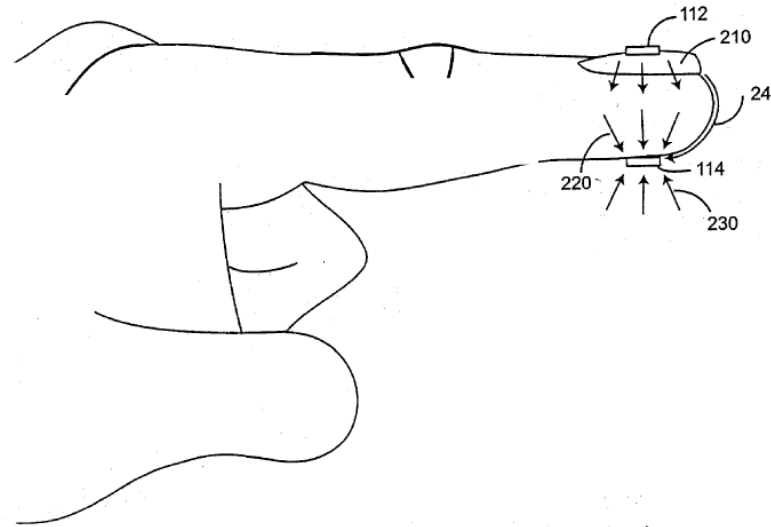


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, Claim 17 (“17. An optical housing comprising:

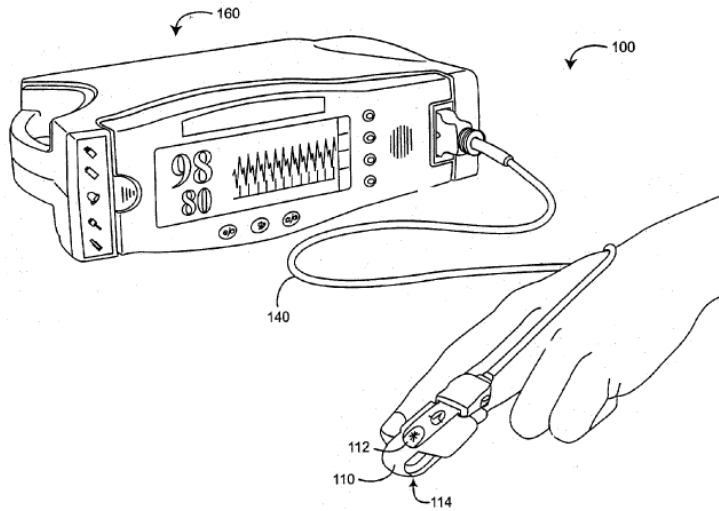
a light reflecting cover means for shielding against ambient light;

a base means for blocking piped light, said base means adjoining said cover means,

a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and

an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”)

To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success

	in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
10[a] at least three LEDs recessed into a cavity, the at least three LEDs configured to emit light of at least three different wavelengths;	Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious at least three LEDs recessed into a cavity, the at least three LEDs configured to emit light of at least three different wavelengths. For example, Abdul-Hafiz discloses and/or suggests at least two LEDs recessed into a cavity, the cavity comprising a portion of a sensor 110, and where the at least two LEDs are configured to emit light of at least two different wavelengths corresponding to wavelengths for red and infrared light being emitted from each of two LEDs, respectively: <i>See, e.g., Abdul-Hafiz at Fig. 1:</i>  FIG. 1 (Prior Art)

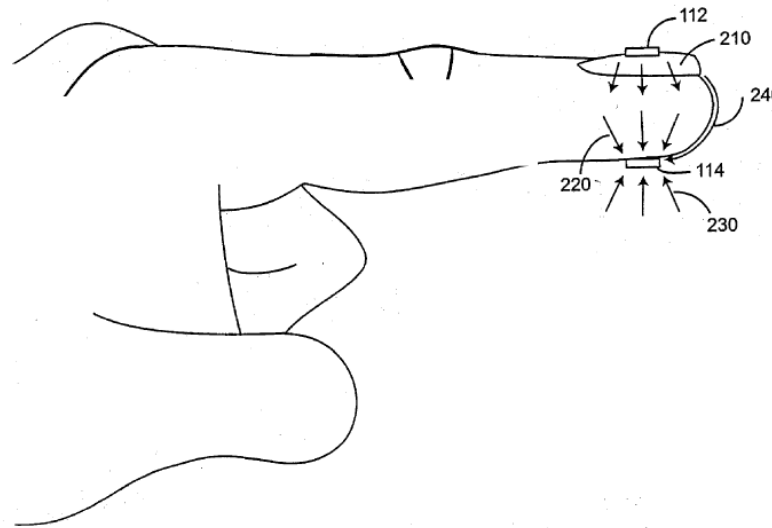


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

	SUMMARY OF THE INVENTION [0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. And incorporated by reference herein.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
10[b] at least one detector configured to detect at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious at least one detector configured to detect at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has been attenuated by tissue, the at least one detector configured to output at least one signal responsive to the detected light. For example, Abdul-Hafiz discloses and/or suggests at least one detector, implemented in a non-limiting example as a photodiode, where the at least one detector is configured to detect at least a portion of the light emitted from the at least two LEDs after at least a portion of the light has been attenuated by tissue of a patient’s finger, and where the at least one detector is configured to output at least one signal responsive to the detected light, where the outputted at least one signal may be relied upon to measure the saturation level of arterial blood:

been attenuated by tissue, the at least one detector configured to output at least one signal responsive to the detected light;

See, e.g., Abdul-Hafiz at Fig. 1:

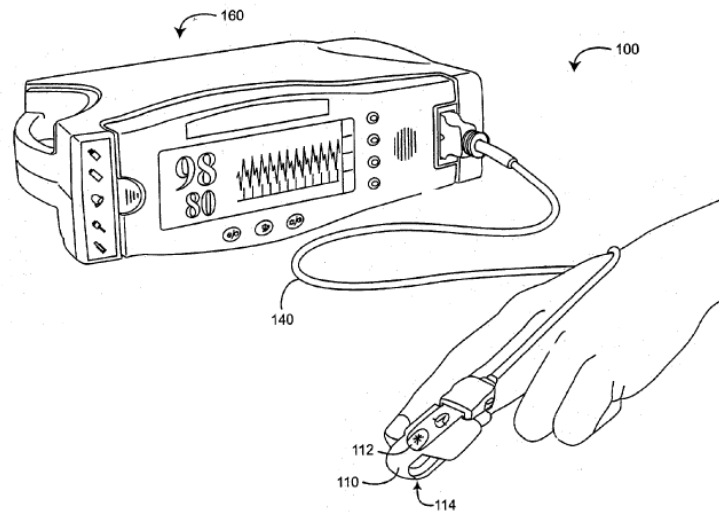


FIG. 1 (Prior Art)

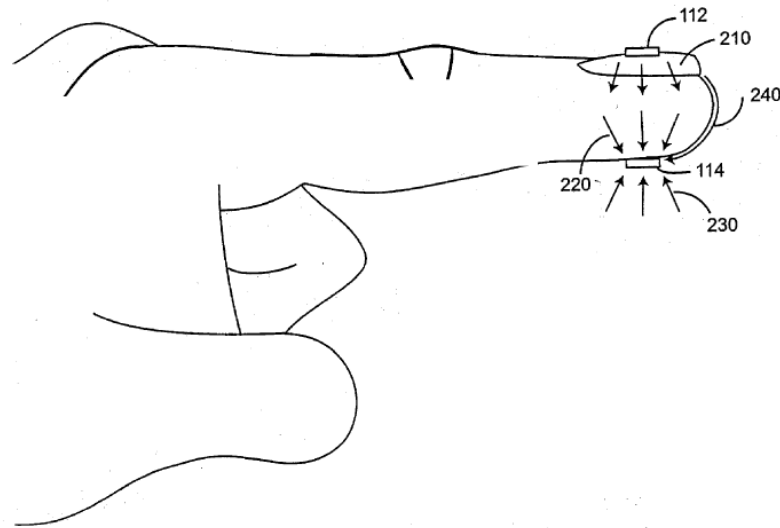


FIG. 2 (Prior Art)

Fig. 2.

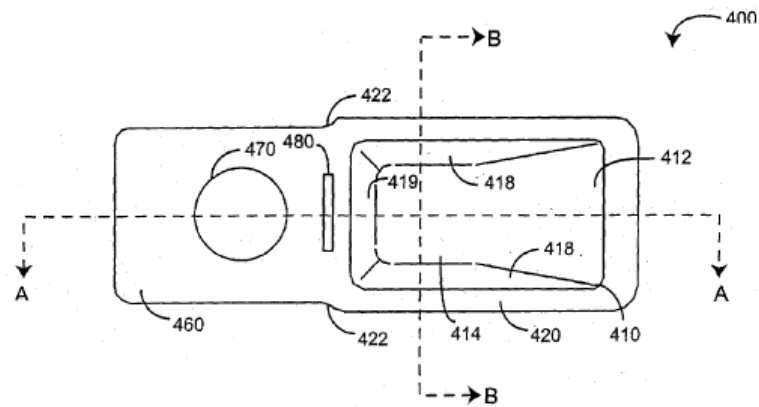
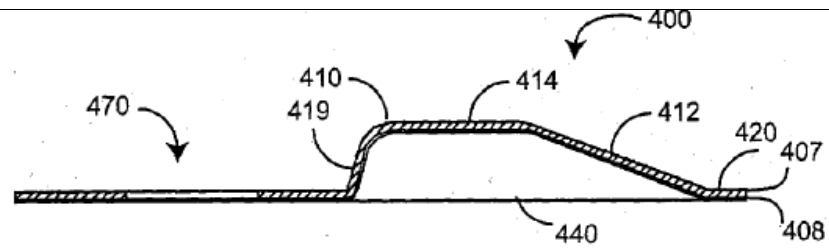


FIG. 4A

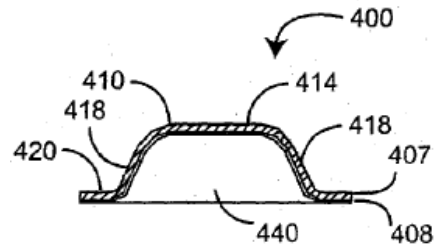
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

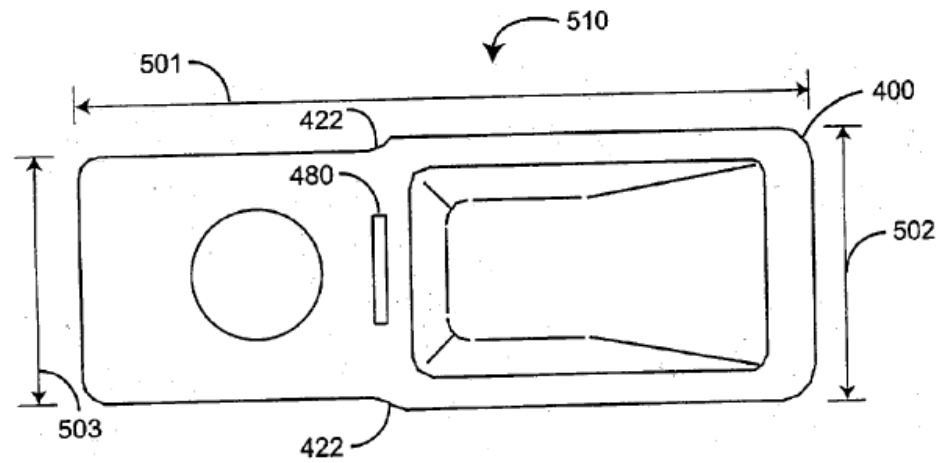


FIG. 5A

Fig. 5A.

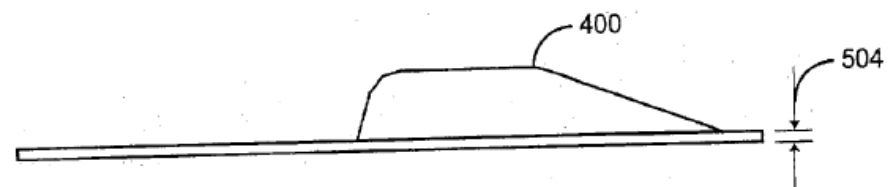


FIG. 5B

Fig. 5B.

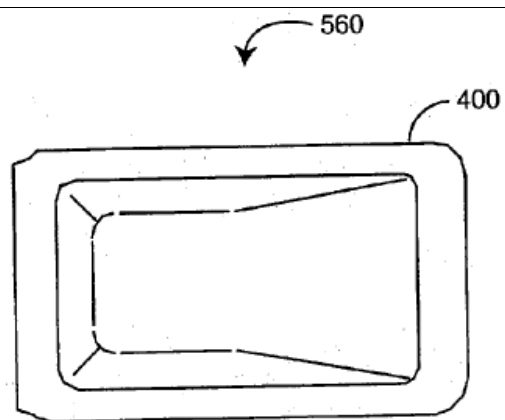


FIG. 5C

Fig. 5C.

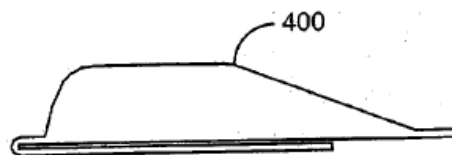


FIG. 5D

Fig. 5D.

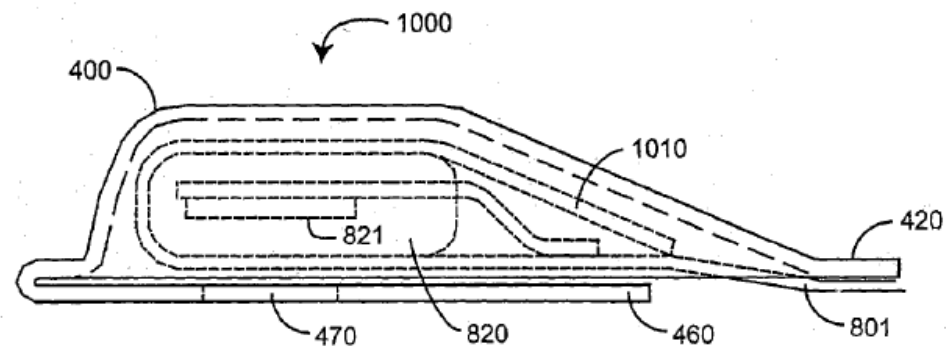


FIG. 6A

Fig. 6A.

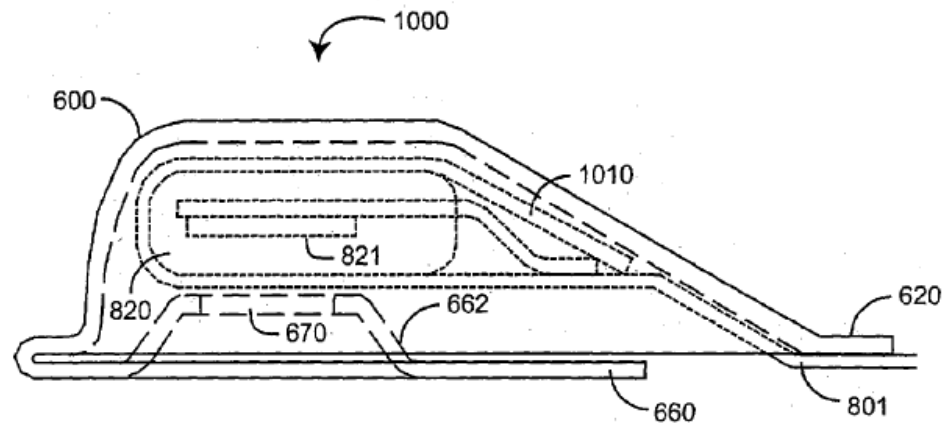
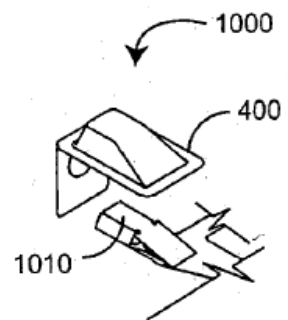


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

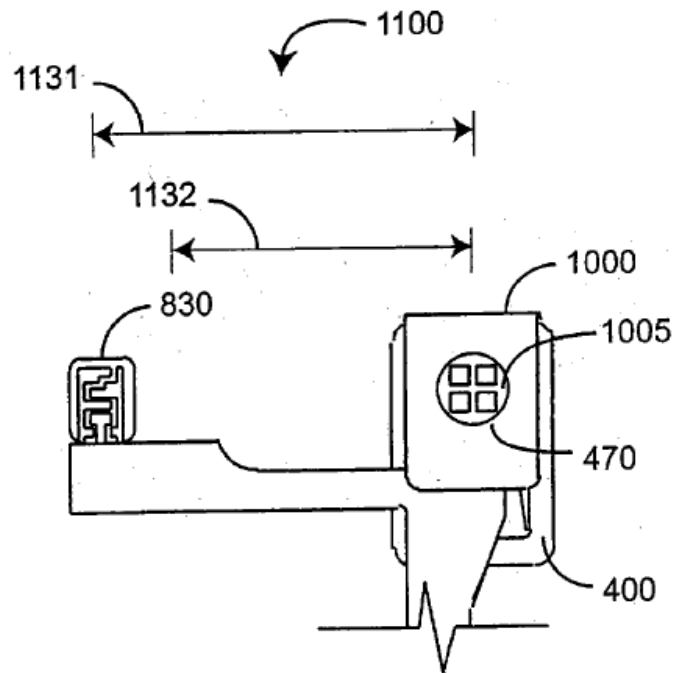


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140

connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical "noise" that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled "Low Noise Optical Probe," which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”). Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a
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	reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines a pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B). [0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5AB) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the
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base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width 502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5AD, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below.

