CLAIMS

1. A smartwatch, comprising:

a watch band;

a watch plate coupled to the watch band and comprising:

an electrocardiosignal collection circuit configured to obtain electrocardiosignal data of a user when the smartwatch is worn by the user;

a housing comprising:

a side wall comprising an end disposed with a groove; and

a bottom wall coupled to the side wall and comprising:

a central region comprising a detection window; and

a peripheral region around the central region;

a transparent lens covering the detection window;

a processor electrically coupled to the electrocardiosignal collection circuit and configured to generate an electrocardiogram according to the electrocardiosignal data;

a display electrically coupled to the processor and configured to display the electrocardiogram, wherein the display and the bottom wall are disposed opposite to each other, and wherein the side wall is positioned between the display and the bottom wall; and

a photoplethysmogram apparatus disposed inside the housing, wherein the photoplethysmogram apparatus is configured to detect a heart rate of the user through the detection window when the smartwatch is worn by the user;

a first electrode electrically coupled to the electrocardiosignal collection circuit and disposed in the peripheral region, wherein the first electrode is configured to contact a first body part of the user when the smartwatch is worn by the user;

a second electrode electrically coupled to the electrocardiosignal collection circuit and disposed in the peripheral region, wherein the second electrode is configured to contact a second

body part of the user when the smartwatch is worn by the user, wherein the first electrode and the second electrode are alternately disposed, and wherein the first electrode and the second electrode are arc-shaped segments and are positioned around the detection window; and

a third electrode electrically coupled to the electrocardiosignal collection circuit and exposed to the side wall, wherein the third electrode is configured to contact a third body part of the user when the smartwatch is worn by the user, and wherein the third electrode comprises:

a touch portion configured to contact the third body part when the smartwatch is worn by the user; and

a fixing portion coupled to the touch portion, wherein the fixing portion extends into the housing, and wherein the fixing portion is engaged into the groove so that the third electrode is fastened to the housing,

wherein a first surface of the first electrode or the second electrode protrudes above a second surface on which no electrode is arranged in the peripheral region, and

wherein the watch plate further comprises:

an electrode spring coupled to the housing, wherein one end of the electrode spring extends into a groove to be coupled to the fixing portion; and

a flexible circuit board coupled to the housing, wherein another end of the electrode spring is coupled to a first end of the flexible circuit board, and wherein a second end of the flexible circuit board is electrically coupled to the electrocardiosignal collection circuit.

2. The smartwatch of claim 1, wherein the first electrode, the second electrode, and the third electrode are made of metal.

3. The smartwatch of claim 1, wherein the watch plate further comprises:

a first circuit board coupled to the housing, wherein the first circuit board is configured to couple to the electrocardiosignal collection circuit and includes a first through hole;

a fixed circuit board electrically coupled to the first circuit board, wherein the fixed circuit board comprises:

a second through hole;

a pad located on a periphery of the second through hole;

an electrode sheet coupled to the first electrode;

a connection base coupled to the electrode sheet; and

a screw coupled to the connection base, wherein the connection base extends into the first through hole, and wherein the screw is coupled to the connection base after passing through the second through hole such that the connection base is in contact with the pad.

4. The smartwatch of claim 3, wherein the pad comprises:

a first subpad disposed on a side of the fixed circuit board and in contact with the connection base; and

a second subpad coupled to the first subpad, wherein the first subpad and the second subpad are disposed opposite to each other, wherein the second subpad is disposed on a side of the fixed circuit board away from the connection base, wherein the second subpad is in contact with the screw, and wherein the screw is made of a conductive material.

5. The smartwatch of claim 3, wherein the watch plate further comprises:

a flexible circuit board coupled to the housing;

an electrode spring disposed inside the housing; and

a connection circuit board coupled to the housing and electrically coupled to the flexible circuit board,

wherein the first electrode is located on an outer side of the bottom wall,

wherein the bottom wall further comprises a third through hole, and

wherein the electrode spring passes through the third through hole and is pressed between the first electrode and the connection circuit board.

