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(54) DEVICE FOR MEASURING A PHYSIOLOGICAL PARAMETER OF A USER

VORRICHTUNG ZUM MESSEN EINES PHYSIOLOGISCHEN PARAMETERS EINES BENUTZERS

DISPOSITIF POUR MESURER UN PARAMÈTRE PHYSIOLOGIQUE D'UN UTILISATEUR

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a device for measuring a physiological parameter of a user carrying said device. Further, the present invention relates to a method of manufacturing a device for measuring a physiological parameter.

BACKGROUND OF THE INVENTION

[0002] Heart rate monitors have been used in the field of leisure and sport for some years already. There are many makes of these devices. Typical devices have the form of a (e.g. ECG) chestband or wristband, e.g. including a sensor of the optical type that measures on the arm. Such a heart rate monitor is e.g. known from US 2009/048526.

[0003] US 2009/048526 discloses a monitoring apparatus for monitoring a user's heart, the apparatus comprising several sensors for measuring changes in an electrical parameter of a user's arm, from which changes in an electrocardiogram, heart rate and/or heart rate variation of the user's heart are determinable. The apparatus further comprises a data processor for determining the electrocardiogram, the heart rate and/or heart rate variation from the changes in the electrical parameter; and an output device for making knowable to the user the electrocardiogram, heart rate and/or heart rate variation. Only a single wristband, particularly a wrist watch, is used having all the means to monitor the user's heart, without using for example a chest band. Herein, the single wristband is at least provided with the at least one sensor and particularly also comprises the data processor, and more particularly also comprises the output device.

[0004] WO 2011/051888 A2 discloses a device for measuring a physiological parameter of a user carrying said device. The device comprises a light emitting element and a light receiving element and a carrier for carrying the sensor. Furthermore, the device comprises a frame surrounding the light emitting element and the light receiving element. An insulator material is provided in the frames and is covering the light emitting element and the light receiving element.

[0005] Other wearable measurement devices use conductivity sensors for measuring the conductivity of the skin to make use of the known fact that skin conductance of a user is related with the level of arousal of the user.

[0006] For protection of the electrical components, by which the sensor is generally connected to other electrical components, such as a driver, processor, controller and/or power source, the electrical contacts of the sensor are generally covered with an insulator material, such as epoxy resin. However, it should be avoided to cover the top surface of the sensor elements, in particular of the light emitting diodes and preferably also of the photo diode in case of an optical sensor, because otherwise this bears the risk that the covered sensor element looses grip to the user's skin which may reduce the signal quality or even the ability to measure a useful signal at all.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to provide a device for measuring a physiological parameter of a user carrying said device in which the internal electrical contacts are safely protected without impeding the performance of the device. It is a further object of the present invention to provide a simple method of manufacturing such a device.

[0008] In a first aspect of the present invention a device for measuring a physiological parameter of a user carrying said device is presented that comprises:

- an optical sensor comprising at least one light emitting element and at least one light receiving element,
- a carrier carrying said sensor, wherein electrical contacts of said sensor elements lead on, into or through said carrier,
- at least one emitter frame carried by said carrier and formed around the at least one light emitting element,
- a insulator material filled between said emitter frame and surrounded by the emitter frame up to a height that is equal to or smaller than the distance between the carrier and a top surface of the light emitting element, wherein said at least one emitter frame having a height from the carrier that is smaller than or equal to the distance between the carrier and a top surface of the respective light emitting element surrounded by said emitter frame.

[0009] In a further aspect of the present invention a method of manufacturing such a device is presented that comprises:

- arranging a sensor comprising at least two sensor elements for detecting a sensor signal on a carrier for carrying said sensor,
- forming electrical contacts of said sensor elements on, into or through said carrier,
- forming one or more frames on said carrier around said sensor and/or said individual sensor elements,
- filling insulator material between said one or more frames and the sensor and/or the sensor elements surrounded by the respective frame without covering the top surface of the respective sensor element facing away from the carrier.

[0010] Preferred embodiments of the invention are defined in the dependent claims. It shall be understood that the claimed method has similar and/or identical preferred embodiments as the claimed device and as defined in the dependent claims.

[0011] The present invention is based on the idea to use one or more frames around the complete sensor or

around the individual sensor elements, made in such a way as to preserve the performance of the sensor. For instance, at least one of these frames helps to prevent shifting of the sensor across the skin. Moreover, dependent on the kind of sensor, one or more frames may additionally help to separate signals emitted by one or more sensor elements and/or signals received by one or more sensor elements. The one or more frames particularly serve to confine the insulator material when it is poured over the electrical contacts between the frame and the respective sensor element so that it does not spill out and negatively impact the correct functioning of the device.

[0012] Generally, the particular kind of sensor that measures one or more physiological parameters (e.g. heart rate, blood pressure, breathing rate, skin conductivity, skin humidity, etc.) is not essential for the present invention. In a preferred embodiment said sensor is an optical sensor comprising at least one light emitting element, in particular an LED, for emitting light to the user's skin and at least one light receiving element, in particular a photo detector, for receiving light reflected from the user's skin. Such an embodiment may e.g. be used for heart rate monitoring. In such an embodiment the one or more frames serve to prevent direct light emitted from the light emitting element from entering the light receiving element.

[0013] Preferably, said at least one light receiving element, in particular each light receiving element, is surrounded by a separate receiver frame having a height from the carrier that is larger than the distance between the carrier and the top surface of the respective light receiving element surrounded by said receiver frame. It has particularly been found that this height difference is advantageous in such an optical sensor to avoid light interference with direct light. In addition, because the receiver will push into the user's skin, the mechanical contact will increase between the skin and the sensor. Another advantage is that the light that travels from the LED to the light receiver will be forced to pass through deeper areas of the skin and less shallow areas. This will increase the robustness of the optical signal.

[0014] In a practical implementation of such a device with an optical sensor the height difference between the top edge of the receiver frame and the top surface of the respective light receiving element surrounded by said receiver frame is in the range from 0mm to 0.5mm, in particular in the range from 0.1mm to 0.2mm.