[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660. So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.

[0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector so as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled “Circuit Board Based Cable Connector,” which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S.

patent application Ser. No. 10/137,942, filed May 2, 2002, entitled “Flex Circuit Shielded Optical Sensor,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit So as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with similar structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”).

	Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”). Abdul-Hafiz, Claim 17 (“17. An optical housing comprising: a light reflecting cover means for Shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
10[c] an electromagnetic interference shield positioned between the at least three LEDs and the at least one detector;	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious an electromagnetic interference shield positioned between the at least three LEDs and the at least one detector. For example, Abdul-Hafiz discloses and/or suggests an electromagnetic interference shield positioned between the at least three LEDs and the at least one detector, implemented in a non-limiting example as a shield detector assembly comprising an EMI shield that encloses the detector and includes a foldable shield and fixed shield. <i>See, e.g., Abdul Hafiz at Figure 2:</i>

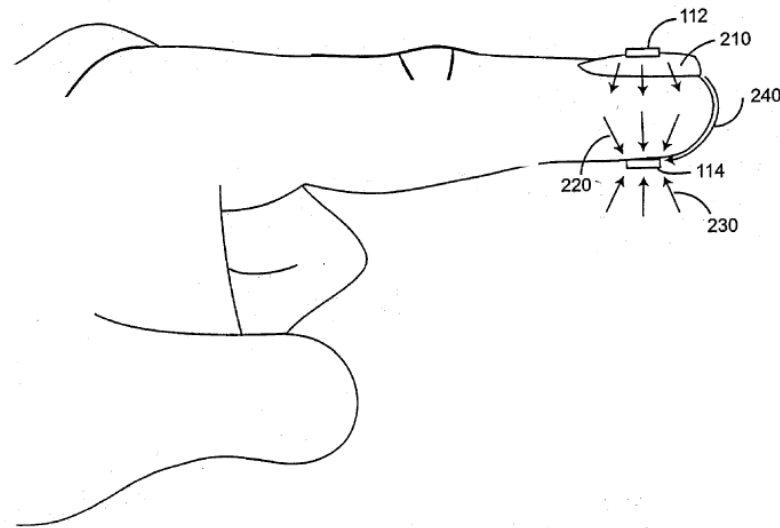


FIG. 2 (Prior Art)

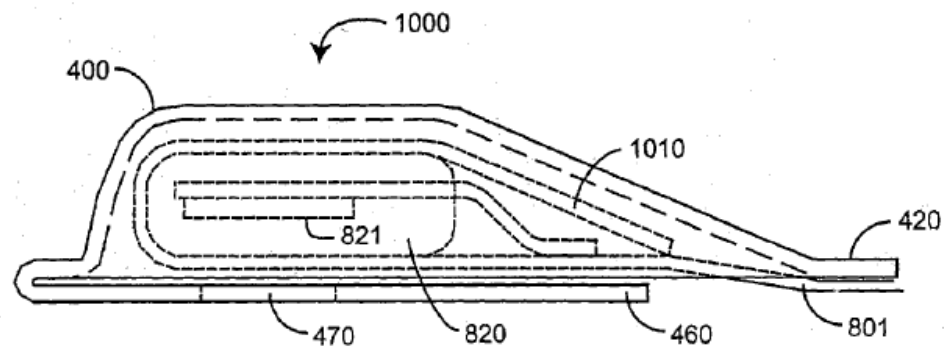


FIG. 6A

Fig. 6A.

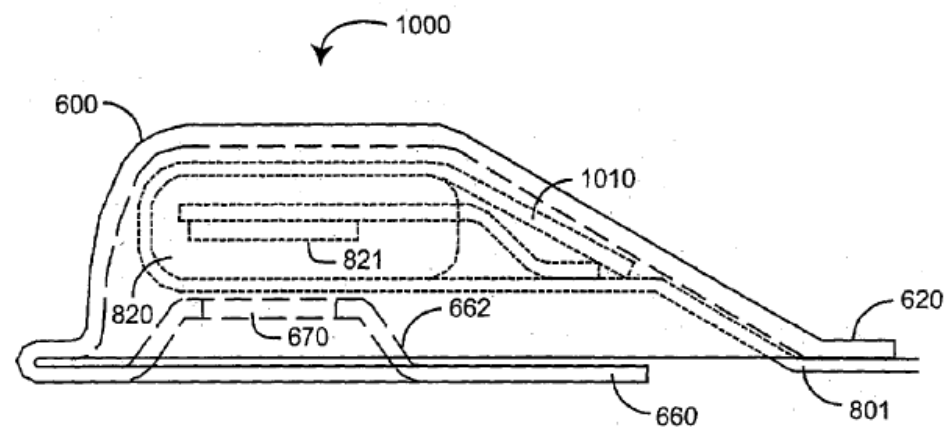
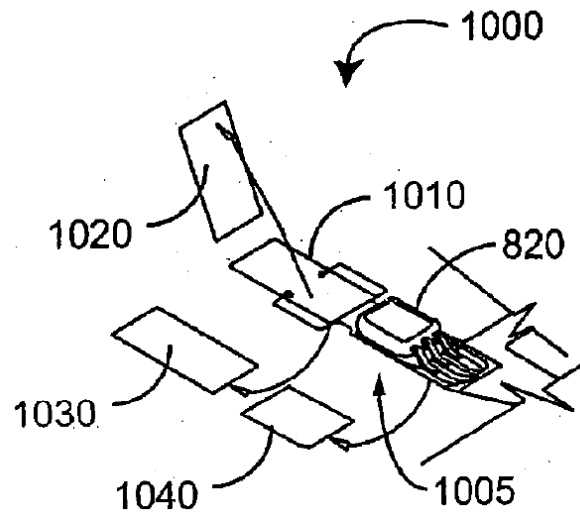


FIG. 6B

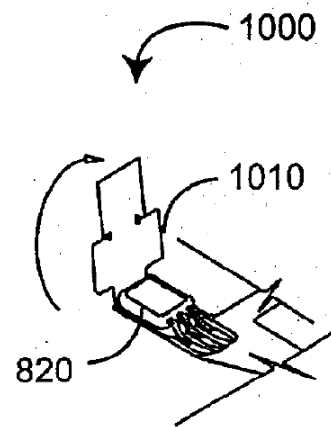
Fig. 6B.



DETAIL A

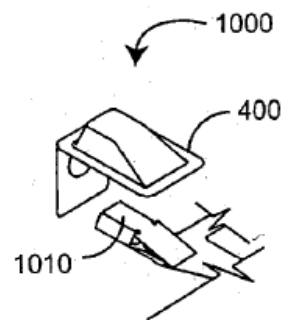
FIG. 10A

Fig. 10A.



DETAIL A
FIG. 10B

Fig. 10B.



DETAIL A

FIG. 10C

Fig. 10C.

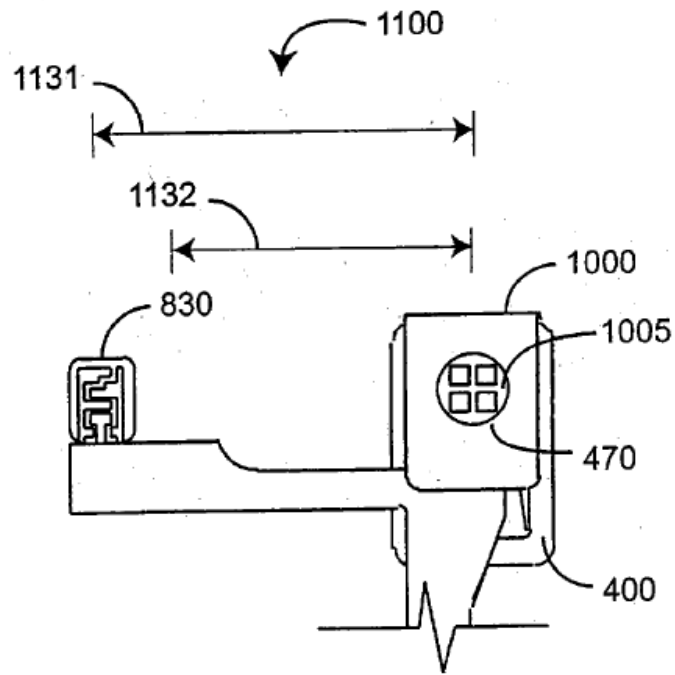


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶0039 (“[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As

	shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.). Abdul-Hafiz, ¶¶0046-0047 (“[0046] FIGS. 10A-C illustrate a shielded detector assembly 1000 configured for the neonate flexible circuit assembly 801 (FIGS. 8A, 9A-B) as shown, or, similarly, for the adult flexible circuit assembly 851 (FIGS. 8B, 9C-D). As shown in FIG. 10A, inside pressure sensitive adhesive (PSA) 1020 and top PSA 1030 are removed from a foldable shield 1010, and bottom PSA 1040 is removed from a fixed shield 1005 (not visible). As shown in FIG. 10B, the shield 1010 is next folded toward the detector 820. As shown in FIG. 10C, the shield 1010 is then folded over the back and sides of the detector 820, enclosing the detector 820. The inside PSA 1020 adheres to the detector 820, maintaining the foldable shield 1010 in place. Next, the EMI shielded detector 820 is placed into the optical housing 400. The top PSA 1030 adheres to the inside surface of the optical housing 400, which defines a pocket 440 (FIGS. 4BC) as described above. The bottom PSA 1040 adheres to the optical housing base 410 (FIGS. 4A-C), maintaining the detector 820 in place within the optical housing cover 410 (FIGS. 4AC), aligned with the aperture 470 (FIG. 4A), and maintaining the optical housing 400 in the closed position 560 (FIGS. 5C-D). FIGS. 11A-B illustrate one embodiment of the optical portion 1100 of a sensor assembly 900 (FIGS. 9A-B) having a detector assembly 1000 and an emitter 830 connected to a pad 1110. As shown in FIG. 11A, a particular embodiment of the pad 1110 advantageously has an inner contact set 1112 and an outer contact set 1114. The emitter 830 may be attached and electrically connected in a first position to the inner contact set 1112 or in a second position to the outer contact set 1114. As shown in FIG. 11B, this advantageously provides two different detector- emitter spacings 1131, 1132 on the same flexible circuit substrate. A comparatively wider spacing 1131 corresponds to the second emitter position attached to the outer contact set 1114 (shown), and a comparatively narrower spacing 1132 corresponds to the first emitter position attached to the inner contact set 1112 (not shown). The choice of mounting the emitter with a narrower or wider spacing accommodates different sensor types for different sized patients or different tissue site thicknesses with fewer unique sensor parts or subassemblies. Note that the detector 820 (FIGS. 10A-B) is not visible in FIG. 11B as it is behind the fixed shield 1005. As an example, a neonate sensor 700 (FIGS. 7A-B) and an infant sensor (not illustrated) configured for different sized foot sites may be manufactured from a single flex circuit part. In a preferred embodiment, the inner pads are configured for a 20 mm detector-emitter spacing appropriate for a neonate, such as a child weighing under
--	---

	3 kg and the outer pads 1114 are configured for a 25 mm detector-emitter spacing appropriate for an infant, such as a child weighing 3-10 kg.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
10[d-1] a light block surrounding the at least one detector, the light block at least partially formed of black materials, the light block comprising a base, four side walls and a top forming an enclosure,	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious a light block surrounding the at least one detector, the light block at least partially formed of black materials, the light block comprising a base, four side walls and a top forming an enclosure. For example, Abdul-Hafiz discloses and/or suggests a light block surrounding the at least one detector, where the light block in a non-limiting example is implemented as a low noise optical housing that is configured to form an optical enclosure for the detector, and where the light block at least partially formed of black materials, implemented in a non-limiting example as an inner black layer or black substrate, and where the light block comprises a base comprising the base of the optical housing, four side walls including any of the ramp and beveled sides and beveled back of the optical housing, and a top comprising the base of the optical housing an enclosure, these components forming an enclosure for the detector: <i>See, e.g., Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a Substrate having a reflective Side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector.”)</i>

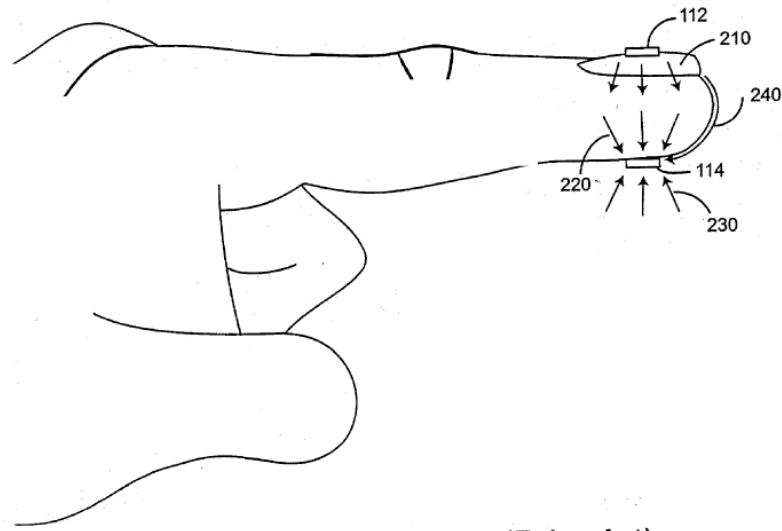


FIG. 2 (Prior Art)

Fig. 2.

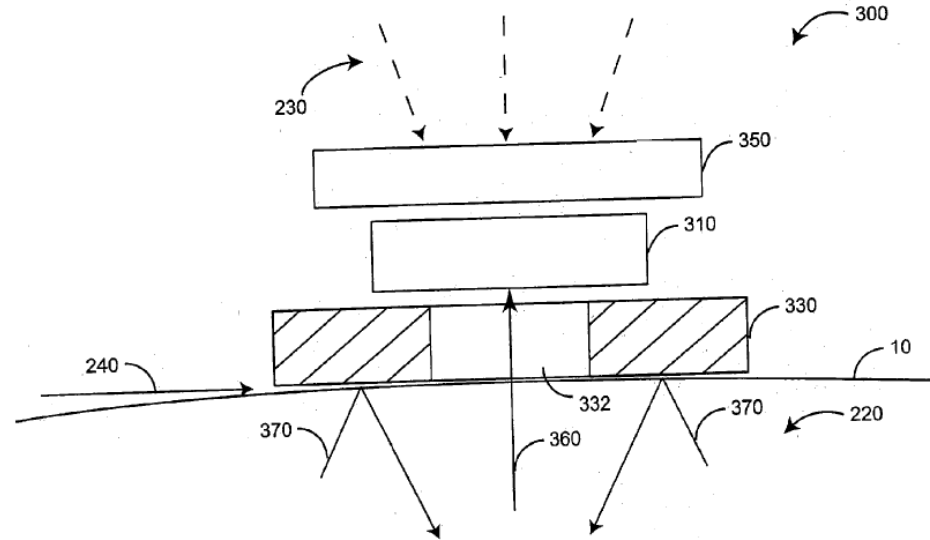


FIG. 3 (Prior Art)

Fig. 3.