6. The smartwatch of claim 1, wherein the third electrode is ring-shaped.

7. The smartwatch of claim 1, wherein an outer diameter of the third electrode is greater than an outer diameter of the display.

8. A smartwatch, comprising:

a watch band;

a watch plate coupled to the watch band and comprising:

an electrocardiosignal collection circuit configured to obtain electrocardiosignal data of a user when the smartwatch is worn by the user;

a housing comprising:

a side wall; and

a bottom wall coupled to the side wall and comprising:

a central region comprising a detection window; and

a peripheral region around the central region;

a first circuit board coupled to the housing, wherein the first circuit board is configured to couple to the electrocardiosignal collection circuit and includes a first through hole;

a transparent lens covering the detection window;

a processor electrically coupled to the electrocardiosignal collection circuit and configured to generate an electrocardiogram according to the electrocardiosignal data;

a display electrically coupled to the processor and configured to display the electrocardiogram, wherein the display and the bottom wall are disposed opposite to each other, and wherein the side wall is positioned between the display and the bottom wall; and

a photoplethysmogram apparatus disposed inside the housing, wherein the photoplethysmogram apparatus is configured to detect a heart rate of the user through the detection window when the smartwatch is worn by the user;

a first electrode electrically coupled to the electrocardiosignal collection circuit and disposed in the peripheral region, wherein the first electrode is configured to contact a first body part of the user when the smartwatch is worn by the user;

a second electrode electrically coupled to the electrocardiosignal collection circuit and disposed in the peripheral region, wherein the second electrode is configured to contact a second body part of the user when the smartwatch is worn by the user, wherein the first electrode and the second electrode are alternately disposed, and wherein the first electrode and the second electrode are arc-shaped segments and are positioned around the detection window; and

a third electrode electrically coupled to the electrocardiosignal collection circuit and exposed to the side wall, wherein the third electrode is configured to contact a third body part of the user when the smartwatch is worn by the user,

wherein a first surface of the first electrode or the second electrode protrudes above a second surface on which no electrode is arranged in the peripheral region, wherein the watch plate further comprises a fixed circuit board electrically coupled to the first circuit board, and wherein the fixed circuit board comprises:

a second through hole;

a pad located on a periphery of the second through hole;

an electrode sheet coupled to the first electrode;

a connection base coupled to the electrode sheet; and

a screw coupled to the connection base, wherein the connection base extends into the first through hole, and wherein the screw is coupled to the connection base after passing through the second through hole such that the connection base is in contact with the pad.

9. The smartwatch of claim 8, wherein the third electrode comprises:

a touch portion configured to contact the third body part of the user when the smartwatch is worn by the user; and

a fixing portion coupled to the touch portion, wherein the fixing portion extends into the housing.

10. The smartwatch of claim 8, wherein the first electrode, the second electrode, and the third electrode are made of metal.

11. The smartwatch of claim 8, wherein the pad comprises:

a first subpad disposed on a side of the fixed circuit board and in contact with the connection base; and

a second subpad coupled to the first subpad, wherein the first subpad and the second subpad are disposed opposite to each other, wherein the second subpad is disposed on a side of the fixed circuit board away from the connection base, wherein the second subpad is in contact with the screw, and wherein the screw is made of a conductive material.

12. The smartwatch of claim 8, wherein the third electrode comprises a fixing portion, and wherein the watch plate further comprises:

an electrode spring coupled to the housing, wherein one end of the electrode spring extends into a groove to be coupled to the fixing portion; and

a flexible circuit board coupled to the housing, wherein another end of the electrode spring is coupled to a first end of the flexible circuit board, and wherein a second end of the flexible circuit board is electrically coupled to the electrocardiosignal collection circuit.