[0015] Further, it is preferred that said at least one light emitting element, in particular each light emitting element, is surrounded by an emitter frame having a height from the carrier that is smaller than or equal to the distance between the carrier and the top surface of the respective light emitting element surrounded by said emitter frame. It has particularly been found that this height difference is advantageous in such an optical sensor to optimize the optical contact between the light emitting element and the user's skin. Because the frame is lower, the surface of the light emitting element will push optimally into the user's skin, avoiding air gaps that may form and that lead to larger artefacts in the optical signal.

[0016] In a practical implementation of such a device with an optical sensor the height difference between the top edge of the emitter frame and the top surface of the respective light emitting element surrounded by said emitter frame is in the range from 0.1mm to 0.8mm, in particular in the range from 0.2mm to 0.5mm. If both frames coincide at the location between the light receiving and light emitting elements, the frame will be higher than the light emitting element itself, but only at that side.

[0017] Preferably, the distance between the carrier and the top surface of said at least one light emitting element is equal to or smaller than the distance between the carrier and the top surface of said least one light receiving element. This ensures that the light receiving element(s) is (are) pushed further into the user's skin enabling a better contact, preventing movements of the whole device and ensuring better collection of light scattered into the skin.

[0018] In another implementation there may be only one wall between the detector and the at least one light emitting element for practical reasons, e.g. in cases where the detector and at least one light emitting element are close. If that is the case the frame walls of both the frames of respectively the light receiving and light emitting elements coincide. This means that the frame wall of the light emitting element will be higher that the surface of the light emitting element itself, but only at the side where the light receiving element is situated. The remainder of the frame of the light emitting element will be lower than the surface of the element itself, in accordance with above mentioned requirements.

[0019] According to an alternative embodiment said sensor is an electrical sensor comprising two skin conductance electrodes for contacting the user's skin and measuring conductivity the user's skin. This embodiment may, for instance, be used for stress monitoring.

[0020] Generally, the device may output its sensor signals to another device, e.g. to a computer, where the sensor signals are processed. Alternatively, as preferred in an embodiment, the device further comprises additional components, such as a processor for processing said sensor signal, in particular for determining the user's heart rate when an optical sensor is used.

[0021] Said additional components are preferably arranged on said carrier on a different surface than said sensor. This prevents said additional components from impeding good contact between the sensor elements and the skin.

[0022] In another implementation said additional components are mounted on a different carrier than the sensor components for reasons of manufacturability. In that case the carrier with sensor components is preferably mounted directly on the carrier with said other components.

[0023] Generally, any kind of insulator material can be

used. Preferably, said insulator material is epoxy resin.

[0024] For fixation or attaching the device to the user's skin, the device preferably further comprises a fixation element for fixing the device to the user's skin. Said fixation element may e.g. be a wristband, an adhesive strip, a band aid or a strap.

[0025] According to another aspect of the present invention a device for measuring a physiological parameter of a user carrying said device is presented, said device comprising:

- a sensor comprising at least two sensor elements for detecting a sensor signal, wherein said sensor is an optical sensor comprising at least one light emitting element, in particular an LED, for emitting light to the user's skin and at least one light receiving element, in particular a photo detector, for receiving light reflected from the user's skin, and
- a carrier carrying said sensor,

wherein the distance between the carrier and the top surface of said least one light emitting element is equal to or smaller than the distance between the carrier and the top surface of said least one light receiving element.

[0026] Preferably, in a further improvement of said aspect the space between the at least one light emitting element and the at least one light receiving element is filled with light absorbing (e.g. black) material (e.g. epoxy resin) to avoid that light can directly enter from the at least one light emitting element to the at least one light receiving element. Further, in an improvement a single frame is provided between a light receiving element and a light emitting element. Then, only on those sides that are not facing the light receiving element the distance between the carrier and the top surface of said least one light emitting element is equal to or smaller than the distance between the carrier and the top surface of said least one light receiving element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter. In the following drawings

Fig. 1 shows a cross section through a known heart rate monitoring device,

Fig. 2 shows a cross section through a first embodiment of a device according to the present invention,

Fig. 3 shows a cross section through a second embodiment of a device according to the present invention,

Fig. 4 shows a cross section through a third embodiment of a device according to the present invention,

Fig. 5 shows a cross section through a fourth embodiment of a device according to the present invention, and

Fig. 6 shows a flow chart of a method of manufacturing a device according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0028] Fig. 1 shows a cross section through a known device 10 for measuring a physiological parameter of a user 1 carrying said device (Fig. 1 only shows the user's arm). It comprises a sensor 12 for measuring at least one physiological parameter of the user 1 and a case 14 housing said sensor 12. The case is held on the user's arm by a fixation 16, e.g. a wristband.

[0029] The sensor 12 comprises, in this embodiment, two sensor elements 121, 122 and may be a heart rate monitoring sensor for measuring or monitoring the heart rate. But generally, the particular kind of sensor that measures one or more physiological parameters (e.g. heart rate, blood pressure, breathing rate, skin conductivity, skin humidity, etc.) is not essential for the present invention.

[0030] The case 14 may be a housing, e.g. of the type of a wristband, a wristwatch or monitoring device as used e.g. in sports. The particular kind and form of case 14 is also not essential for the present invention, but mainly serves to hold the sensor 12 at a desired position with respect to the user 1 and to optionally house further elements like a battery, a processing unit, a display, a user interface, etc.

[0031] In this embodiment the device 10 is implemented as a heart rate monitoring device 10 for monitoring the user's heart rate, and the sensor 12 is an optical sensor comprising a light emitting element 121 and a light receiving element 122. The principle of optical heart rate monitors relies on a light source 121 (usually a LED) that shines light inside the skin. Light is scattered in the skin, where it is absorbed more or less by blood. The light exits the skin and it is captured by light receiving element 122 (usually a photodiode). The amount of the signal on the light receiving element 122 is an indication of the blood volume. When the heart pulsates the blood volume in the skin changes and thus the signal on the light receiving element 122 changes as well. The light receiving element 122 measures thus directly the pulse in the skin and thus the heart rate. By counting the number of pulses per unit time, e.g. per 10 seconds, the number the heart beats per minute (i.e. the heart rate) is obtained.

