

– or to Figure out how to connect or disconnect different parts of the device. Other users may have motor-control issues that make it difficult to actually perform the actions necessary to connect or disconnect different parts of the device.

Furthermore, most users, even those without any cognitive or motor-control issues, dislike it when a physiological monitoring device breaks and needs to be repaired.

[0005] All of these challenges apply particularly to an adhesive patch device comprising a reusable component and a disposable component. The user has to know how to connect the reusable component to the disposable component; the user has to enter environments involving water; the user has to change the device's battery and adhesive; and the user needs a reliable device that does not break.

[0006] A need exists for a durable, reliable, easy to use wearable physiological monitoring device that is safe to use around water and that is easy to maintain and easy to connect and disconnect.

SUMMARY

[0006a] According to an aspect, the present disclosure refers to a wearable physiological monitoring device, comprising: a disposable component comprising: a first electrode; a second electrode; a cradle, comprising: a battery; a first electrical contact and a second electrical contact, both the first and second electrical contacts being electrically coupled to the battery; a third electrical contact electrically coupled to the first electrode; a fourth electrical contact electrically coupled to the second electrode; a battery disconnect switch located between the first electrical contact and the battery, said battery disconnect switch comprising: a first trace electrically coupled to the first electrical contact, said first trace comprising a first free end; a second trace electrically coupled to the battery, said second trace comprising a second free end, wherein the first free end is electrically isolated from the second free end; a button comprising a top side in proximity to the first trace and a bottom side in proximity to the second trace; and a conductive plate located on the bottom

side of the button; and a reusable component configured to be secured to the disposable component, the reusable component comprising: an electronics module; and an electrical interface associated with the electronics module and configured to interface with at least one of the first, second, third, and fourth electrical contacts of the disposable component.

[0006b] According to another aspect, the present disclosure refers to a wearable physiological monitoring device, comprising: a disposable component comprising: a first electrode; a second electrode; a cradle, wherein the cradle comprises: a battery; a first electrical contact and a second electrical contact, both the first and second electrical contacts being electrically coupled to the battery; a third electrical contact electrically coupled to the first electrode; a fourth electrical contact electrically coupled to the second electrode; and a disposable component latching system; and a reusable component configured to be secured to the disposable component, the reusable component comprising: a reusable component latching system configured to operably engage the disposable component latching system; an electronics module; an electrical interface associated with the electronics module, wherein the electrical interface comprises a fifth electrical contact for electrically coupling the electronics module to the first electrical contact, a sixth electrical contact for electrically coupling the electronics module to the second electrical contact, a seventh electrical contact for electrically coupling the electronics module to the third electrical contact, and an eighth electrical contact for electrically coupling the electronics module to the fourth electrical contact; wherein each of the fifth electrical contact, sixth electrical contact, seventh electrical contact, and eighth electrical contact are spring loaded electrical connectors; wherein each one of the first electrical contact, second electrical contact, third electrical contact, and fourth electrical contact comprises a multilayered ink contact comprising a first ink layer and a second ink layer, further wherein the first ink layer has a higher conductivity than the second ink layer, and the second ink layer is made up of material with a smaller particle size than the first ink layer.

[0006c] According to another aspect, the present disclosure refers to a method of assembling a device comprising a plastic housing and a printed circuit board assembly (PCBA) located inside the plastic housing, wherein the plastic housing comprises a top half and a bottom half, the method comprising: placing the PCBA on the bottom half of the plastic housing in such a way that the PCBA is not mechanically coupled to the bottom half; placing the top half on the bottom half of the plastic housing in such a way that the PCBA is not mechanically coupled to the top half; and ultrasonically welding the top half to the bottom half.

[0007] In some examples, a device of the present disclosure comprises a disposable component and a reusable component. The disposable component comprises two electrodes intended to make connection with a user's skin, and a cradle comprising a battery and electrical contacts connected to the battery and to the electrodes. The cradle also comprises a latching system for the reusable component to latch onto. The reusable component comprises an electrical interface to the cradle and a reusable component latching system configured to engage the disposable component latching system. In some examples, the cradle also comprises a battery disconnect switch connected between the first electrical contact and the battery, such that the battery disconnect switch disconnects the battery from the first electrical contact when no pressure is applied to the battery disconnect switch, and connects the battery to the first electrical contact when pressure is applied to the battery disconnect switch. In some examples, the reusable

component comprises a protrusion configured in such a way as to apply pressure to the battery disconnect switch when the reusable component is latched to the cradle.

[0008] In some examples, the device of the present disclosure comprises a disposable component and a reusable component. The disposable component comprises two electrodes intended to make connection with a user's skin, and a cradle comprising a battery and electrical contacts connected to the battery and to the electrodes. The cradle also comprises a latching system for the reusable component to latch onto. The reusable component comprises an electrical interface to the cradle and a reusable component latching system configured to engage the disposable component latching system. In some examples, all the electrical connectors in the reusable component are spring loaded electrical connectors, and each one of the electrical contacts in the cradle comprise two layers of ink – a layer of a highly conductive first ink comprising large metal particles, and a layer of a second ink applied on top of the layer of first ink, wherein the second ink comprises carbon particles.