13. The smartwatch of claim 8, wherein the watch plate further comprises:

a flexible circuit board coupled to the housing;

an electrode spring disposed inside the housing; and

a connection circuit board coupled to the housing and electrically coupled to the flexible circuit board,

wherein the first electrode is located on an outer side of the bottom wall,

wherein the bottom wall further comprises a third through hole, and

wherein the electrode spring passes through the third through hole and is pressed between the first electrode and the connection circuit board.

14. The smartwatch of claim 8, wherein the third electrode is ring-shaped.

15. The smartwatch of claim 14, wherein an outer diameter of the third electrode is greater than an outer diameter of the display.

16. A smartwatch, comprising:

a watch band;

a watch plate coupled to the watch band and comprising:

an electrocardiosignal collection circuit configured to obtain electrocardiosignal data of a user when the smartwatch is worn by the user;

a housing comprising:

a side wall; and

a bottom wall coupled to the side wall and comprising:

a central region comprising a detection window; and

a peripheral region around the central region;

a transparent lens covering the detection window;

a processor electrically coupled to the electrocardiosignal collection circuit and configured to generate an electrocardiogram according to the electrocardiosignal data;

a display electrically coupled to the processor and configured to display the electrocardiogram, wherein the display and the bottom wall are disposed opposite to each other, and wherein the side wall is positioned between the display and the bottom wall; and

a photoplethysmogram apparatus disposed inside the housing, wherein the photoplethysmogram apparatus is configured to detect a heart rate of the user through the detection window when the smartwatch is worn by the user;

a first electrode electrically coupled to the electrocardiosignal collection circuit and disposed in the peripheral region, wherein the first electrode is configured to contact a first body part of the user when the smartwatch is worn by the user;

a second electrode electrically coupled to the electrocardiosignal collection circuit and disposed in the peripheral region, wherein the second electrode is configured to contact a second body part of the user when the smartwatch is worn by the user, wherein the first electrode and the second electrode are alternately disposed, and wherein the first electrode and the second electrode are arc-shaped segments and are positioned around the detection window; and

a third electrode that comprises a fixing portion, that is electrically coupled to the electrocardiosignal collection circuit, and that is exposed to the side wall, wherein the third electrode is configured to contact a third body part of the user when the smartwatch is worn by the user,

wherein a first surface of the first electrode or the second electrode protrudes above a second surface on which no electrode is arranged in the peripheral region, and

wherein the watch plate further comprises:

a first electrode spring coupled to the housing, wherein one end of the first electrode spring extends into a groove to be coupled to the fixing portion; and

a flexible circuit board coupled to the housing, wherein another end of the first electrode spring is coupled to a first end of the flexible circuit board, and wherein a second end of the flexible circuit board is electrically coupled to the electrocardiosignal collection circuit.

17. The smartwatch of claim 16, wherein the third electrode comprises a touch portion configured to contact the third body part of the user when the smartwatch is worn by the user, and wherein the fixing portion is coupled to the touch portion and extends into the housing.

18. The smartwatch of claim 16, wherein the first electrode, the second electrode, and the third electrode are made of metal.

19. The smartwatch of claim 16, wherein the watch plate further comprises:

a first circuit board coupled to the housing, wherein the first circuit board is configured to couple to the electrocardiosignal collection circuit and includes a first through hole;

a fixed circuit board electrically coupled to the first circuit board, wherein the fixed circuit board comprises:

a second through hole;

a pad located on a periphery of the second through hole;

an electrode sheet coupled to the first electrode;

a connection base coupled to the electrode sheet; and

a screw coupled to the connection base, wherein the connection base extends into the first through hole, and wherein the screw is coupled to the connection base after passing through the second through hole such that the connection base is in contact with the pad.

20. The smartwatch of claim 19, wherein the pad comprises:

a first subpad disposed on a side of the fixed circuit board and in contact with the connection base; and

a second subpad coupled to the first subpad, wherein the first subpad and the second subpad are disposed opposite to each other, wherein the second subpad is disposed on a side of the fixed circuit board away from the connection base, wherein the second subpad is in contact with the screw, and wherein the screw is made of a conductive material.