[0032] Fig. 2 shows a cross section through a first embodiment of a device 20 for measuring a physiological parameter of a user carrying said device according to the present invention. Said device 20 comprises a sensor 22 comprising at least two (here three) sensor elements 221, 222, 223 for detecting a sensor signal, wherein said sensor is an optical sensor comprising two light emitting element 221, 223, in particular two LEDs, for emitting light to the user's skin and at least one light receiving element 222, in particular a photo detector, for receiving light reflected from the user's skin. Further, the device 20 comprises a case or housing (not shown; may generally be

similar or identical as the case 14 shown in Fig. 1) and a carrier 26 carrying said sensor 22. This embodiment is however not preferred for use with an optical sensor because it allows light to go directly from the light emitting elements to the light receiving element without passing through the skin.

[0033] In this device 20 the distance between the carrier 26 and the top surface 221 a, 223a of said light emitting elements 221, 223 is smaller than the distance between the carrier 26 and the top surface 222a said light receiving element 222, i.e. there is height distance Δh. This solution has the advantage that a large portion of the light from the light emitting elements 221, 223 is coupled directly (i.e. without intervention of a layer of air) towards the skin and further to the light receiving element 222. Furthermore, no light from the light emitting elements can enter the light receiving element 222 directly, without having passed through the skin.

[0034] For protection of the electrical components, the electrical contacts of the light emitting element(s) and the light receiving element(s) should preferably be covered with an insulator material, such as epoxy resin. It should, however, be avoided that the insulator material covers the light emitting element(s), because otherwise the skin cannot surround the light emitting elements giving the risk of air gaps and reduced grip of the skin on the light emitting elements. A generally possible embodiment of a device 30 according to the present invention, in which epoxy 32 is brought to protect the contacts of the light emitting elements 221, 223 without covering the top surface 221a, 223a of the light emitting elements 221, 223, is depicted in Fig. 3.

[0035] This embodiment can be further improved by practically bringing the epoxy 32 to cover the electrical contacts 34 of the components (i.e. the sensor elements 221, 222, 223), in such a way as to minimally interfere with a correct functioning of the sensor. Pouring of epoxy just like as shown in Fig. 3 is not optimal yet, since the epoxy may spill out. Creating additional structures to confine the epoxy is an option that allows high volume production.

[0036] Fig. 4 shows a further improved embodiment of a device 40 according to the present invention. In this embodiment structures are created in the device to confine the insulator material (which is not shown in Fig. 4). In particular, in this implementation that is suited for high-volume production frames 41, 42, 43 are formed around the sensor elements 221, 222, 223 that will confine the insulator material when it is poured over the electrical contacts 34 of the sensor elements in the space 36 between the frame and the optically active parts of the sensor elements.

[0037] In the embodiment shown in Fig. 4 every sensor element 221, 222, 223 is surrounded by an individual frame 41, 42, 43. In other embodiments same or all frames are combined with each other, or all sensor elements are surrounded by a common frame.

[0038] To further improve such a device so that it does not negatively affect the functioning of the device it has been found that the frames 41, 43 around the light emitting elements 221, 223 are preferably lower than the top surface 221a, 223a of the light emitting elements 221, 223. In other words, in such an improved implementation the light emitting elements 221, 223, in particular each light emitting element, is surrounded by a separate emitter frame 41, 43 having a height from the carrier 26 that is smaller than or equal to the distance between the carrier 26 and the top surface 221a, 223a of the respective light emitting element 221, 223 surrounded by said emitter frame 41, 43. This can be quantified in Fig. 4 by the relation $h_{FR\text{-}LED} < h_{LED}$. Preferably, the height difference between the top edge 41a, 43a of the emitter frames and the top surface 221a, 223a of the respective light emitting element 221, 223 surrounded by said emitter frame 41, 43 is in the range from 0.1mm to 0.8mm, in particular in the range from 0.2mm to 0.5mm.

[0039] Regarding the receiver frame 42 around the light receiving element 222 it is preferred that this is higher than the top surface 222a of the light receiving element 222. In other words, in such an improved implementation the receiver frames 42 has a height from the carrier 26 that is larger than the distance between the carrier 26 and the top surface 222a of the light receiving element 222 surrounded by said receiver frame 42. This can be quantified in Fig. 4 by the relation $h_{FR\text{-}PD} > h_{PD}$. Preferably, the height difference between the top edge 42a of the receiver frame 42 and the top surface 222a of the light receiving element 222 surrounded by said receiver frame 42 is in the range from 0mm to 0.5mm, in particular in the range from 0.1mm to 0.2mm.

[0040] It may occur for reasons of manufacturability that only one frame wall between the light receiving element and the light emitting element is present, e.g. in cases where the light receiving element and light emitting element are close. If that is the case the frame walls of both the frames of respectively the light receiving and light emitting elements coincide. This means that the frame wall of the light emitting element will be higher that the surface of the light emitting element itself, but only at the side where the light receiving element is situated. The remainder of the frame of the light emitting element will be lower than the surface of the element itself, in accordance with the above mentioned requirements.

[0041] The height of the top surface of the light emitting element(s) should be lower the top edge 42a of frame 42 around the light receiving element. The height difference should be in the range from 0.1 to 1 mm, preferably in the range from 0.2 to 0.8 mm.