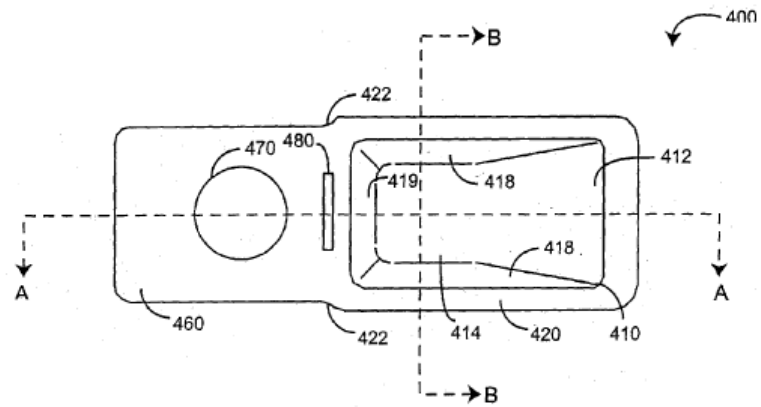
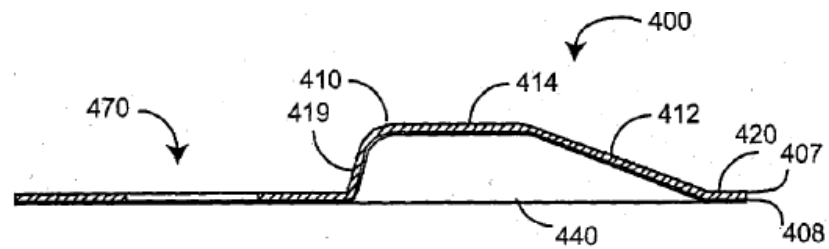


FIG. 4A

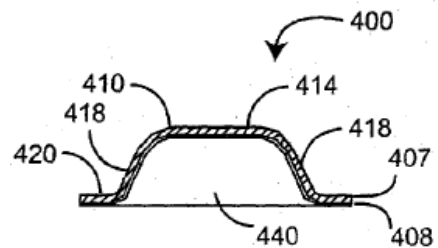
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

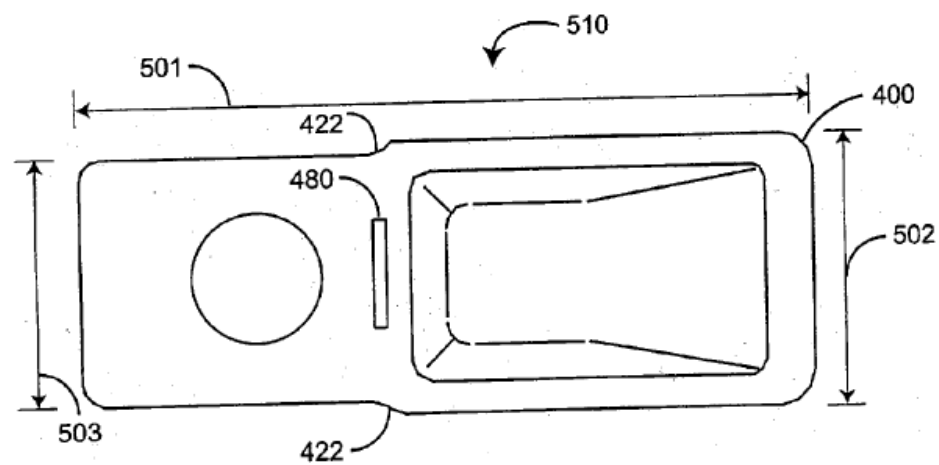


FIG. 5A

Fig. 5A.

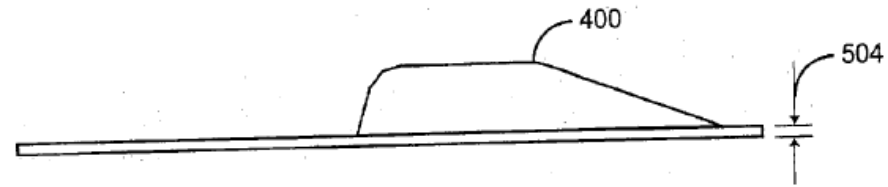


FIG. 5B

Fig. 5B.

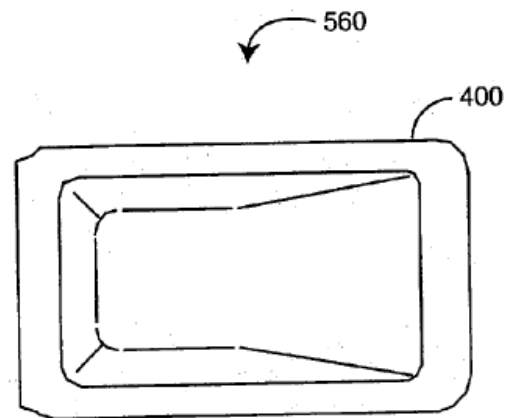


FIG. 5C

Fig. 5C.

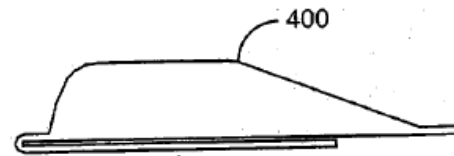


FIG. 5D

Fig. 5D.

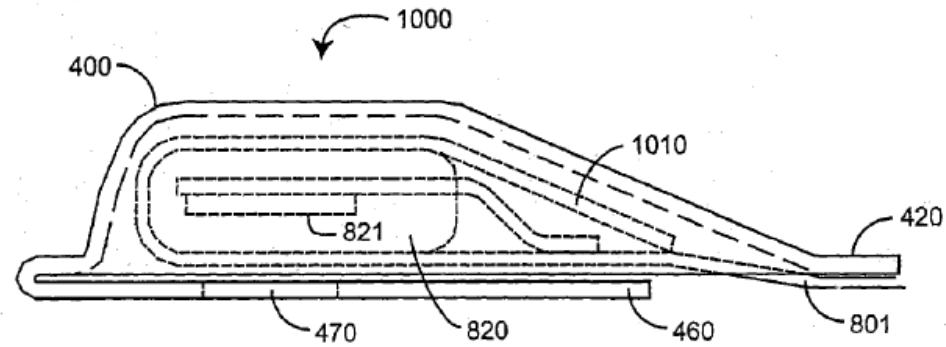


FIG. 6A

Fig. 6A.

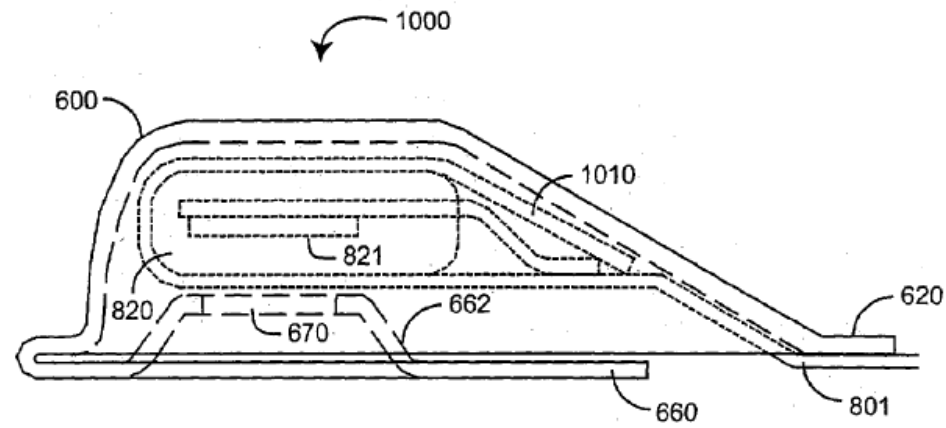
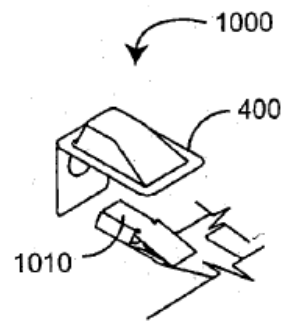


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

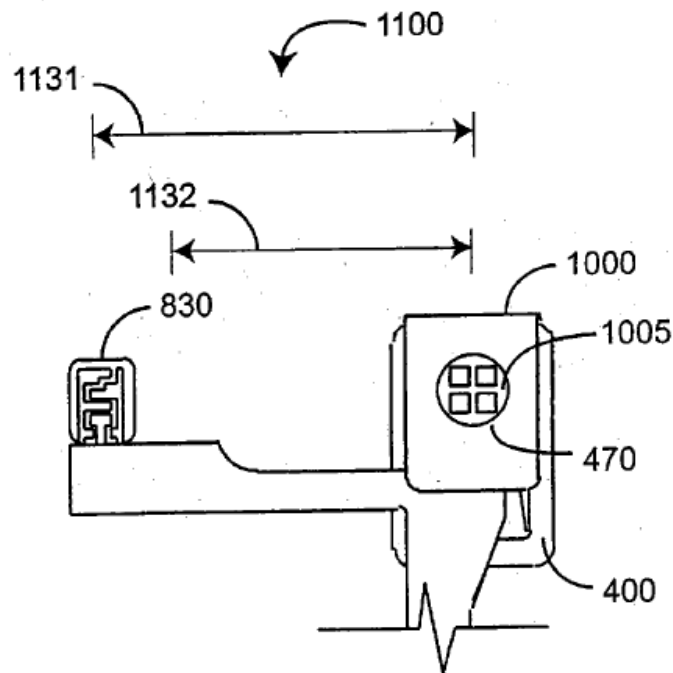


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable

140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described
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	below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B). [0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5AB) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width
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502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5AD, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below.

[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger spacing between the detector 820 and a tissue site, further reducing the effects of light piping.

[0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector So as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled "Circuit Board Based Cable Connector," which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S. patent application Ser. No. 10/137,942, filed May 2, 2002, entitled "Flex Circuit Shielded Optical Sensor," assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”)

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit so as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with Similar Structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”)

Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”).

	Abdul-Hafiz, Claims 6, 9, 17 (“6. The optical housing according to claim 1 wherein said substrate comprises a laminate having a generally white layer corresponding to said reflective side and a generally black layer corresponding to said absorptive side. 9. The optical housing method according to claim 8 wherein said providing step comprises the substep of laminating a white layer and a black layer. 17. An optical housing comprising: a light reflecting cover means for shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
10[d-2] wherein the light block comprises a window, the window having an area smaller than a detection surface area of	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the light block comprises a window, the window having an area smaller than a detection surface area of the at least one detector. For example, Abdul-Hafiz discloses and/or suggests wherein a light block comprises a window through which light passes to the detector, the window having an area that is smaller than a detection surface area of the at least one detector, implemented as a low noise sensor for which there is a spacer that defines an aperture that allows a transmitted portion of propagated light to reach the detector so as to reduce the intensity of the piped light, where

the at least one detector; and

the surface area of the opening of the aperture through which light passes is smaller than the surface area of the detection surface of the at least one detector:

See, e.g., Abdul-Hafiz at Fig. 3:

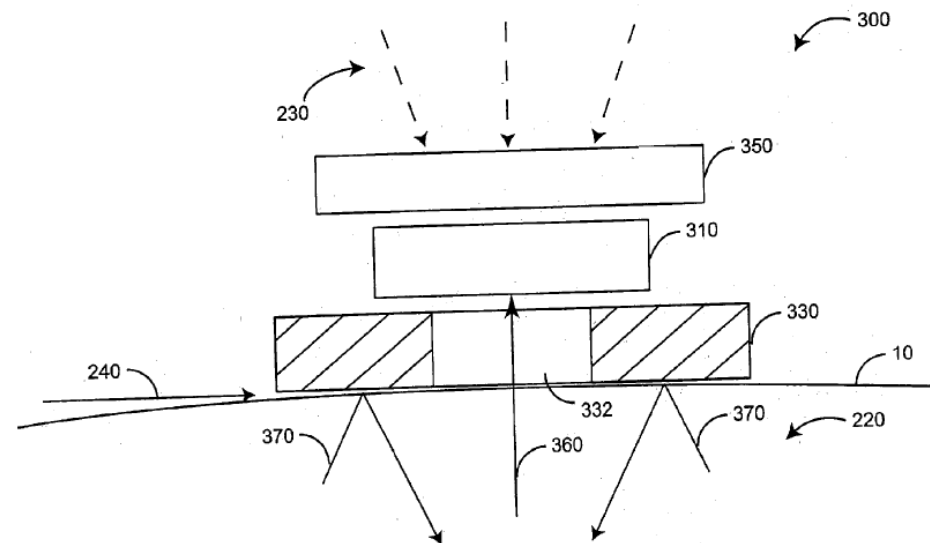


FIG. 3 (Prior Art)

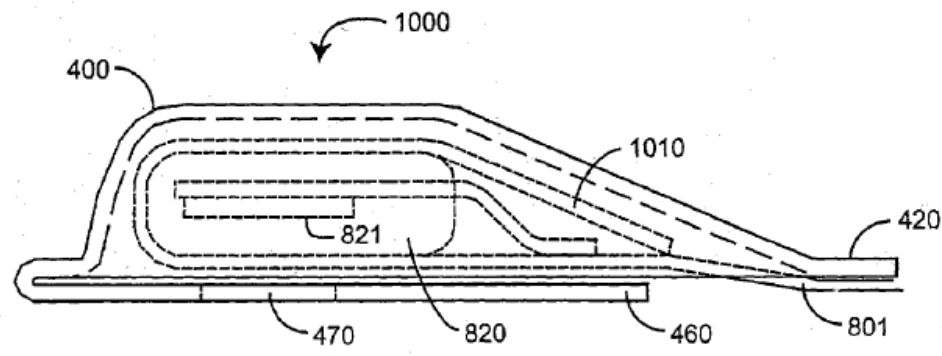


FIG. 6A

Fig. 6A.

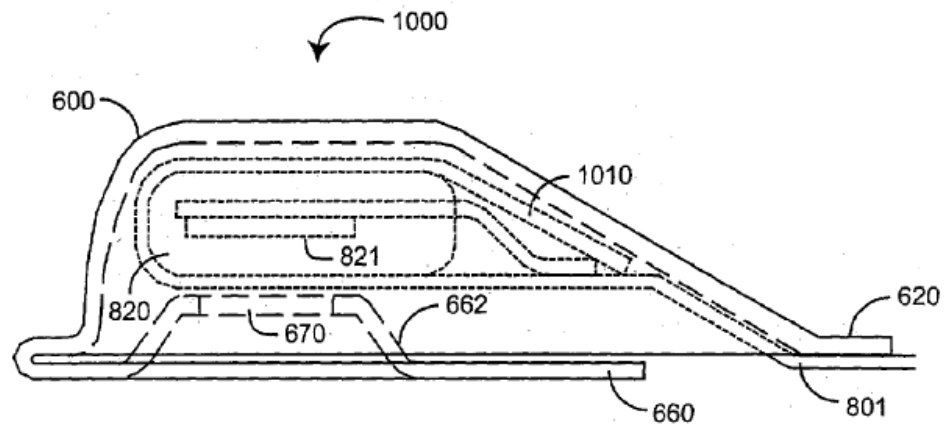


FIG. 6B

Fig. 6B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

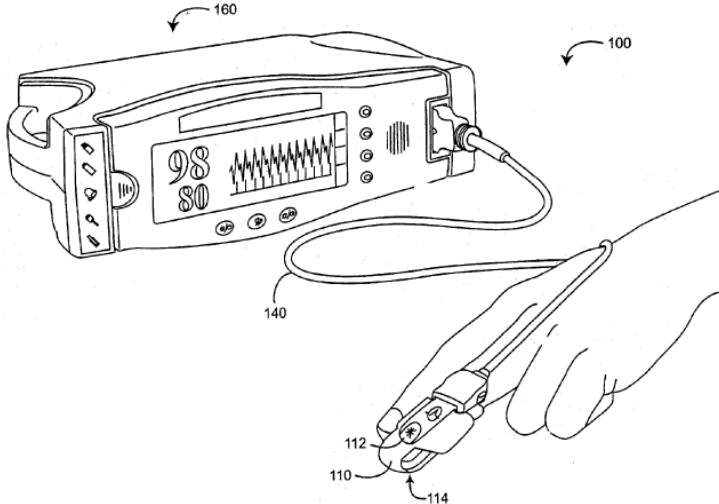
[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light

	240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above. [0005] One aspect of a low noise optical housing is a substrate having a reflective side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the substrate, securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0037 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously
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	incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the
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	flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B).)” Abdul-Hafiz, ¶0039 (“[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.”) Abdul-Hafiz, ¶0046 (“[0046] FIGS. 10A-C illustrate a shielded detector assembly 1000 configured for the neonate flexible circuit assembly 801 (FIGS. 8A, 9A-B) as shown, or, similarly, for the adult flexible circuit assembly 851 (FIGS. 8B, 9C-D). As shown in FIG. 10A, inside pressure sensitive adhesive (PSA) 1020 and top PSA 1030 are removed from a foldable shield 1010, and bottom PSA 1040 is removed from a fixed shield 1005 (not visible). As shown in FIG. 10B, the shield 1010 is next folded toward the detector 820. As shown in FIG. 10C, the shield 1010 is then folded over the back and sides of the detector 820, enclosing the detector 820. The inside PSA 1020 adheres to the detector 820, maintaining the foldable shield 1010 in place. Next, the EMI shielded detector 820 is placed into the optical housing 400. The top PSA 1030 adheres to the inside surface of the optical housing 400, which defines a pocket 440 (FIGS. 4BC) as described above. The bottom PSA 1040 adheres to the optical housing base 410 (FIGS. 4A-C), maintaining the detector 820 in place within the optical housing cover 410 (FIGS. 4AC), aligned with the aperture 470 (FIG. 4A), and maintaining the optical housing 400 in the closed position 560 (FIGS. 5C-D).”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial
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	Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
10[e] a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of a user responsive to the one or more signals.	Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious a processor configured to receive and process one or more signals responsive to the outputted at least one signal and determine a physiological parameter of a user responsive to the one or more signals. For example, Abdul-Hafiz discloses and/or suggests a pulse oximetry system including a monitor that receives and processes through a patient cable one or more signals responsive to the outputted at least one signal from the detector in order to determine a physiological parameter of a user such as an oxygen saturation level of arterial blood responsive to the one or more signals. <i>See, e.g., Abdul-Hafiz at Fig. 1.</i>  FIG. 1 (Prior Art) Fig. 1.