[0009] In some examples, the device comprises a plastic housing and a printed circuit board assembly (PCBA) located inside the plastic housing. The plastic housing comprises a top half and a bottom half. The PCBA is not rigidly attached to either the top half or the bottom half during assembly; instead, it is placed on the bottom half and then the top half is placed on top of the bottom half, and the ultrasonic weld is performed. The PCBA is not mechanically coupled to either the top half or the bottom half during the ultrasonic weld or at any other point.

[0010] In some examples, the device comprises a disposable component and a reusable component. The disposable component comprises two electrodes intended to make connection with a user's skin, and a cradle comprising a battery and electrical contacts connected to the battery and to the electrodes. The cradle also comprises a latching system for the reusable component to latch onto. The reusable component comprises an electrical interface to the cradle and a reusable component

latching system configured to engage the disposable component latching system. In some examples, the device also comprises a gasket that provides an individual enclosure around each individual electrical contact, to prevent water from short-circuiting any two electrical contacts even if it is present around any given electrical contact.

[0011] In some examples, the device comprises a disposable component and a reusable component. The disposable component comprises two electrodes intended to make connection with a user's skin, and a cradle comprising a battery and electrical contacts connected to the battery and to the electrodes. The cradle also comprises a latching system for the reusable component to latch onto. The reusable component comprises an electrical interface to the cradle and a reusable component latching system configured to engage the disposable component latching system. In some examples, the device also comprises an asymmetrical wall feature in the reusable component latching system and an asymmetrical cradle feature in the disposable component latching system that is configured to engage with the asymmetrical wall feature in only one orientation of the reusable component with respect to the disposable component.

[0012] In some examples, the device comprises a disposable component and a reusable component. The disposable component comprises two electrodes intended to make connection with a user's skin, and a cradle comprising a battery and electrical contacts connected to the battery and to the electrodes. The cradle also comprises a latching system for the reusable component to latch onto. The reusable component comprises an electrical interface to the cradle and a reusable component latching system configured to engage the disposable component latching system. In some examples, the device also comprises at least two protrusions located around the perimeter of the reusable component and at least two cutouts located around the perimeter of the disposable component, wherein each one of the at least

two protrusions engages with one of the at least two cutouts when the reusable component is placed on the disposable component.

[0013] In some examples, the device comprises a disposable component and a reusable component. The disposable component comprises two electrodes intended to make connection with a user's skin, and a cradle comprising a battery and electrical contacts connected to the battery and to the electrodes. The cradle also comprises a latching system for the reusable component to latch onto. The reusable component comprises an electrical interface to the cradle and a reusable component latching system configured to engage the disposable component latching system. In some examples, the device also comprises a front snap connector and a rear snap connector, such that the reusable component may be latched onto the disposable component regardless of angle of approach.

LIST OF FIGURES

[0014] Fig. 1 shows a view of a re-wearable physiological monitoring device according to at least one aspect of the present disclosure.

[0015] Fig. 2 shows a block diagram of a re-wearable physiological monitoring device according to at least one aspect of the present disclosure.

[0016] Fig. 3 shows a block diagram of a reusable component according to at least one aspect of the present disclosure.

[0017] Fig. 4 shows a block diagram of an ingestible event marker system according to at least one aspect of the present disclosure.

[0018] Fig. 5 shows a view of a re-wearable physiological monitoring device according to at least one aspect of the present disclosure with the reusable component and the disposable component latched together.

[0019] Fig. 6 shows two views of a disposable component according to at least one aspect of the present disclosure.

Claims

1. A wearable physiological monitoring device, comprising:
 - a disposable component comprising:
 - a first electrode;
 - a second electrode;
 - a cradle, comprising:
 - a battery;
 - a first electrical contact and a second electrical contact, both the first and second electrical contacts being electrically coupled to the battery;
 - a third electrical contact electrically coupled to the first electrode;
 - a fourth electrical contact electrically coupled to the second electrode;
 - a battery disconnect switch located between the first electrical contact and the battery, said battery disconnect switch comprising:
 - a first trace electrically coupled to the first electrical contact, said first trace comprising a first free end;
 - a second trace electrically coupled to the battery, said second trace comprising a second free end, wherein the first free end is electrically isolated from the second free end;
 - a button comprising a top side in proximity to the first trace and a bottom side in proximity to the second trace; and
 - a conductive plate located on the bottom side of the button; and
 - a reusable component configured to be secured to the disposable component, the reusable component comprising:
 - an electronics module; and
 - an electrical interface associated with the electronics module and configured to interface with at least one of the first, second, third, and fourth electrical contacts of the disposable component.
2. The device of claim 1, wherein the reusable component is configured to apply pressure to the button when the reusable component is connected to the disposable component.
3. The device of claim 1, wherein the reusable component comprises a protrusion configured to apply pressure to the button when the reusable component is connected to the disposable component.
4. The device of claim 1, wherein the disposable component further comprises a disposable component latching system; and the reusable component further comprises a reusable

component latching system configured to operably engage the disposable component latching system.