[0042] As explained above, the insulator material will protect the electrical contacts 34 of the sensor elements. However, these electrical contacts 34 should further make contact with other elements, such as a driver, detection electronics, processor or power source, meaning that on the carrier 26 (which may be a PCB (Printed Circuit Board)) there are some "external" electrical connections to these additional electronics. Fig. 5 shows a cross

section through a fourth embodiment of a device 50 according to the present invention. Said device 50 comprises such additional electronics, such as a processor 52 and a driver 54. The external electrical connections are not placed on the same surface of the carrier 26 as the sensor elements 221, 222. Otherwise the parts to which they are connected would impede good contact between the skin and the sensor elements. For instance, the external electrical connections can be placed on the side surfaces of the carrier 26.

[0043] As mentioned above different kinds of sensors can be used in a device according to the present invention. For instance, in an embodiment said sensor 22 is an electrical sensor comprising two skin conductance electrodes (e.g. the sensor elements 221, 222 shown in Fig. 2) for contacting the user's skin and measuring conductivity the user's skin. Still further, two or more of sensor can generally be used in such a device, and also the number of sensor elements is not essential for the present invention.

[0044] A flow chart of a method of manufacturing a device for measuring a physiological parameter as proposed herein is depicted in Fig. 6. In a first step S1 the sensor 22 comprising at least two sensor elements 221, 222 for detecting a sensor signal is arranged on the carrier 26. In a second step S2 electrical contacts of said sensor elements are formed on, into or through said carrier 26. In a third step S3 one or more frames 41, 42 are formed on said carrier 26 around said sensor 22 and/or said individual sensor elements 221, 222. In a fourth step insulator material 32 is filled between said one or more frames 41, 42 and the sensor 22 and/or the sensor elements 221, 222 surrounded by the respective frame 41, 42 without covering the top surface 221a, 222a of the respective sensor element 221, 222 facing away from the carrier 26.

[0045] In summary, according to the present invention a way of achieving a protection of the electrical contacts without having a negative effect on the performance of the device is proposed. For this purpose frame(s) around sensor elements is (are) used, made in such a way as to preserve the performance of the sensor. For instance, at least one of these frames helps to prevent shifting of the sensor across the skin; moreover, at least one of these frames may serve to prevent direct emitted light from entering the light receiving element. Preferably, the height of the frame around the light emitting element(s) should be smaller than the height of the surface of the light emitting element(s), with the possible exception of the side facing the light receiving element. In addition, the frame around the light receiving element(s) may be higher than the surface of the light receiving element(s).

[0046] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments. Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims.

[0047] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single element or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0048] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. Device for measuring a physiological parameter of a user carrying said device, said device comprising:

   - an optical sensor (22) comprising at least one light emitting element (221, 223) for emitting light to the user's skin and at least one light receiving element (222), for receiving light reflected from the user's skin,
   - a carrier (26) carrying said sensor, wherein electrical contacts (34) of said at least one light emitting element and at least one light receiving element lead on, into or through said carrier,
   - at least one emitter frame (41, 43) carried by said carrier and formed around one of said at least one light emitting element (221, 223),
   - a insulator material (32) filled between said at least one emitter frame and the at least one light emitting element (221, 223) surrounded by the respective emitter frame (41, 43) up to a height;

   wherein said at least one emitter frame (41, 43) has a height from the carrier (26),
   characterised in that each of the height of the insulator material (32) and the height of the at least one light emitter frame (41,43) is smaller than or equal to the distance between the carrier (26) and a top surface of the respective light emitting element (221, 223) surrounded by said emitter frame (41, 43).

2. Device as claimed in claim 1, wherein said at least one light receiving element (222) is surrounded by a separate receiver frame (42) having a height from the carrier that is larger than the distance between the carrier (26) and the top surface of the respective light receiving element (222) surrounded by said receiver frame (42).

3. Device as claimed in claim 2, wherein the height difference between the top edge of the receiver frame (42) and the top surface of the respective light receiving element surrounded by said receiver frame

is in the range from 0mm to 0.5mm, in particular in the range from 0.1mm to 0.2mm.

4. Device as claimed in claims 1 to 3, wherein the height difference between the top edge of the emitter frame and the top surface of the respective light emitting element surrounded by said emitter frame is in the range from 0.1mm to 0.8 mm, in particular in the range from 0.2mm to 0.5mm.

5. Device as claimed in claims 1 to 4, wherein the distance between the carrier and the top surface of said least one light emitting element (221, 223) is equal to or smaller than the distance between the carrier and the top surface of said least one light receiving element (222).

6. Device as claimed in claim 1, further comprising additional components (52), in particular a processor (52) for processing a signal from said optical sensor.

7. Device as claimed in claim 6 , wherein said additional components (52) are arranged on said carrier on a different surface than said sensor.

8. Device as claimed in claim 1, wherein the light emitting element is a light emitting device LED.

9. Device as claimed in claim 1, wherein the light receiving element is a photodetector.

10. Device as claimed in claim 1, wherein said insulator material (32) is epoxy resin.

11. Device as claimed in claim 1, further comprising a fixation element (16) for fixing the device to the user's skin.

12. Device as claimed in claim 11,
wherein said fixation element (16) is a wristband, an adhesive strip, a band aid or a strap.

13. Method of manufacturing a device as claimed in claim 1 for measuring a physiological parameter, said method comprising:

- arranging an optical sensor (22) comprising at least one light emitting element (221, 223) for emitting light to the user's skin and at least one light receiving element (222), for receiving light reflected from the user's skin on a carrier (26),
- forming electrical contacts (34) of said at least one light emitting element and at least one light receiving element on, into or through said carrier,
- forming at least one emitter frame (41, 43) on said carrier around one of said at least one said light emitting element (221, 223),
- filling insulator material (32) between said at least one emitter frame and the light emitting element surrounded by the emitter frame (41, 43) up to a height that is equal to or smaller than a distance between the carrier (26) and a top surface of the light emitting element (221, 223),

wherein said at least one emitter frame (41, 43) has a height from the carrier (26) that is smaller than or equal to the distance between the carrier (26) and a top surface of the respective light emitting element (221, 223) surrounded by said emitter frame (41, 43)