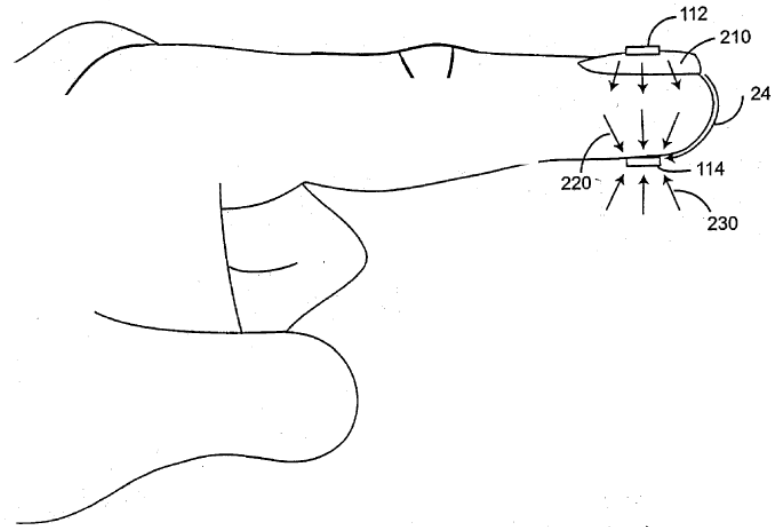


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0042 (“[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit So as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C).

	One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with similar structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 11	Prior Art
11. The device of claim 10, wherein the at least three LEDs comprises at least eight LEDs.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 10. <i>See, e.g., Claim 10.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least three LEDs comprises at least eight LEDs. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success

	in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 12	Prior Art
12. The device of claim 11, wherein the at least eight LEDs comprises at least two LEDs of the same wavelength.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 11. <i>See, e.g., Claim 11.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least eight LEDs comprises at least two LEDs of the same wavelength. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 13	Prior Art
13. The device of claim 10, wherein the at least three LEDs comprises at least twelve LEDs.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 10. <i>See, e.g., Claim 10.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least three LEDs comprises at least twelve LEDs. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success

	in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 14	Prior Art
14. The device of claim 10, wherein at least two LEDs of the at least three LEDs are configured for concurrent activation.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 10. <i>See, e.g., Claim 10.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein at least two LEDs of the at least three LEDs are configured for concurrent activation. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 17	Prior Art
17. The device of claim 10, wherein the window provides an optical path from the tissue to the at least one detector.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the device of claim 10. <i>See, e.g., Claim 10.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the window provides an optical path from the tissue to the at least one detector. For example, Abdul-Hafiz discloses and/or suggests wherein, as a non-limiting example, the opening provides an optical path from the tissue of the finger to the at least one detector, implemented as the light path from the tissue, through the aperture, and to the detector: <i>See, e.g., Abdul-Hafiz at Fig. 2:</i>

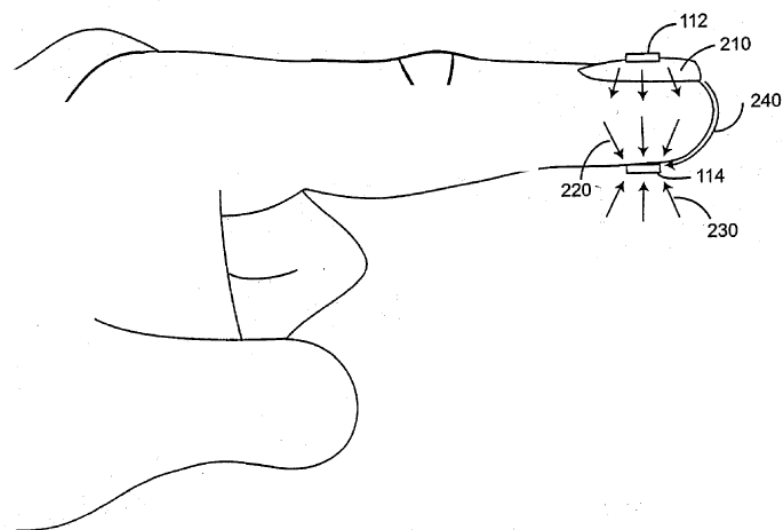


FIG. 2 (Prior Art)

Fig. 2.

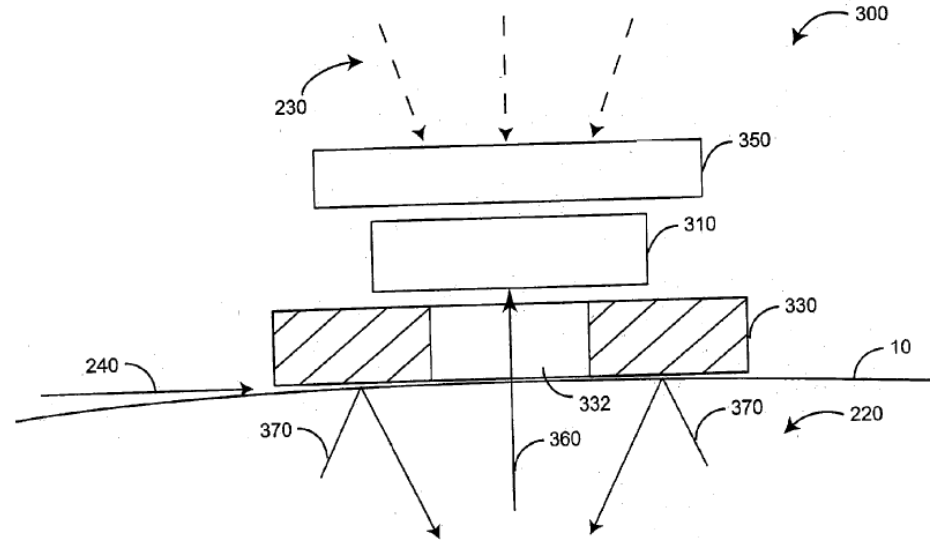


FIG. 3 (Prior Art)

Fig. 3.

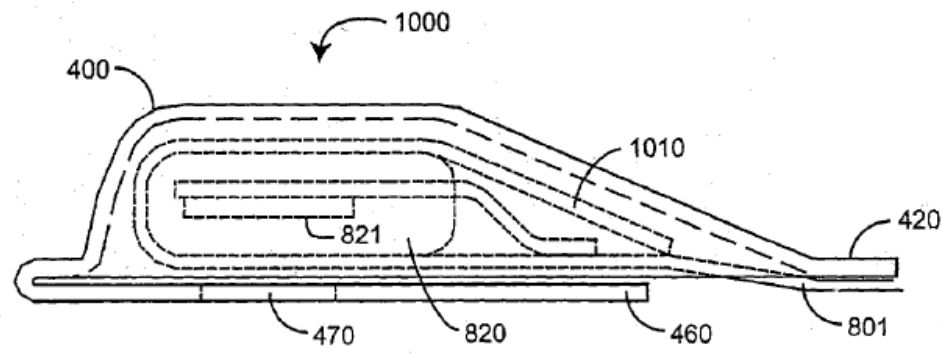


FIG. 6A

Fig. 6A.

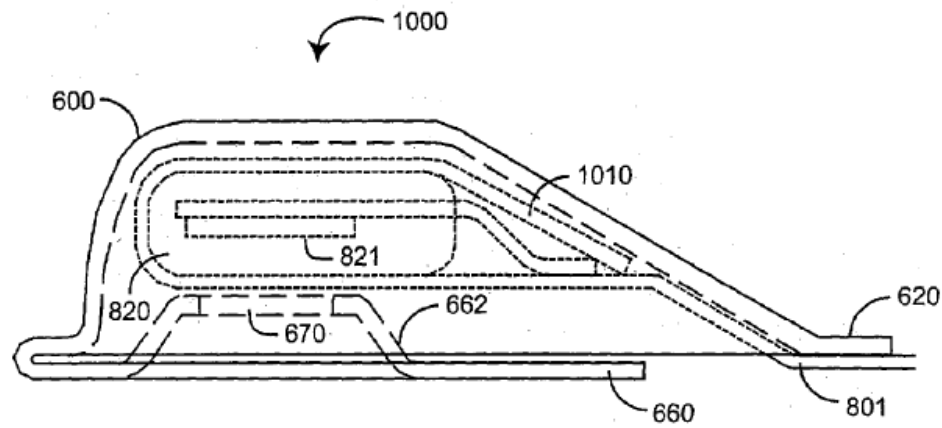


FIG. 6B

Fig. 6B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light

	240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above. [0005] One aspect of a low noise optical housing is a substrate having a reflective side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the substrate, securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0037 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously
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	incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the
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flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B).)”

Abdul-Hafiz, ¶0039 (“[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.”)

Abdul-Hafiz, ¶0046 (“[0046] FIGS. 10A-C illustrate a shielded detector assembly 1000 configured for the neonate flexible circuit assembly 801 (FIGS. 8A, 9A-B) as shown, or, similarly, for the adult flexible circuit assembly 851 (FIGS. 8B, 9C-D). As shown in FIG. 10A, inside pressure sensitive adhesive (PSA) 1020 and top PSA 1030 are removed from a foldable shield 1010, and bottom PSA 1040 is removed from a fixed shield 1005 (not visible). As shown in FIG. 10B, the shield 1010 is next folded toward the detector 820. As shown in FIG. 10C, the shield 1010 is then folded over the back and sides of the detector 820, enclosing the detector 820. The inside PSA 1020 adheres to the detector 820, maintaining the foldable shield 1010 in place. Next, the EMI shielded detector 820 is placed into the optical housing 400. The top PSA 1030 adheres to the inside surface of the optical housing 400, which defines a pocket 440 (FIGS. 4BC) as described above. The bottom PSA 1040 adheres to the optical housing base 410 (FIGS. 4A-C), maintaining the detector 820 in place within the optical housing cover 410 (FIGS. 4AC), aligned with the aperture 470 (FIG. 4A), and maintaining the optical housing 400 in the closed position 560 (FIGS. 5C-D).”)

Abdul-Hafiz, Claim 17 (“17. An optical housing comprising:

a light reflecting cover means for shielding against ambient light;

a base means for blocking piped light, said base means adjoining said cover means,

	a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”) To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 19	Prior Art
19[pre] A method for determining a physiological parameter of a living patient, the method comprising:	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious a method for determining a physiological parameter of a living patient. For example, Abdul-Hafiz discloses and/or suggests a method for determining a physiological parameter of a living patient, in a non-limiting example implemented as a pulse oximetry system that measures a patient’s blood oxygen saturation level: <i>See, e.g.,</i> Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a Substrate having a reflective side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with

the detector in the closed position so as to pass light through to the detector.”)

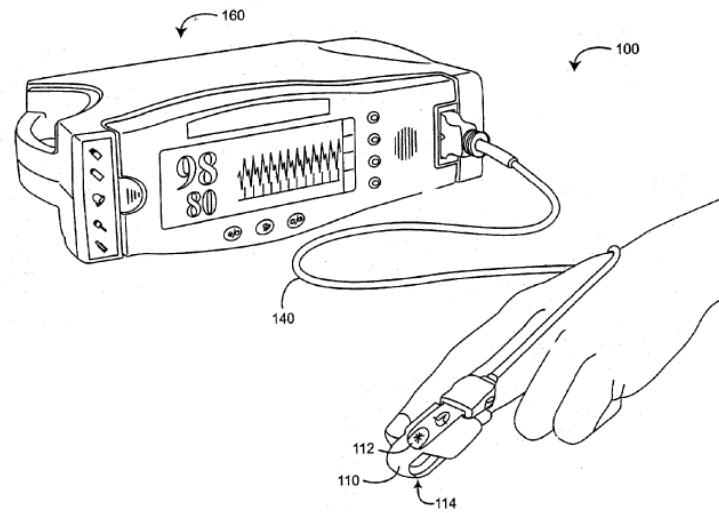


FIG. 1 (Prior Art)

Fig. 1.

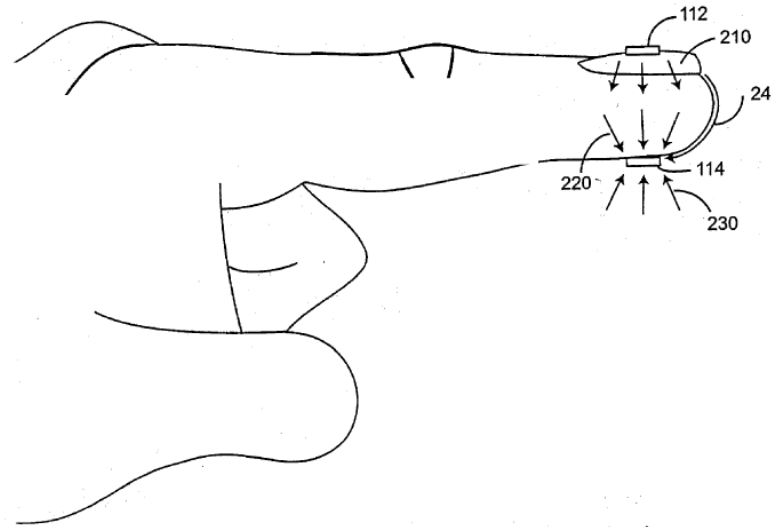


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, Claim 17 (“17. An optical housing comprising:

a light reflecting cover means for shielding against ambient light;

a base means for blocking piped light, said base means adjoining said cover means,

a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and

an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”)

To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success

	in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
19[a] positioning a sensor with respect to body tissue of a living patient, the sensor comprising at least three LEDs, at least one detector, and a light block at least partially surrounding the at least one detector, wherein a top of the light block comprises only one opening through which light is configured to pass;	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious positioning a sensor with respect to body tissue of a living patient, the sensor comprising at least three LEDs, at least one detector, and a light block at least partially surrounding the at least one detector, wherein a top of the light block comprises only one opening through which light is configured to pass. For example, Abdul-Hafiz discloses and/or suggests positioning a sensor with respect to body tissue of a living patient, the sensor implemented as at least part of a pulse oximetry system, where the sensor is comprising at least two LEDs and at least one detector implemented in a non-limiting example as a photodiode, where light emitted by the LEDs propagates through the body tissue of a living patient’s finger before being received by the detector, and where there is a light block at least partially surrounding the at least one detector, where the light block in a non-limiting example is implemented as a low noise optical housing that is configured to form an optical enclosure for the detector and where the low noise optical housing includes a aperture or opening or window, where the aperture/opening/window is positioned so as to provide the only opening through which light may pass through the optically enclosing low noise optical housing to the detector: <i>See, e.g., Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a substrate having a reflective side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector.</i>

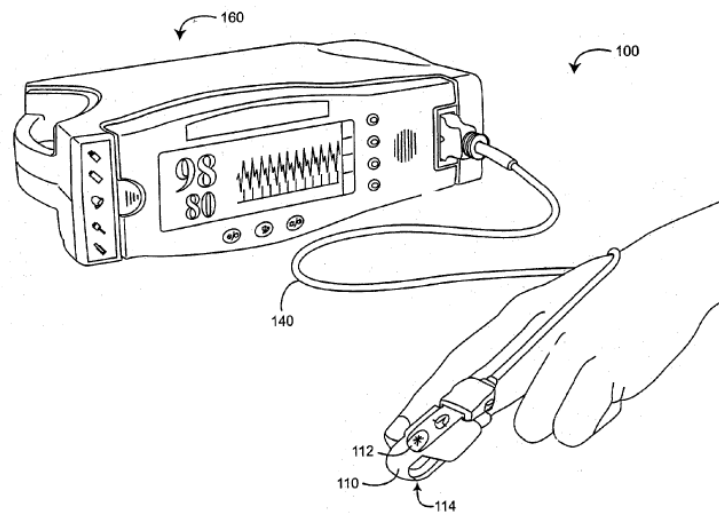


FIG. 1 (Prior Art)

Fig. 1.