5. The device of claim 1, wherein the electrical interface of the reusable component comprises a fifth electrical contact for electrically coupling the electronics module to the first electrical contact, a sixth electrical contact for electrically coupling the electronics module to the second electrical contact, a seventh electrical contact for electrically coupling the electronics module to the third electrical contact, and an eighth electrical contact for electrically coupling the electronics module to the fourth electrical contact.
6. The device of claim 5, further comprising:
 - a gasket, wherein the gasket comprises a first individual enclosure around the fifth electrical contact that does not enclose any other electrical contact, a second individual enclosure around the sixth electrical contact that does not enclose any other electrical contact, a third individual enclosure around the seventh electrical contact that does not enclose any other electrical contact, and a fourth individual enclosure around the eighth electrical contact that does not enclose any other electrical contact, in such a way that water cannot enter or exit any individual enclosures when the reusable component is engaged with the disposable component.
7. The device of claim 6, wherein the gasket comprises a top half attached to the reusable component and a bottom half attached to the disposable component.
8. The device of claim 6, wherein each one of the first, second, third, and fourth individual enclosure is cylindrical in shape.
9. The device of claim 1, wherein the button is spring-loaded so that in a first configuration, the conductive plate is not in electrical contact with the first free end and the second free end, and in a second configuration when pressure is applied to the button, the conductive plate comes into electrical contact with the first free end and the second free end so as to electrically couple the first free end to the second free end.
10. A wearable physiological monitoring device, comprising:
 - a disposable component comprising:
 - a first electrode;
 - a second electrode;

a cradle, wherein the cradle comprises:

- a battery;
- a first electrical contact and a second electrical contact, both the first and second electrical contacts being electrically coupled to the battery;
- a third electrical contact electrically coupled to the first electrode;
- a fourth electrical contact electrically coupled to the second electrode; and
- a disposable component latching system; and

a reusable component configured to be secured to the disposable component, the reusable component comprising:

- a reusable component latching system configured to operably engage the disposable component latching system;
- an electronics module;
- an electrical interface associated with the electronics module, wherein the electrical interface comprises a fifth electrical contact for electrically coupling the electronics module to the first electrical contact, a sixth electrical contact for electrically coupling the electronics module to the second electrical contact, a seventh electrical contact for electrically coupling the electronics module to the third electrical contact, and an eighth electrical contact for electrically coupling the electronics module to the fourth electrical contact;

wherein each of the fifth electrical contact, sixth electrical contact, seventh electrical contact, and eighth electrical contact are spring loaded electrical connectors;

wherein each one of the first electrical contact, second electrical contact, third electrical contact, and fourth electrical contact comprises a multilayered ink contact comprising a first ink layer and a second ink layer, further wherein the first ink layer has a higher conductivity than the second ink layer, and the second ink layer is made up of material with a smaller particle size than the first ink layer.

11. The device of claim 10, wherein:

- the first ink layer comprises a silver ink, wherein a thickness of the first ink layer is approximately 0.01mm; and
- the second ink layer comprises a carbon ink, wherein a thickness of second ink layer is approximately 0.013mm.

12. The device of claim 10, further comprising:

- a gasket, wherein the gasket comprises a first individual enclosure around the fifth electrical contact that does not enclose any other electrical contact, a second individual enclosure around the sixth electrical contact that does not enclose any

other electrical contact, a third individual enclosure around the seventh electrical contact that does not enclose any other electrical contact, and a fourth individual enclosure around the eighth electrical contact that does not enclose any other electrical contact, in such a way that water cannot enter or exit any individual enclosures when the reusable component is engaged with the disposable component.

13. The device of claim 12, wherein each one of the first, second, third, and fourth individual enclosure is cylindrical in shape.
14. The device of claim 12, wherein the gasket comprises a top half attached to the reusable component and a bottom half attached to the disposable component.
15. The device of claim 12, wherein the gasket is entirely attached to the reusable component.
16. The device of claim 12, wherein the gasket is entirely attached to the disposable component.
17. A method of assembling a device comprising a plastic housing and a printed circuit board assembly (PCBA) located inside the plastic housing, wherein the plastic housing comprises a top half and a bottom half, the method comprising:
 - placing the PCBA on the bottom half of the plastic housing in such a way that the PCBA is not mechanically coupled to the bottom half;
 - placing the top half on the bottom half of the plastic housing in such a way that the PCBA is not mechanically coupled to the top half; and
 - ultrasonically welding the top half to the bottom half.
18. The method of claim 17, further comprising engaging a first wall feature of the top half to a second wall feature of the bottom half while ultrasonically welding the top half to the bottom half.
19. The method of claim 18, further comprising melting the first wall feature to the second wall feature during the ultrasonic welding to create a waterproof connection between the top half and the bottom half.

20. The method of claim 19, further comprising generating a bulge on one side of the plastic housing that is larger than a threshold value as a result of forming the waterproof connection through the ultrasonic welding.