Patentansprüche

1. Vorrichtung zum Messen eines physiologischen Parameters eines die genannte Vorrichtung tragenden Benutzers, wobei die genannte Vorrichtung Folgendes umfasst:

- einen optischen Sensor (22) umfassend mindestens ein lichtemittierendes Element (221, 223) zum Emittieren von Licht auf die Haut des Benutzers und mindestens ein lichtempfangendes Element (222) zum Empfangen von Licht, das von der Haut des Benutzers reflektiert wird,
- einen den genannten Sensor tragenden Träger (26), wobei elektrische Kontakte (34) des genannten mindestens einen lichtemittierenden Elements und mindestens einen lichtempfangenden Elements auf, in und durch den genannten Träger führen,
- mindestens einen Emitterrahmen (41, 43), der durch den genannten Träger getragen wird und um eines der genannten mindestens einen lichtemittierenden Elemente (221, 223) ausgebildet ist,
- ein Isoliermaterial (32), das zwischen den genannten mindestens einen Emitterrahmen und das mindestens eine lichtemittierende Element (221, 223), welches durch den betreffenden Emitterrahmen (41, 43) umgeben ist, bis auf eine Höhe gefüllt ist; wobei der genannte mindestens eine Emitterrahmen (41, 43) eine Höhe von dem Träger (26) aus hat,

dadurch gekennzeichnet, dass sowohl die Höhe des Isoliermaterials (32) als auch die Höhe des mindestens einen Lichtemitterrahmens (41, 43) kleiner als oder gleich dem Abstand zwischen dem Träger (26) und einer Oberfläche des betreffenden, durch den genannten Empfängerrahmen (41, 43) umgebenen lichtemittierenden Elements (221, 223) ist.

2. Vorrichtung nach Anspruch 1, wobei das genannte mindestens eine lichtempfangende Element (222) durch einen separaten Empfängerrahmen (42) mit

einer Höhe von dem Träger aus ist, die größer ist als der Abstand zwischen dem Träger (26) und der Oberfläche des betreffenden, durch den genannten Empfängerrahmen (42) umgebenen lichtempfangenden Elements (222).

3. Vorrichtung nach Anspruch 2, wobei die Höhendifferenz zwischen der oberen Kante des Empfängerrahmens (42) und der Oberfläche des betreffenden, durch den genannten Empfängerrahmen umgebenen lichtempfangenden Elements im Bereich von 0 mm bis 0,5 mm liegt, insbesondere im Bereich von 0,1 mm bis 0,2 mm.

4. Vorrichtung nach Anspruch 1 bis 3, wobei die Höhendifferenz zwischen der oberen Kante des Emitterrahmens und der Oberfläche des betreffenden, durch den genannten Emitterrahmen umgebenen lichtemittierenden Elements im Bereich von 0,1 mm bis 0,8 mm liegt, insbesondere im Bereich von 0,2 mm bis 0,5 mm.

5. Vorrichtung nach Anspruch 1 bis 4, wobei der Abstand zwischen dem Träger und der Oberfläche des genannten mindestens einen lichtemittierenden Elements (221, 223) gleich oder kleiner als der Abstand zwischen dem Träger und der Oberfläche des genannten mindestens einen lichtempfangenden Elements (222) ist.

6. Vorrichtung nach Anspruch 1, weiterhin umfassend zusätzliche Komponenten (52), insbesondere einen Prozessor (52) zum Verarbeiten eines Signals von dem genannten optischen Sensor.

7. Vorrichtung nach Anspruch 6, wobei die genannten zusätzlichen Komponenten (52) auf dem genannten Träger auf einer anderen Oberfläche angeordnet sind als der genannte Sensor.

8. Vorrichtung nach Anspruch 1, wobei das lichtemittierende Element eine Leuchtdiode (LED) ist.

9. Vorrichtung nach Anspruch 1, wobei das lichtempfangende Element ein Fotodetektor ist.

10. Vorrichtung nach Anspruch 1, wobei das genannte Isoliermaterial (32) Epoxidharz ist.

11. Vorrichtung nach Anspruch 1, weiterhin umfassend ein Befestigungselement (16) zum Befestigen des Vorrichtung an der Haut des Benutzers.

12. Vorrichtung nach Anspruch 11, wobei das genannte Befestigungselement (16) ein Armband, ein Klebestreifen, ein Heftpflaster oder ein Gurt ist.

13. Verfahren zur Herstellung einer Vorrichtung nach Anspruch 1 zum Messen eines physiologischen Parameters, wobei das genannte Verfahren Folgendes umfasst:

- Anordnen eines optischen Sensors (22) umfassend mindestens ein lichtemittierendes Element (221, 223) zum Emittieren von Licht auf die Haut des Benutzers und mindestens ein lichtempfangendes Element (222) zum Empfangen von Licht, das von der Haut des Benutzers reflektiert wird, auf einem Träger (26),
- Ausbilden von elektrischen Kontakten (34) des genannten mindestens einen lichtemittierenden Elements und mindestens einen lichtempfangenden Elements auf, in und durch den genannten Träger,
- Ausbilden mindestens eines Emitterrahmens (41, 43) auf dem genannten Träger um eines der genannten mindestens einen lichtemittierenden Elemente (221, 223),
- Füllen von Isoliermaterial (32) zwischen den genannten mindestens einen Emitterrahmen und das durch den Emitterrahmen (41, 43) umgebene lichtemittierende Element bis auf eine Höhe, die gleich oder kleiner als ein Abstand zwischen dem Träger (26) und einer Oberfläche des lichtemittierenden Elements (221, 223) ist,

wobei der genannte mindestens eine Emitterrahmen (41, 43) eine Höhe von dem Träger (26) aus hat, die kleiner als oder gleich dem Abstand zwischen dem Träger (26) und einer Oberfläche des betreffenden, durch den genannten Emitterrahmen (41, 43) umgebenen lichtemittierenden Elements (221, 223) ist.