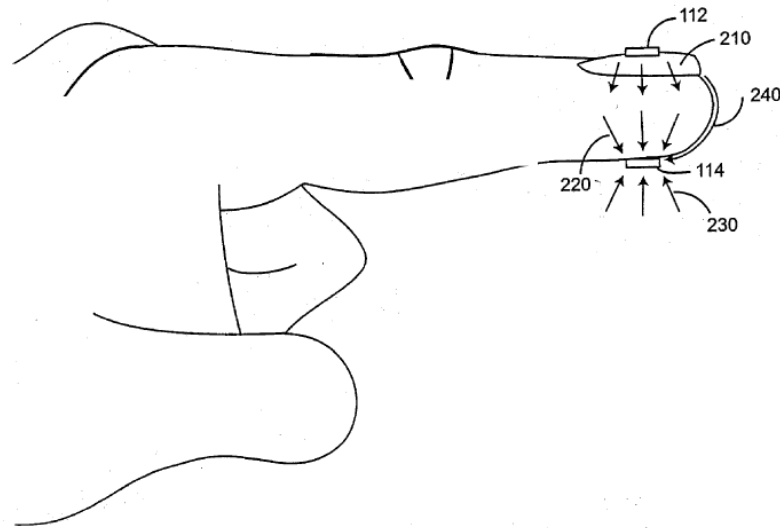


FIG. 2 (Prior Art)

Fig. 2.

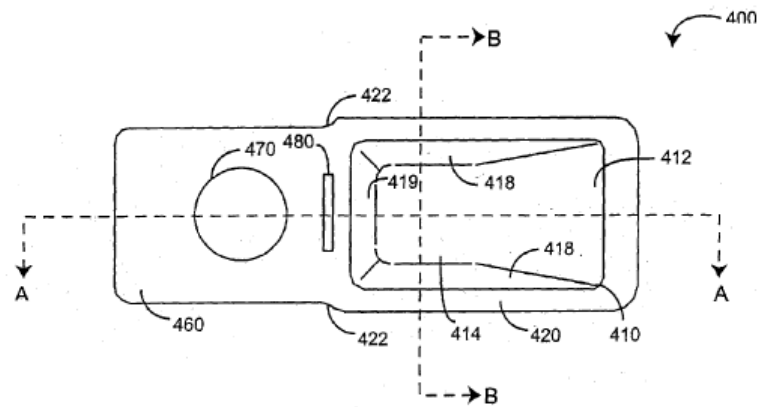
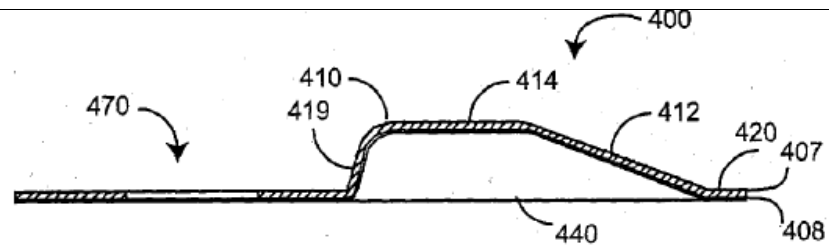


FIG. 4A

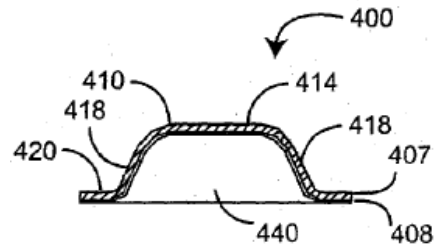
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

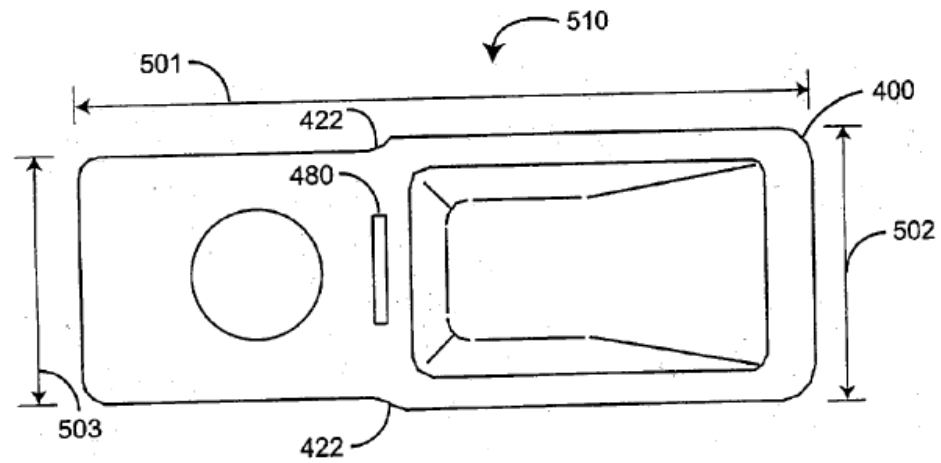


FIG. 5A

Fig. 5A.

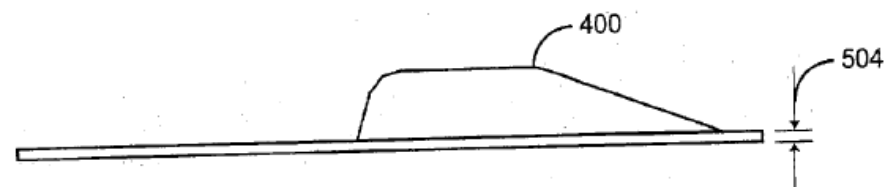


FIG. 5B

Fig. 5B.

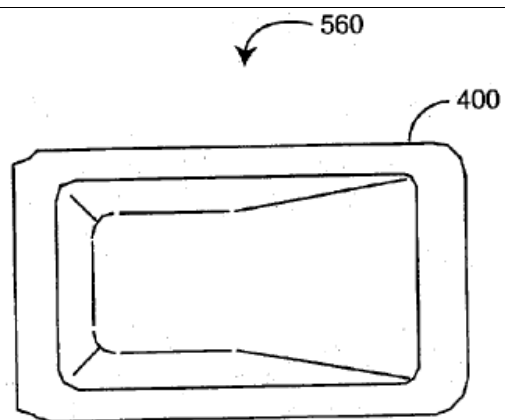


FIG. 5C

Fig. 5C.

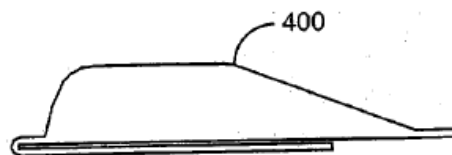


FIG. 5D

Fig. 5D.

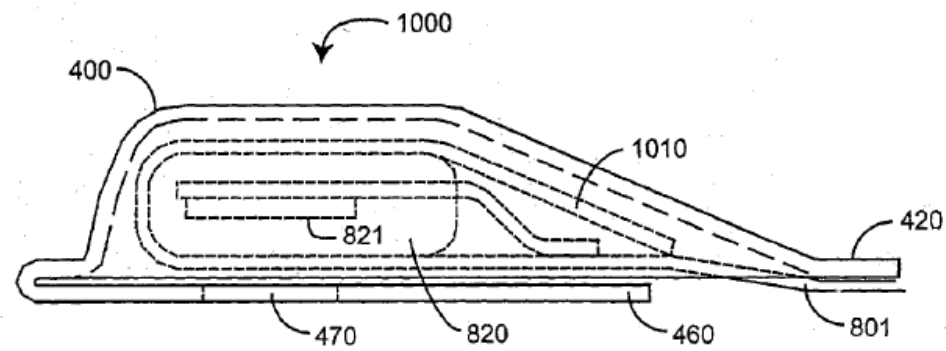


FIG. 6A

Fig. 6A.

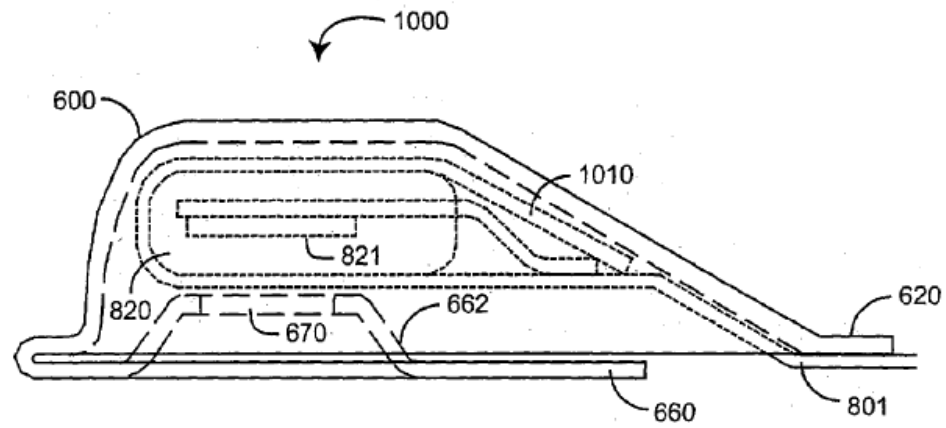
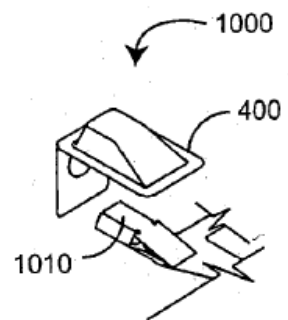


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

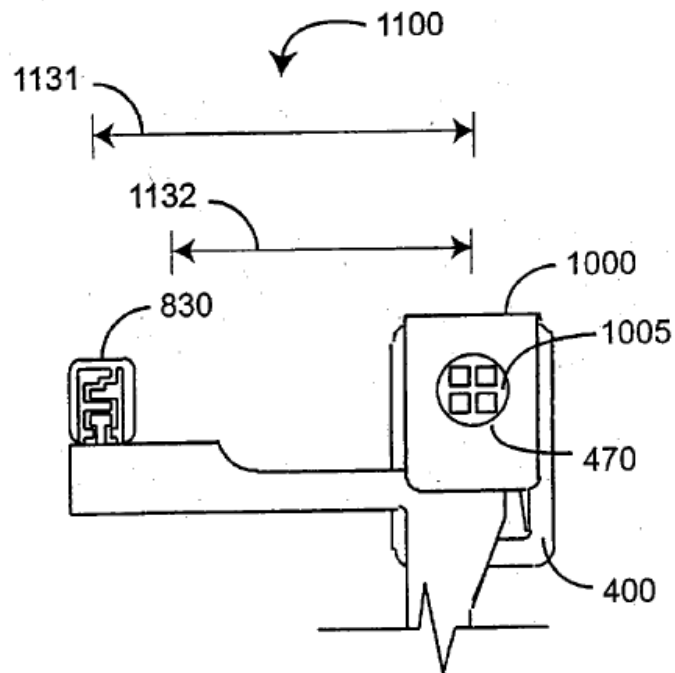


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable

140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”). Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a
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	reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines a pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) so as to seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B). [0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5A-B) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the
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	base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width 502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5A-D, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below. [0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping. [0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector So as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled "Circuit Board Based Cable Connector," which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein. [0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S.
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patent application Ser. No. 10/137,942, filed May 2, 2002, entitled “Flex Circuit Shielded Optical Sensor,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit so as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG. 11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with Similar Structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”).

	Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”). Abdul-Hafiz, Claim 17 (“17. 17. An optical housing comprising: a light reflecting cover means for Shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
19[b] activating the at least three LEDs such that at least three wavelengths of light are emitted from the at least three LEDs;	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious activating the at least three LEDs such that at least three wavelengths of light are emitted from the at least three LEDs. For example, Abdul-Hafiz discloses and/or suggests activating at least two LEDs, implemented in a non-limiting example as both red and infrared LEDs, such that at least two wavelengths of light are emitted from the at least two LEDs, corresponding to wavelengths for red and infrared light being emitted from each of the LEDs, respectively:

See, e.g., Abdul-Hafiz at Fig. 1:

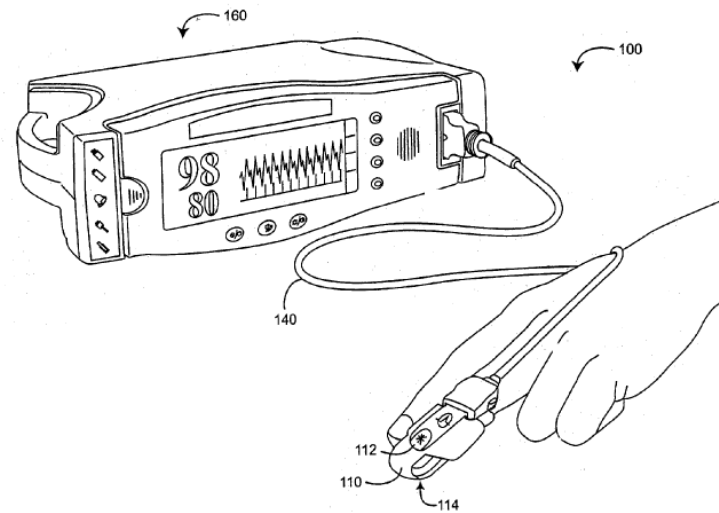


FIG. 1 (Prior Art)

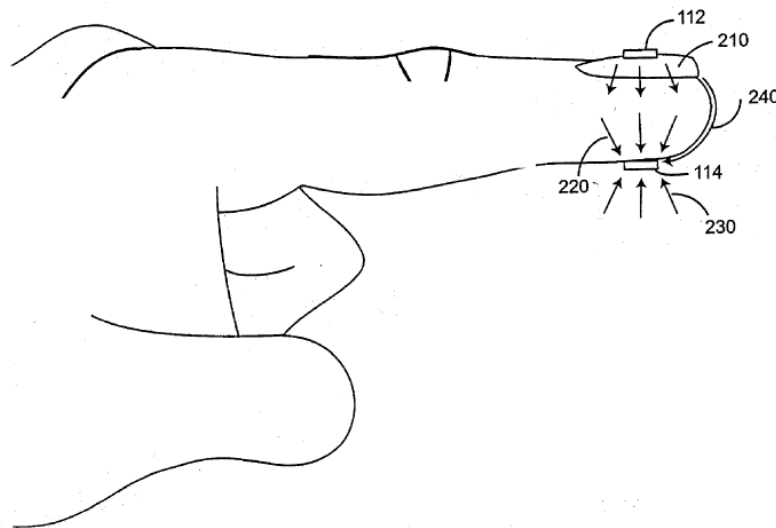


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

	SUMMARY OF THE INVENTION [0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. And incorporated by reference herein.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
19[c] detecting, at the at least one detector, at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has been attenuated	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious detecting, at the at least one detector, at least a portion of the light emitted from the at least three LEDs after at least a portion of the light has been attenuated by the body tissue and passed through the opening of the top of the light block, wherein the at least one detector outputs at least one signal responsive to the detected light. For example, Abdul-Hafiz discloses and/or suggests detecting, at the least one detector, implemented in a non-limiting example as a photodiode, at least a portion of the light emitted from the at least two LEDs after at least a portion of that light has been attenuated by the body tissue of a patient’s finger and passed through the opening of the top of the light block to the detector, where the opening at the top of the light block is implemented in a non-

by the body tissue and passed through the opening of the top of the light block, wherein the at least one detector outputs at least one signal responsive to the detected light; and

limiting example as a low noise optical housing that is configured to form an optical enclosure for the detector and where the low noise optical housing includes a aperture or opening or window through which light passes to the detector, and where the at least one detector outputs at least one sensor signal responsive to the detected light:

See, e.g., Abdul-Hafiz at Fig. 1:

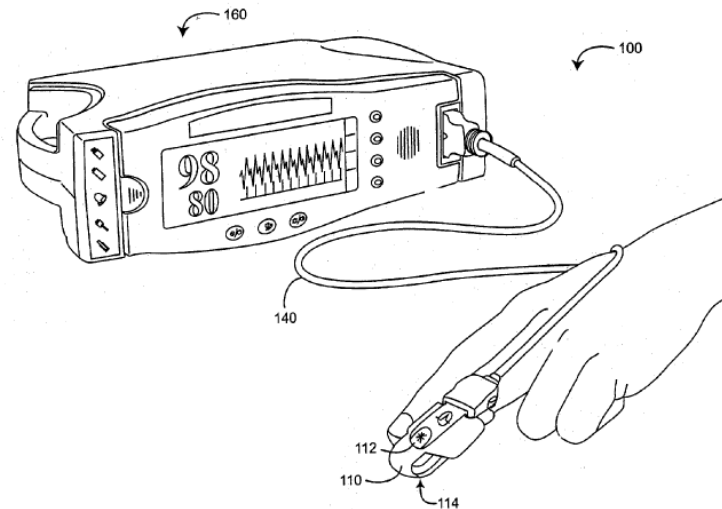


FIG. 1 (Prior Art)

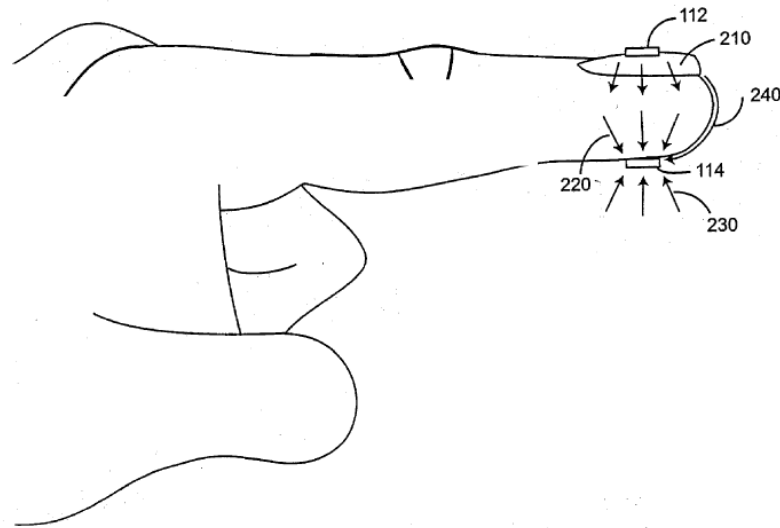


FIG. 2 (Prior Art)

Fig. 2.