Revendications

1. Dispositif pour mesurer un paramètre physiologique d'un utilisateur portant ledit dispositif, ledit dispositif comprenant :

- un capteur optique (22) comprenant au moins un élément d'émission de lumière (221, 223) pour émettre de la lumière sur la peau de l'utilisateur et au moins un élément de réception de lumière (222), pour recevoir de la lumière réfléchie par la peau de l'utilisateur,
- un support (26) portant ledit capteur, dans lequel des contacts électriques (34) dudit au moins un élément d'émission de lumière et dudit au moins un élément de réception de lumière mènent sur, à l'intérieur ou à travers ledit support,
- au moins un cadre émetteur (41, 43) porté par ledit support et formé autour de l'un dudit au moins un élément d'émission de lumière (221, 223),

- un matériau isolant (32) comblant l'espace entre ledit au moins un cadre d'émetteur et ledit au moins un élément d'émission de lumière (221, 223) entouré par le cadre d'émetteur (41, 43) respectif jusqu'à une certaine hauteur ; dans lequel ledit au moins un cadre d'émetteur (41, 43) a une certaine hauteur à partir du support (26),

caractérisé en ce que chacune de la hauteur du matériau isolant (32) et de la hauteur du au moins un cadre d'émetteur de lumière (41, 43) est plus petite ou égale à la distance entre le support (26) et une surface supérieure de l'élément d'émission de lumière (221, 223) respectif entouré par ledit cadre d'émetteur (41, 43).

2. Dispositif selon la revendication 1, dans lequel ledit au moins un élément de réception de lumière (222) est entouré par un cadre de récepteur séparé (42) ayant une hauteur à partir du support qui est plus grande que la distance entre le support (26) et la surface supérieure de l'élément de réception de lumière (222) respectif entouré par ledit cadre de récepteur (42).

3. Dispositif selon la revendication 2, dans lequel la différence de hauteur entre le bord supérieur du cadre de récepteur (42) et la surface supérieure de l'élément de réception de lumière respectif entouré par ledit cadre de récepteur est dans la plage allant de 0 mm à 0,5 mm, en particulier dans la plage allant de 0,1 mm à 0,2 mm.

4. Dispositif selon les revendications 1 à 3, dans lequel la différence de hauteur entre le bord supérieur du cadre d'émetteur et la surface supérieure de l'élément d'émission de lumière respectif entouré par ledit cadre d'émetteur est dans la plage allant de 0,1 mm à 0,8 mm, en particulier dans la plage allant de 0,2 mm à 0,5 mm.

5. Dispositif selon les revendications 1 à 4, dans lequel la distance entre le support et la surface supérieure dudit au moins un élément d'émission de lumière (221, 223) est égale ou inférieure à la distance entre le support et la surface supérieure dudit au moins un élément de réception de lumière (222).

6. Dispositif selon la revendication 1, comprenant en outre des composants supplémentaires (52), en particulier un processeur (52) pour traiter un signal provenant dudit capteur optique.

7. Dispositif selon la revendication 6, dans lequel lesdits composants supplémentaires (52) sont agencés sur ledit support sur une surface différente dudit capteur.

8. Dispositif selon la revendication 1, dans lequel l'élément d'émission de lumière est un dispositif électroluminescent DEL.

9. Dispositif selon la revendication 1, dans lequel l'élément de réception de lumière est un photodétecteur.

10. Dispositif selon la revendication 1, dans lequel ledit matériau isolant (32) est une résine époxy.

11. Dispositif selon la revendication 1, comprenant en outre un élément de fixation (16) pour fixer le dispositif à la peau de l'utilisateur.

12. Dispositif selon la revendication 11, dans lequel ledit élément de fixation (16) est un serre-poignet, un ruban adhésif, un pansement adhésif ou une sangle.

13. Procédé de fabrication d'un dispositif tel que revendiqué dans la revendication 1 pour mesurer un paramètre physiologique, ledit procédé comprenant :

- la disposition d'un capteur optique (22) comprenant au moins un élément d'émission de lumière (221, 223) pour émettre de la lumière sur la peau de l'utilisateur et au moins un élément de réception de lumière (222), pour recevoir de la lumière réfléchie par la peau de l'utilisateur sur un support (26),
- la formation de contacts électriques (34) sur ledit au moins un élément d'émission de lumière et ledit au moins un élément de réception de lumière sur, à l'intérieur ou à travers ledit support,
- la formation d'au moins un cadre d'émetteur (41, 43) sur ledit support autour de l'un dudit au moins un dit élément d'émission de lumière (221, 223),
- le remplissage de matériau isolant (32) entre ledit au moins un cadre d'émetteur et ledit élément d'émission de lumière entouré par le cadre d'émetteur (41, 43) jusqu'à une certaine hauteur qui est égale ou inférieure à une distance entre le support (26) et une surface supérieure de l'élément d'émission de lumière (221, 223),

dans lequel ledit au moins un cadre d'émetteur (41, 43) a une certaine hauteur à partir du support (26) qui est inférieure ou égale à la distance entre le support (26) et une surface supérieure de l'élément d'émission de lumière (221, 223) respectif entouré par ledit cadre d'émetteur (41, 43).