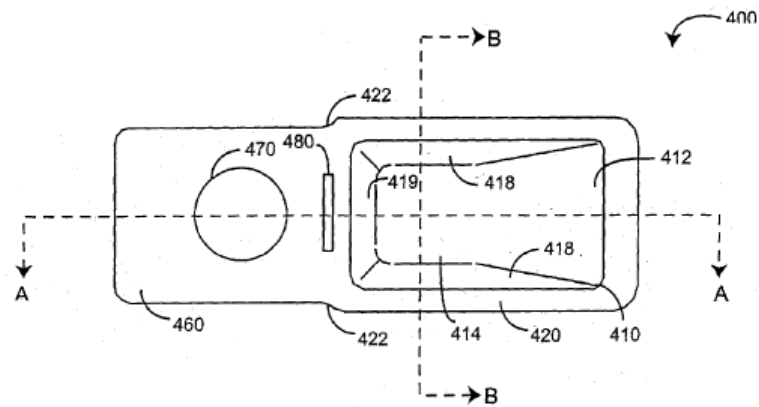
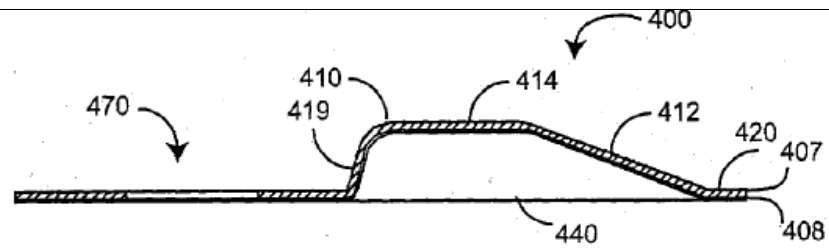


FIG. 4A

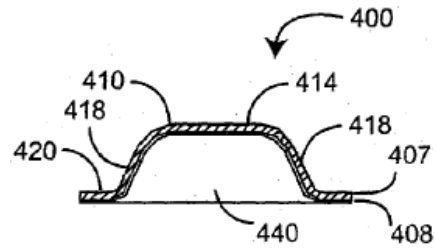
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

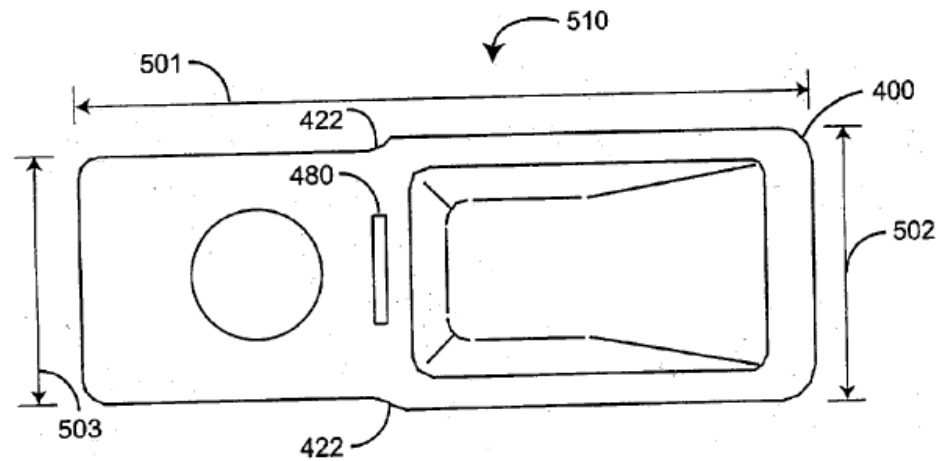


FIG. 5A

Fig. 5A.

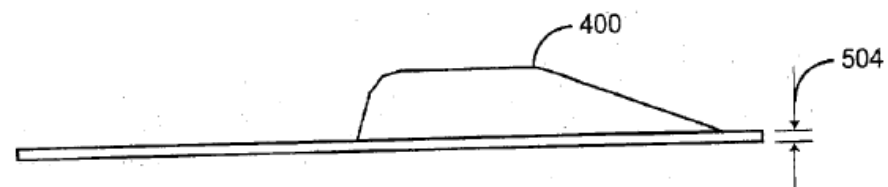


FIG. 5B

Fig. 5B.

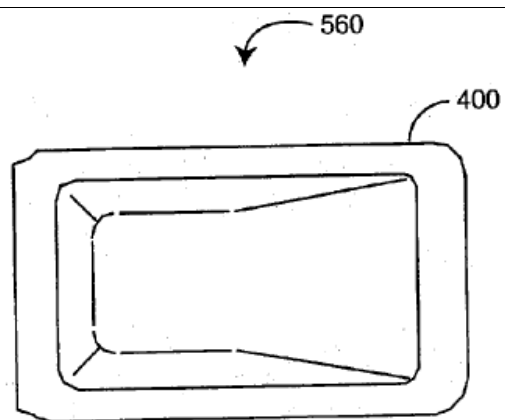


FIG. 5C

Fig. 5C.

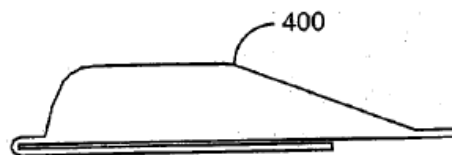


FIG. 5D

Fig. 5D.

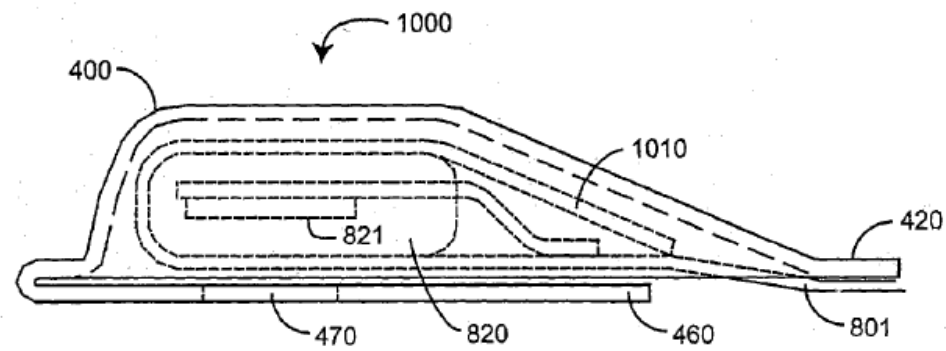


FIG. 6A

Fig. 6A.

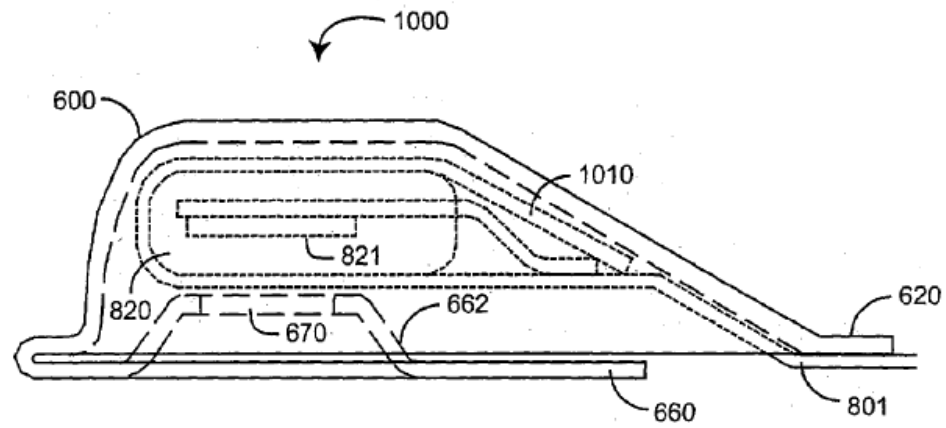
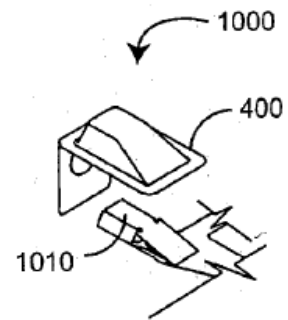


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

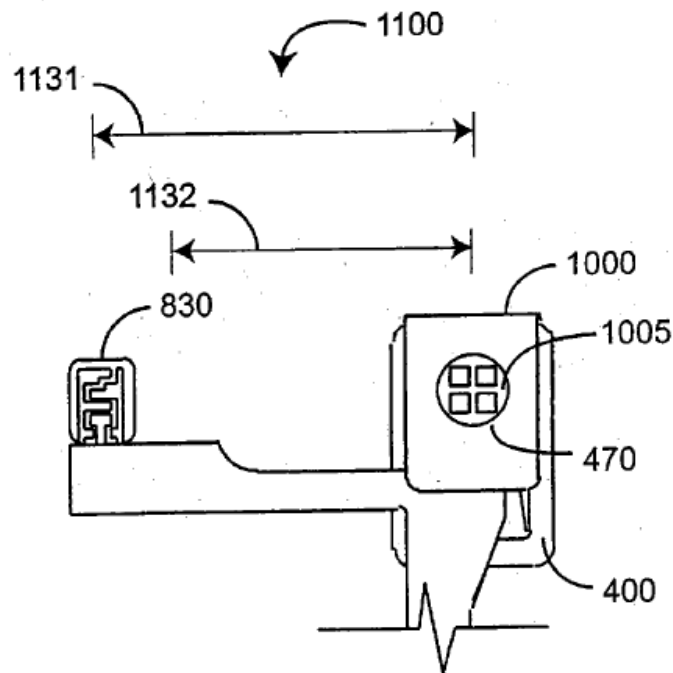


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140

connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical "noise" that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled "Low Noise Optical Probe," which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”). Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a
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reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material.

[0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance.

[0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines a pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A).

[0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B).

[0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5AB) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the

base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width 502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5AD, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below.

[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.

[0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector so as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled “Circuit Board Based Cable Connector,” which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S.

patent application Ser. No. 10/137,942, filed May 2, 2002, entitled “Flex Circuit Shielded Optical Sensor,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit So as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with similar structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”).

	Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”). Abdul-Hafiz, Claim 17 (“17. An optical housing comprising: a light reflecting cover means for Shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
19[d] determining a physiological parameter of the living patient responsive to the outputted at least one signal.	Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious determining a physiological parameter of the living patient responsive to the outputted at least one signal. For example, Abdul-Hafiz discloses and/or suggests determining a physiological parameter of a living patient such as an oxygen saturation level of arterial blood responsive to the outputted at least one signal: <i>See, e.g.,</i> Abdul-Hafiz at Fig. 1.

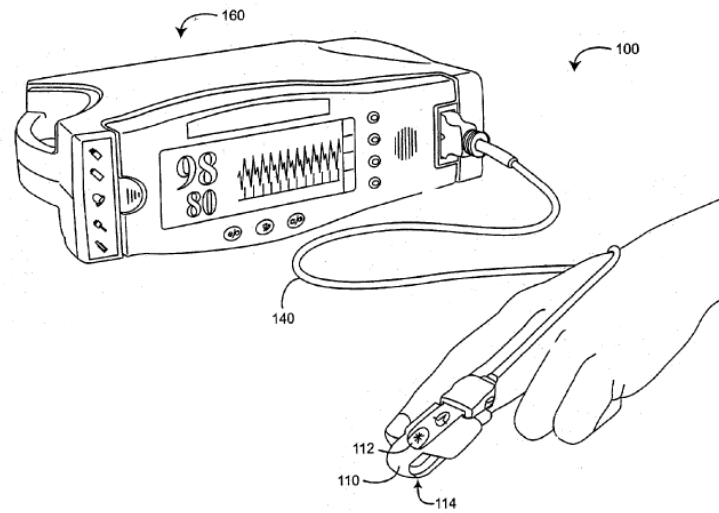


FIG. 1 (Prior Art)

Fig. 1.

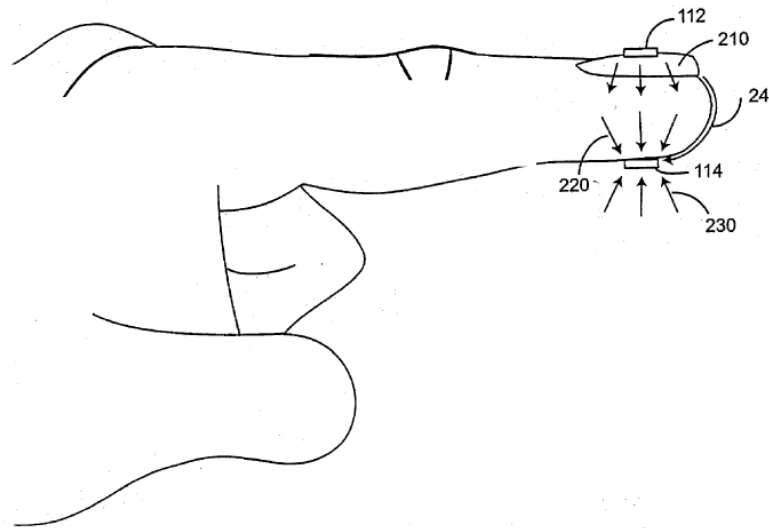


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0042 (“[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit So as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG.11C).

	One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with similar structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 20	Prior Art
20. The method of claim 19, wherein an area of the opening is smaller than a detection surface area of the at least one detector.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 19. <i>See, e.g., Claim 19.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein an area of the opening is smaller than a detection surface area of the at least one detector. For example, Abdul-Hafiz discloses and/or suggests wherein an area of the opening is smaller than a detection surface area of the at least one detector, implemented as a low noise sensor for which there is a spacer that defines an aperture that allows a transmitted portion of propagated light to reach the detector so as to reduce the intensity of the piped light, where the surface area of the opening of the aperture through which light passes is smaller than the surface area of the detection surface of the at least one detector:

See, e.g., Abdul-Hafiz at Fig. 3:

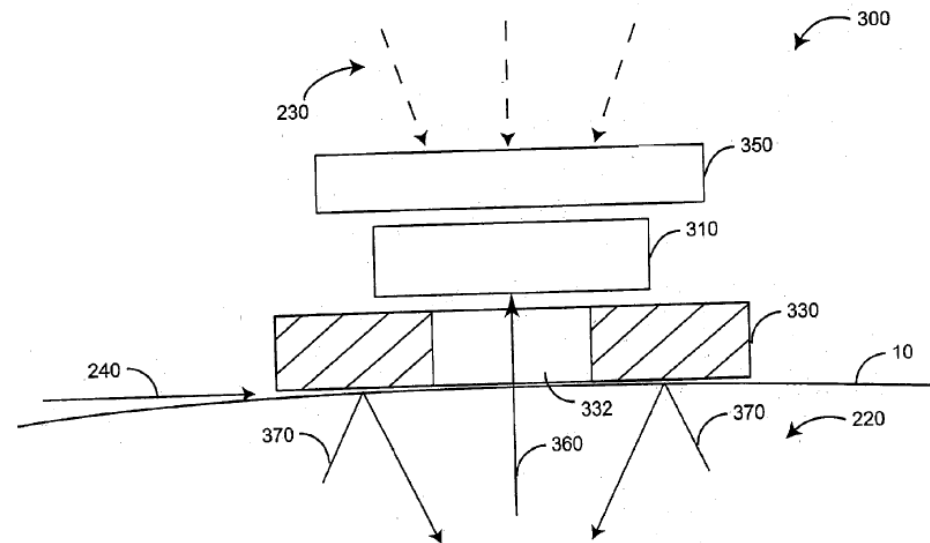


FIG. 3 (Prior Art)

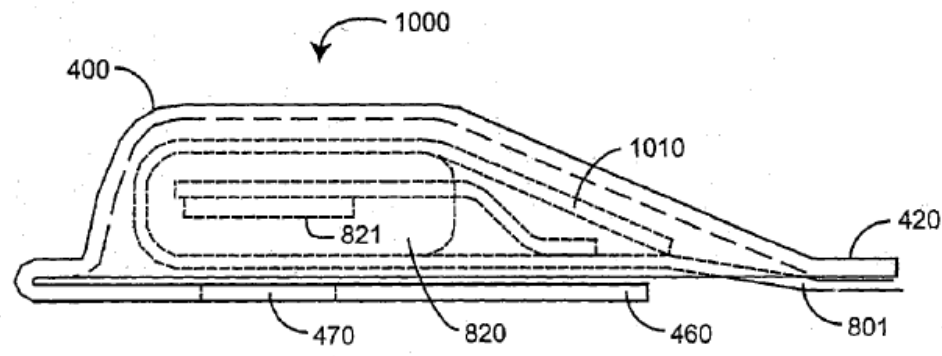


FIG. 6A

Fig. 6A.