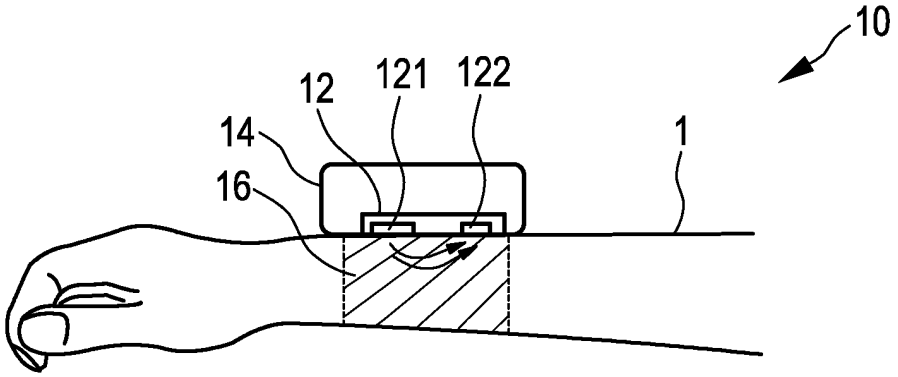


FIG. 1

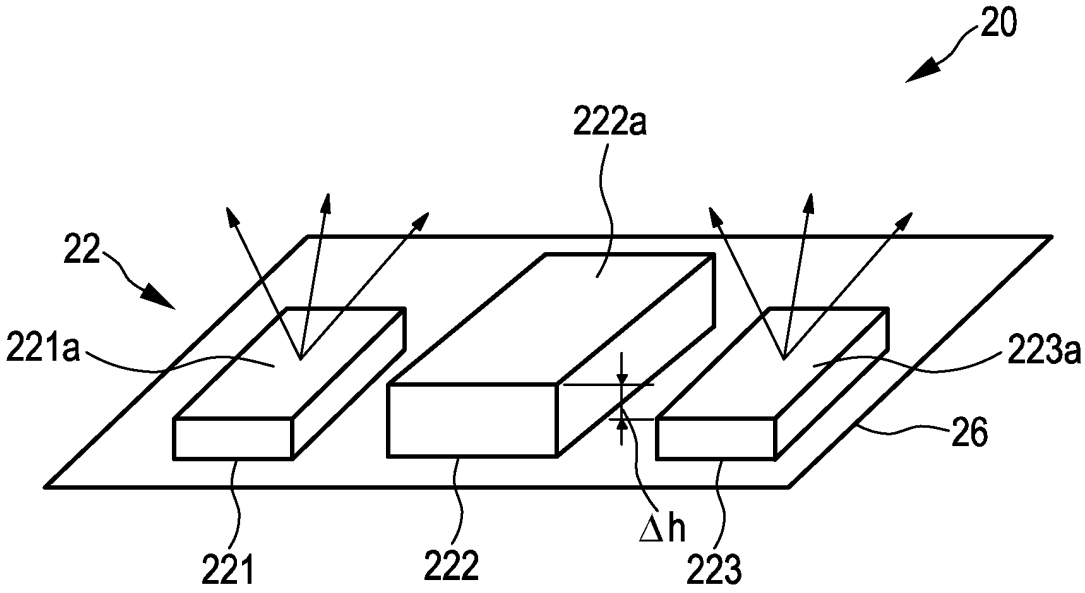


FIG. 2

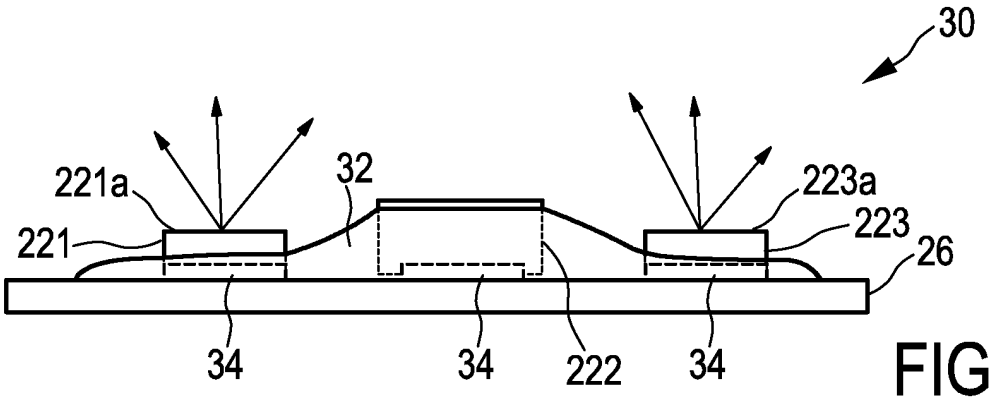
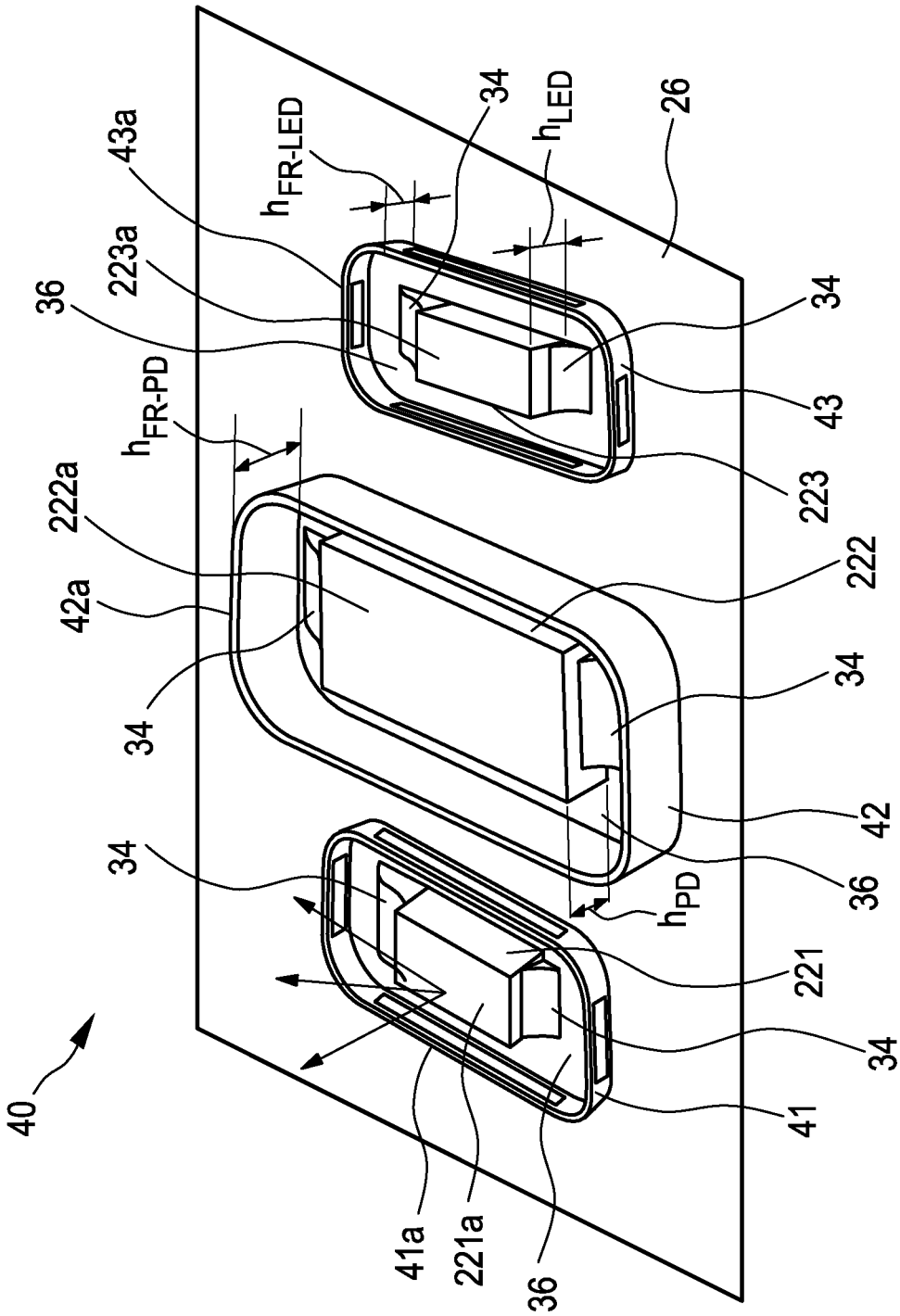