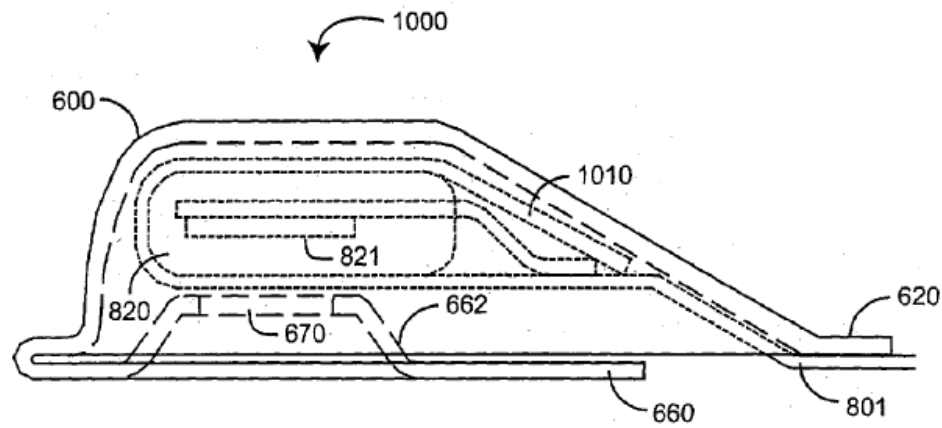


FIG. 6B

Fig. 6B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light

	240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above. [0005] One aspect of a low noise optical housing is a substrate having a reflective side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the substrate, securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0037 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously
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	incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the
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flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B).)”

Abdul-Hafiz, ¶0039 (“[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger Spacing between the detector 820 and a tissue site, further reducing the effects of light piping.”)

Abdul-Hafiz, ¶0046 (“[0046] FIGS. 10A-C illustrate a shielded detector assembly 1000 configured for the neonate flexible circuit assembly 801 (FIGS. 8A, 9A-B) as shown, or, similarly, for the adult flexible circuit assembly 851 (FIGS. 8B, 9C-D). As shown in FIG. 10A, inside pressure sensitive adhesive (PSA) 1020 and top PSA 1030 are removed from a foldable shield 1010, and bottom PSA 1040 is removed from a fixed shield 1005 (not visible). As shown in FIG. 10B, the shield 1010 is next folded toward the detector 820. As shown in FIG. 10C, the shield 1010 is then folded over the back and sides of the detector 820, enclosing the detector 820. The inside PSA 1020 adheres to the detector 820, maintaining the foldable shield 1010 in place. Next, the EMI shielded detector 820 is placed into the optical housing 400. The top PSA 1030 adheres to the inside surface of the optical housing 400, which defines a pocket 440 (FIGS. 4BC) as described above. The bottom PSA 1040 adheres to the optical housing base 410 (FIGS. 4A-C), maintaining the detector 820 in place within the optical housing cover 410 (FIGS. 4AC), aligned with the aperture 470 (FIG. 4A), and maintaining the optical housing 400 in the closed position 560 (FIGS. 5C-D).”).

To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial

	Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 21	Prior Art
21. The method of claim 19, wherein the light block is formed of black materials and further comprises a base, side walls, and a top forming an enclosure, and wherein the at least one detector is positioned in the enclosure.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 19. <i>See, e.g., Claim 19.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the light block is formed of black materials and further comprises a base, side walls, and a top forming an enclosure, and wherein the at least one detector is positioned in the enclosure. For example, Abdul-Hafiz discloses and/or suggests wherein the light block is formed of black materials implemented in a non-limiting example as an inner black layer or black substrate, and where the light block implemented as the optical housing further comprises a base comprising the base of the optical housing, side walls comprising the ramp and beveled sides and beveled back of the optical housing, and a top comprising the base of the optical housing, where these form an enclosure for the detector, and wherein the at least one detector is positioned in the enclosure: <i>See, e.g., Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a Substrate having a reflective Side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector.”)</i>

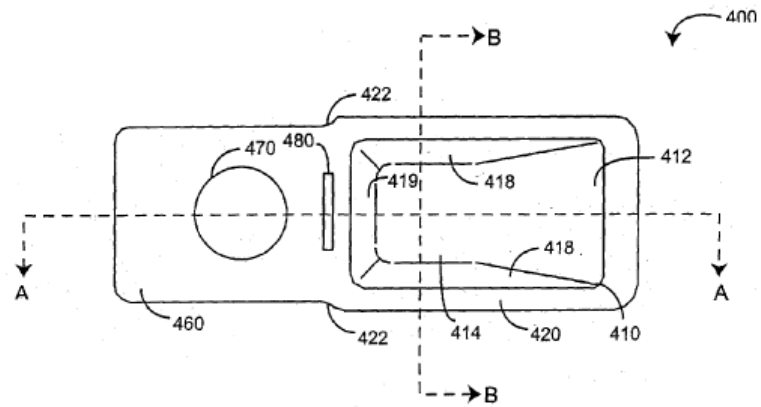
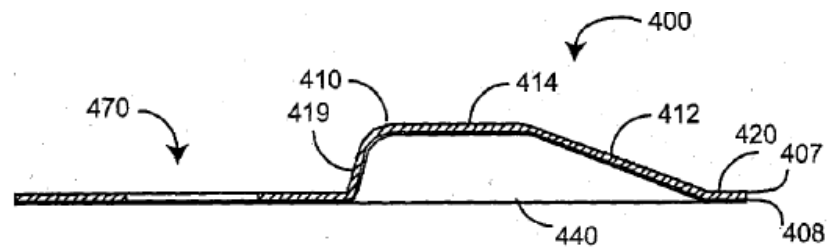


FIG. 4A

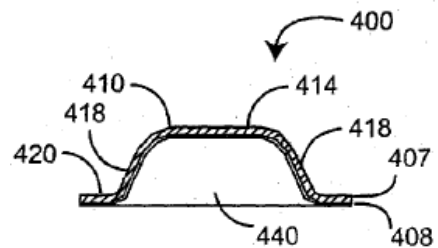
Fig. 4A.



SECTION A-A

FIG. 4B

Fig. 4B.



SECTION B-B

FIG. 4C

Fig. 4C.

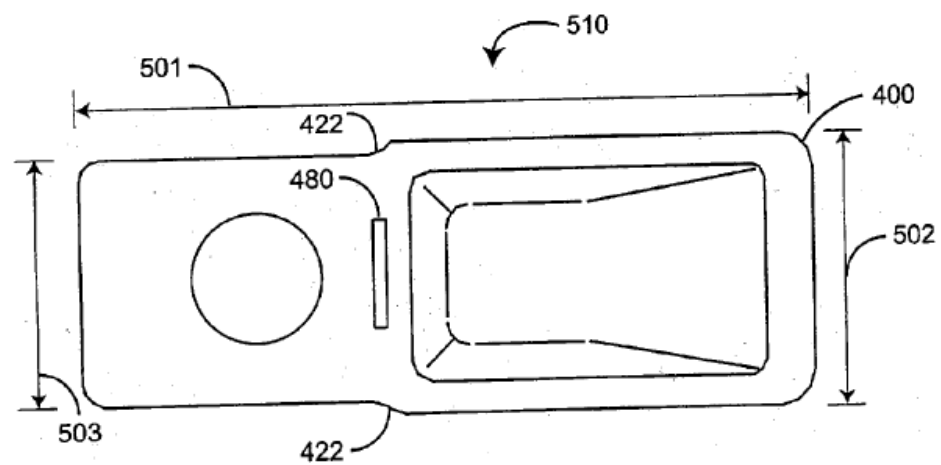


FIG. 5A

Fig. 5A.

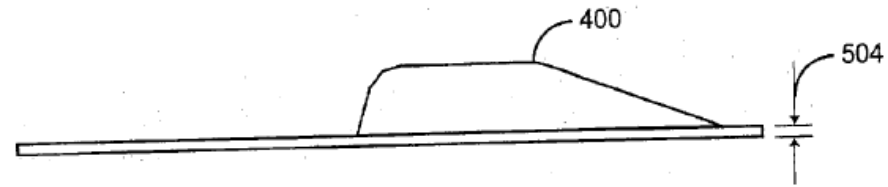


FIG. 5B

Fig. 5B.

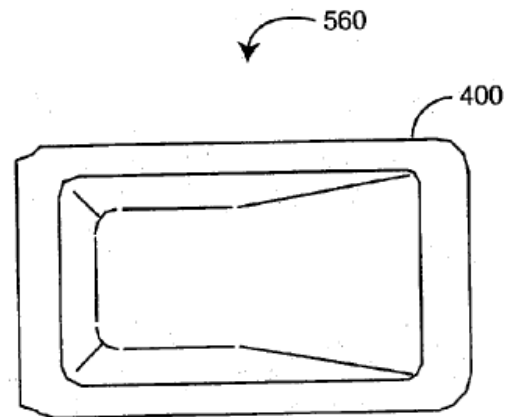


FIG. 5C

Fig. 5C.

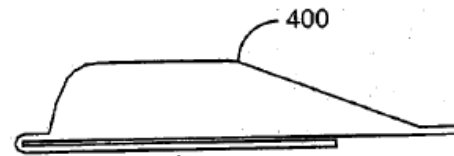


FIG. 5D

Fig. 5D.

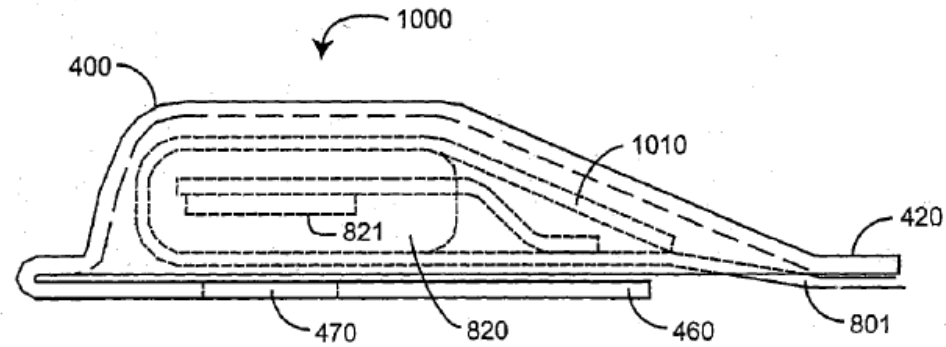


FIG. 6A

Fig. 6A.

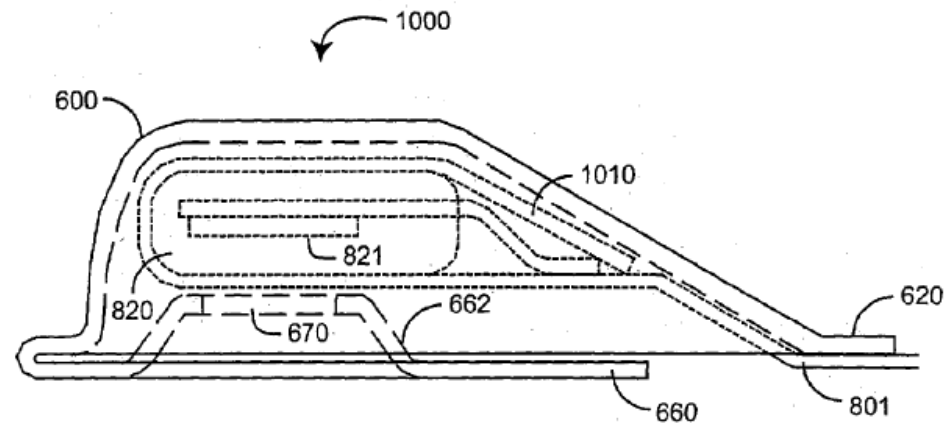
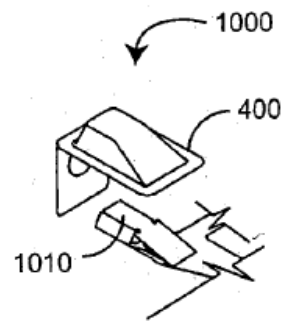


FIG. 6B

Fig. 6B.



DETAIL A

FIG. 10C

Fig. 10C.

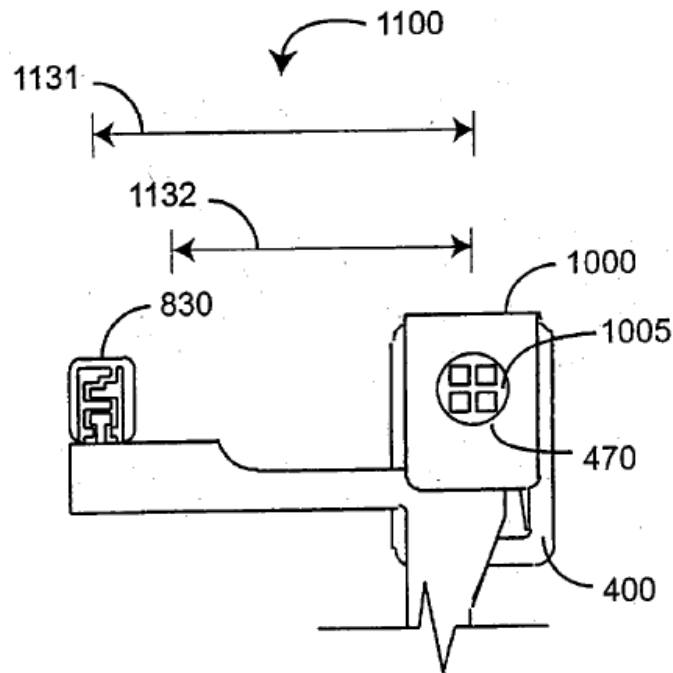


FIG. 11B

Fig. 11B.

Abdul-Hafiz, ¶¶0002-0007 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and Surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable

140 connecting the sensor 110 and the monitor 160. The Sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other Sensor types are configured to attach, say, to a neonatal patient's foot. The Sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries underneath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail So as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and Scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired Sensor Signal. Noise Sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light Sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive Surface, Such as a reflective inner Surface of face Stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0004] FIG. 3 illustrates a prior art low noise sensor 300. The sensor 300 has a detector 310, a spacer 330 and an optical shield 350. The detector 310 is configured to receive light 220 that has propagated through a tissue site 10, as described with respect to FIGS. 1-2, above. The spacer 330 is positioned between the tissue site 10 and the detector 310, providing an optical barrier So as to reduce the intensity of piped light 240 that reaches the detector 310. The spacer 330 defines an aperture 332 that allows a transmitted portion 360 of propagated light 220 to reach the detector 310. A blocked portion 370 of propagated light 220 is reflected back into the tissue and/or absorbed by the spacer 330, depending upon the spacer material. The optical shield 350 may be a metal foil or other opaque material that prevents ambient light 230 from reaching the detector 310. Further, the detector 310, spacer 330 and optical shield 350 may be enclosed in a housing (not shown) of opaque material that further prevents ambient light 230 from reaching the detector 310. A low noise sensor is described in U.S. Pat. No. 5,782,757, cited above.