FIG. 3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41
41a
42
42a
43
43a
221
221a
222
222a
223
223a
26
34
36
h_{FR-LED}
h_{LED}
h_{FR-PD}
h_{PD}

FIG. 4

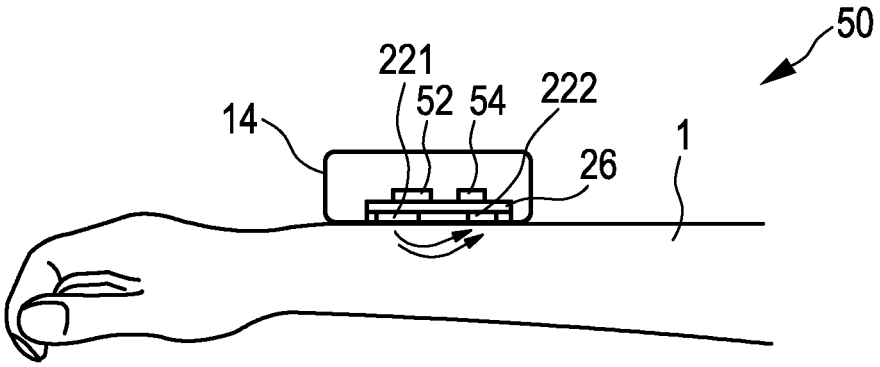

FIG. 5

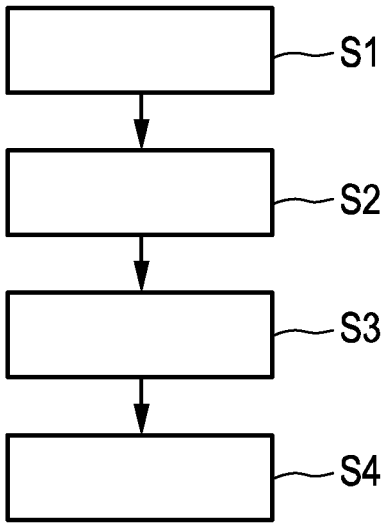

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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- WO 2011051888 A2 **[0004]**

专利名称(译)	用于测量用户的生理参数的设备		
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申请(专利权)人(译)	皇家飞利浦N.V.		
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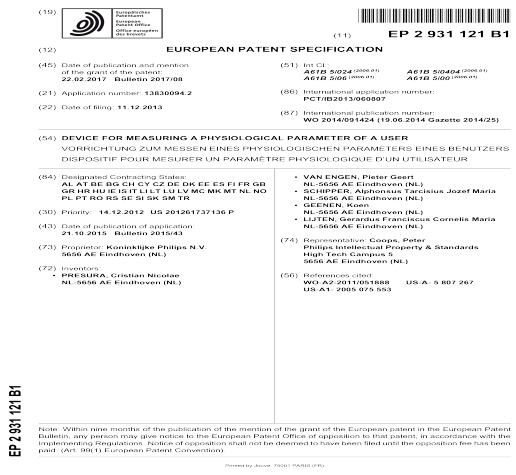
外部链接	Espacenet		

摘要(译)

本发明涉及一种用于测量携带所述装置的用户的生理参数的装置。该装置包括传感器（22），该传感器包括用于检测传感器信号的至少两个传感器元件（221,222,223）和承载所述传感器的载体（26），其中所述传感器元件的电触点（34）或通过所述载体。由所述载体承载的一个或多个框架（41,42,43）形成在所述传感器和/或所述单独的传感器元件周围，并且绝缘体材料（32）填充在所述一个或多个框架与所述传感器和/由相应的框架包围的传感器元件，而不覆盖相应的传感器元件的背离载体的顶面。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(54) DEVICE FOR MEASURING A PHYSIOLOGICAL PARAMETER OF A USER
VORRICHTUNG ZUM MESSEN EINES PHYSIOLOGISCHEN PARAMETERS EINES BENUTZERS
DISPOSITIF POUR MESURER UN PARAMÈTRE PHYSIOLOGIQUE D'UN UTILISATEUR
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(56) References cited: WO-A2-2011/051888 US-A- 5 807 267 US-A1- 2005 075 553
EP 2 931 121 B1
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