	[0005] One aspect of a low noise optical housing is a substrate having a reflective Side and an absorptive side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorptive side. The Substrate has an open position with the base portion distal the cover portion and a closed position with the base portion proximate the cover portion. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector. [0006] Another aspect of a low noise optical housing is a method comprising the steps of providing a substrate having an absorptive side and a reflective side and forming a cover portion of the substrate so as to create a pocket on the absorptive side. Further steps include punching the substrate so as to separate a housing from the Substrate, Securing a the pocket, and enclosing the detector with the housing. [0007] A further aspect of a low noise optical housing comprises a light reflecting cover means for shielding against ambient light and a base means for blocking piped light. The base means adjoins the cover means. The housing also comprises a light absorbing pocket means for securing a detector. The pocket means is defined by the cover means and the base means. The housing further comprises an aperture means for allowing light transmitted through a tissue site to be received by the detector. The aperture means is defined by the base means.”) Abdul-Hafiz, ¶¶0033-0042 (“DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT [0033] FIGS. 4A-C illustrate a low noise optical housing 400 having a protruding cover 410, a generally flat flange 420 disposed around the periphery of the cover 410, and a generally flat base 460 adjoining the flange 420. The housing 400 is configured to accept a detector 820 (FIGS. 6A-B) and provide ambient light and piped light reduction. In particular, the low noise optical housing 400 advantageously incorporates the functions of a light barrier, opaque cover, Spacer and aperture, as described with respect to FIG. 3, above, in a relatively Small, easy to manufacture, one-piece design. [0034]. As shown in FIGS. 4B-C, the housing 400 is advantageously constructed of a flat Substrate which, in one embodiment, is a laminate of two materials including an outer white layer 407 and an inner black layer 408. By utilizing a laminate of both white and black material, the low noise optical housing 400 advantageously functions both as a light absorber and as a light reflector. The white layer 407 acts as a reflector, reflecting unwanted ambient light outward from a detector enclosed in the housing, as described
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	below, as well as reflecting emitter Source light back into a patient tissue site. The reflected ambient light reduces noise and the reflected Source light increases the Sensor current transfer ratio. The black layer 408 absorbs unwanted ambient light, preventing it from reaching the enclosed detector 820 (FIGS. 6A-B). The two materials 407, 408 are laminated together before the housing 400 is formed and shaped. The housing 400 is vacuum formed on a flat blank of the laminated material to create a cover 410, as described below. The housing 400, aperture 470 and slot 480, as described below, are then punched out and the housing 400 is removed from the remainder of the laminated material. [0035] In an alternative embodiment, the housing 400 is formed from a black substrate, which is painted white on the outside, i.e. the side corresponding to the outer white layer 407, or otherwise coated on the outside with a reflecting material or substance. In another alternative embodiment, the housing 400 is formed from a white substrate, which is painted black on the inside, i.e. the side corresponding to the inner black layer 408, or otherwise coated on the inside with an absorbing material or substance. [0036] As shown in FIGS. 4A-C, the cover 410 has a ramp 412 sloping from the flange 420 to a generally level platform 414 raised above the flange 420. The cover 410 also has beveled sides 418 and a beveled back 419 that slope from the flange 420 inward to the platform 414. The cover 410 defines an pocket 440 for securing a detector 820 (FIGS. 6AB), as described below. The flange 420 has indents 422 that gradually taper from the wider flange width 502 (FIG. 5A) to that of the narrower base width 503 (FIG. 5A). [0037] Also shown in FIGS. 4A-C, the base 460 defines a generally centered aperture 470 and a slot 480 proximate the flange 420, partially extending across the base width 503 (FIG. 5A). In a closed position, as described with respect to FIGS. 5C-D, below, the base 460 provides a bottom for the cover 410 and pocket 440 and optically shields the detector 820 (FIGS. 6A-B). The base 460 also provides a spacer and aperture to reduce light piping. The slot 480 allows the base 460 to be easily folded so that the aperture 470 is in proper alignment with the detector active area. Further, the narrower base width 503 (FIG. 5A) allows the flange 420 to overlap the base 460 in the closed position 560 (FIGS. 5C-D) So as to Seal the housing edges from ambient light. The flange 420 also provides structure for attaching the housing 400 to a tape stock layer (FIGS. 12A-B). [0038] FIGS. 5A-D illustrate the housing 400 in an open position 510 (FIGS. 5AB) and a closed position 560 (FIGS. 5C-D). As shown in FIGS. 5A-B, in an open position 510 the housing 400 has an overall length 501, a flange width 502, a base width 503 and a thickness 504. The flange width 502 is greater than the base width 503. In one embodiment, the housing length 501 is less than about 1.1 inches, the flange width
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502 is less than about 0.4 inches and the housing thickness 504 is less than about 0.015 inches. As shown in FIGS. 5AD, from an open position 510, the housing 400 is folded to the closed position 560 along the slot 480 and across the base width 503 proximate to each indent 422. In the closed position 560, the housing 400 provides an optical enclosure for a detector, as described with respect to FIGS. 6A-B, below.

[0039] FIGS. 6A-B illustrate shielded detector assemblies 1000 incorporating flat aperture 400 and raised aperture 600 embodiments, respectively, of a low noise optical housing. A detector 820 is enclosed in the optical housing 400, 600 so that the active area of the photodiode chip 821 is aligned with the housing aperture 470, 670. An EMI shield 1010, described with respect to FIGS. 10A-C, below, also encloses the detector 820, and a corresponding flexible circuit assembly 801, described with respect to FIGS. 8-9, below, exits the housing 400, 600 between the base 460, 660 and the flange 420, 620. As shown in FIG. 6B, the raised aperture housing 600 includes a raised aperture portion 662 that extends from the plane of the base 660 So as to advantageously provide a larger spacing between the detector 820 and a tissue site, further reducing the effects of light piping.

[0040] FIGS. 7A-B illustrate an assembled pulse oximetry neonate sensor 700. The sensor 700 includes an optical end 701, an elongated body 703 and a connector end 705. The optical end 701 incorporates a detector assembly 1000 (FIGS. 10A-C), described below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The body 703 includes signal traces (not visible) between the optical end 701 and the connector end 705. The connector end 705 has a plug portion configured to insert into a mating patient cable connector So as to mechanically and electrically connect the sensor 700 to a patient cable 140 (FIG. 1), for example. A patient cable connector is described in U.S. Pat. No. 6,152,754 entitled "Circuit Board Based Cable Connector," which is assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0041] FIG. 7C illustrates an assembled pulse oximetry adult sensor 750. The sensor 750 includes an end wrap 751, a body 753 including an optical section 754, a middle wrap 755, and a connector end 759. The optical section 754 incorporates a detector assembly 1000 similar in construction to that described in FIGS. 10A-C, below, including a low noise optical housing 400 (FIGS. 6A-B), as described above. The sensor 750 includes signal traces (not visible) between the optical section 754 and the connector end 759. The connector end 759 is similar to that described with respect to FIGS. 7A-B, above. A pulse oximetry adult sensor having end and middle wraps and an electromagnetic interference (EMI) shield is described in U.S. patent application Ser. No. 10/137,942, filed May 2, 2002, entitled "Flex Circuit Shielded Optical Sensor," assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.

[0042] FIGS. 8-12 illustrate assembly of a neonate sensor 700 (FIGS. 7A-B) and an adult sensor 750 (FIG. 7C) including component attachment (FIGS. 8A-B), detector EMI shielding and optical shielding (FIGS. 9-11), and tape stock assembly (FIGS. 12A-B). FIG. 8A illustrates a neonate sensor circuit assembly 800 including multiple, duplicate flexible circuit assemblies 801 each having a flexible circuit substrate 810 and associated components soldered or otherwise electrically connected to the flexible circuit substrate 810, as is well known in the art. Each flexible circuit assembly 801 includes a detector 820 and an emitter 830. The detector 820 is enclosed in an EMI shield 1010, described in further detail with respect to FIGS. 10A-C, below. The emitter 830 is connected to a pad 1110 having multiple contact sets, described in further detail with respect to FIG. 11A, below. Each assembly 801 may also include an information element 840, which can be read by an attached pulse oximeter 160 (FIG. 1). The information element 840 may provide information regarding the Sensor 700, Such as Sensor type or manufacturer to name a few. An information element is described in U.S. Pat. No. 6,397,091, entitled “Manual and Automatic Probe Calibration,” assigned to Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”)

Abdul-Hafiz, ¶0050 (“[0050] The ability to adjust the detector-emitter spacing on a particular flexible circuit so as to minimize the number of unique parts in manufacturing various sensor types and sizes is disclosed above. That disclosure is with respect to a pad 1110 (FIG. 11A) having multiple contact sets and a pad 1160 (FIG. 11C) having extended contacts with an associated elongated aperture 1170 (FIG. 11C). One of ordinary skill in the art will recognize other electrical and mechanical structures that allow such detector-emitter spacing adjustment. For example, although adjustment of the emitter 830 location relative to the detector 820 is achieved by the above disclosed embodiments, adjustment of the detector 820 location relative to the emitter 830 may be achieved with Similar Structures. Further, adjustment of the detector-emitter spacing may also be achieved by altering the orientation of the detector 820 and/or the emitter 830. These adjustments may also be accommodated by multiple apertures rather than an elongated aperture. Although the sensors disclosed are based upon the detection of light transmitted through a tissue site, the ability to adjust detector-emitter spacing is equally applicable to reflectance sensors, i.e. sensors that are based upon the detection of light reflected from a tissue site.”)

Abdul-Hafiz, ¶0053 (“[0053] The low noise optical housing 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. One of ordinary skill in the art will appreciate many variations and modifications.”)

	Abdul-Hafiz, Claims 6, 9, 17 (“6. The optical housing according to claim 1 wherein said substrate comprises a laminate having a generally white layer corresponding to said reflective side and a generally black layer corresponding to said absorptive side. 9. The optical housing method according to claim 8 wherein said providing step comprises the substep of laminating a white layer and a black layer. 17. An optical housing comprising: a light reflecting cover means for shielding against ambient light; a base means for blocking piped light, said base means adjoining said cover means, a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”). To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 22	Prior Art
22. The method of claim 19, wherein said activating the at least three LEDs comprises concurrently activating at least two LEDs	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 19. <i>See, e.g., Claim 19.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein said activating the at least three LEDs comprises concurrently activating at least two LEDs of the at least three LEDs.

of the at least three LEDs.	To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 23	Prior Art
23. The method of claim 19, wherein the at least three LEDs comprises at least eight LEDs.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 19. <i>See, e.g., Claim 19.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least three LEDs comprises at least eight LEDs. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
Claim 24	Prior Art
24. The method of claim 23, wherein the at least eight LEDs comprises at least two LEDs of the same wavelength.	Under at least the apparent construction based on Masimo's Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 23. <i>See, e.g., Claim 23.</i> Under at least the apparent construction based on Masimo's Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least eight LEDs comprises at least two LEDs of the same wavelength.

	To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 25	Prior Art
25. The method of claim 19, wherein the at least three LEDs comprises at least twelve LEDs.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 19. <i>See, e.g., Claim 19.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least three LEDs comprises at least twelve LEDs. To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial Invalidity Contentions.
Claim 28	Prior Art
28. The method of claim 19, wherein the at least a portion of the light passes through the opening after it interacts with the body tissue.	Under at least the apparent construction based on Masimo’s Infringement Contentions, and to the extent that the preamble is limiting, Abdul-Hafiz discloses and/or renders obvious the method of claim 19. <i>See, e.g., Claim 19.</i> Under at least the apparent construction based on Masimo’s Infringement Contentions, Abdul-Hafiz discloses and/or renders obvious wherein the at least a portion of the light passes through the opening after it interacts with the body tissue.

For example, Abdul-Hafiz discloses and/or suggests wherein the at least a portion of the light passes through the opening comprising as a non-limiting example the aperture of the optical housing after it interacts with the body tissue of a patient, such as the body tissue of a patient's finger:

See, e.g., Abdul-Hafiz at Abstract (“Aspects of the invention include an optical housing including a substrate having a reflective side and an absorbing side. The substrate has a generally planar base portion and a protruding cover portion. The cover portion defines a pocket on the absorbing side. The substrate has an open position where the base portion is distal the cover and a closed position where the base portion is proximate the cover. The substrate is configured to enclosed a detector within the pocket in the closed position. The base portion defines an aperture generally centered within the base portion and aligned with the detector in the closed position so as to pass light through to the detector.”)

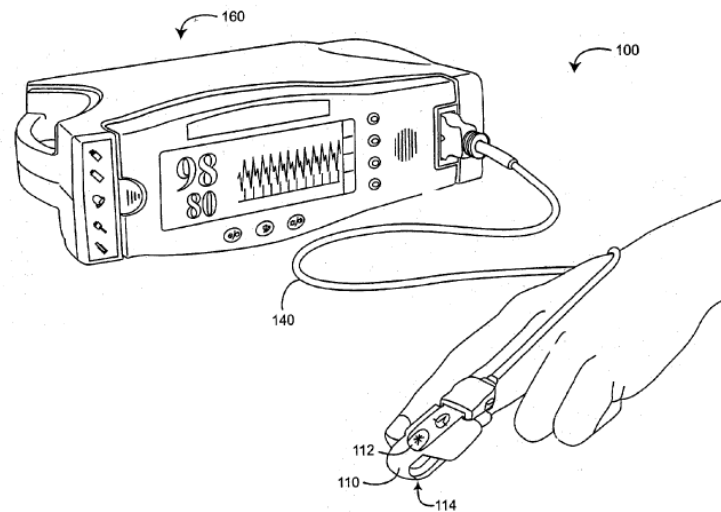


FIG. 1 (Prior Art)

Fig. 1.

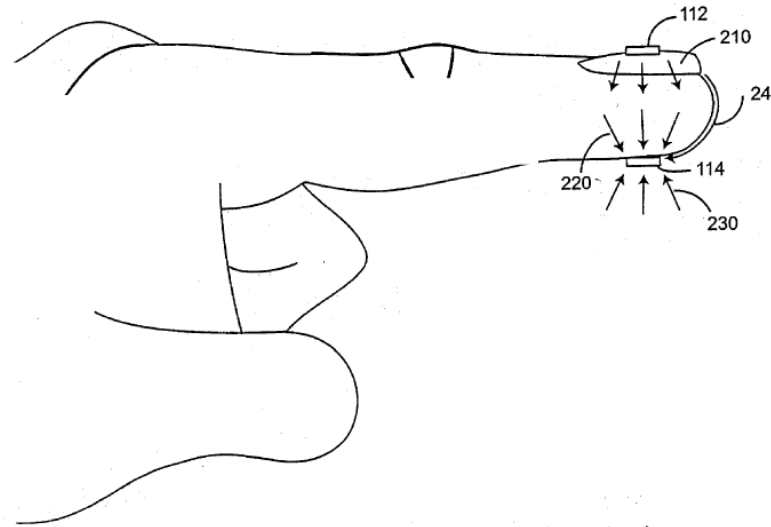


FIG. 2 (Prior Art)

Fig. 2.

Abdul-Hafiz, ¶¶0002-0003 (“BACKGROUND OF THE INVENTION

[0002] 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. Early detection of low blood oxygen level is critical in the medical field, for example in critical care and surgical applications, because an insufficient Supply of oxygen can result in brain damage and death in a matter of minutes. FIG. 1 illustrates a pulse oximetry system 100 having a sensor 110 applied to a patient, a monitor 160 and a patient cable 140 connecting the sensor 110 and the monitor 160. The sensor 110 is attached to a tissue site, Such as an adult patient's finger (as shown). Other sensor types are configured to attach, say, to a neonatal patient's foot. The sensor 110 is configured with both red and infrared LEDs 112 (hidden) that, for finger attachment, project light through the fingernail and into the blood vessels and capillaries under neath. A photodiode 114 (not visible) is positioned at the finger tip opposite the fingernail so as to detect the LED emitted light as it emerges from the finger tissues.

SUMMARY OF THE INVENTION

[0003] FIG. 2 illustrates various optical noise sources for a sensor 110 (FIG. 1). Shown is the placement of the sensor LEDs 112 and detector 114 on a finger without showing the associated electrical interconnections, base Stock and face stock materials. Emitted light 210 is projected from the LEDs 112 into the fingernail bed. Received light 220 propagates through the finger tissues to the detector 114, subject to absorption and scattering, to generate a desired Sensor signal. Light which illuminates the detector 114 without propagating through the finger is unwanted optical “noise” that corrupts the desired sensor Signal. Noise sources include ambient light 230 and piped light 240. Ambient light 230 is transmitted to the detector 114 from external light sources, i.e. light sources other than the LEDs 112. Piped light 240 is stray light from the LEDs 112 that is transmitted around a tissue site along a light conductive surface, such as a reflective inner surface of face stock material, directly to the detector 114. Light piping and light piping reduction are described in U.S. Pat. No. 5,782,757 entitled “Low Noise Optical Probe,” which is assigned Masimo Corporation, Irvine, Calif. and incorporated by reference herein.”).

Abdul-Hafiz, Claim 17 (“17. An optical housing comprising:

a light reflecting cover means for shielding against ambient light;

a base means for blocking piped light, said base means adjoining said cover means,

a light absorbing pocket means for securing a detector, said pocket means defined by said cover means and said base means, and

an aperture means for allowing light transmitted through a tissue site to be received by said detector, said aperture means defined by said base means.”).

To the extent Masimo contends or the Court determines that Abdul-Hafiz does not expressly or inherently disclose this limitation, it would have been obvious to combine Abdul-Hafiz with one or more references charted for this limitation in Apple’s Initial Invalidity Contentions. A person of ordinary skill in the art would have been motivated to combine Abdul-Hafiz with one or more of those references for the reasons set forth in Apple’s Initial

	Invalidity Contentions. A person of ordinary skill in the art would have had a reasonable expectation of success in combining Abdul-Hafiz with one or more of those references for the reasons set forth in Apple's Initial Invalidity Contentions.
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