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COMPONENT MOUNTING MEMBER, CASE AND TIMEPIECE

Abstract

A component mounting member including a base member which is provided with an attachment hole and attached to a case, an attachment member which is inserted into the attachment hole of the base member so as to be attached to an inner surface of the base member located on an inner side of the case, and a terminal which is provided on the attachment member and exposed from the inner surface of the base member and an outer surface opposite to the inner surface.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a continuation of U.S. patent application Ser. No. 17/684,877, filed on Mar. 2, 2022, which is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2021-039489, filed Mar. 11, 2021, the entire contents of U.S. patent application Ser. No. 17/684,877 and Japanese Patent Application No. 2021-039489 are incorporated herein by reference.

BACKGROUND

1. Technical Field

[0002] The technical field relates to a component mounting member that is used for electronic devices, such as timepieces, mobile phones, and portable information terminals, a case equipped with the component mounting member, and a timepiece equipped with the case.

2. Description of the Related Art

[0003] A wristwatch is known which has a structure where a communication module and a communication terminal are provided inside a housing which is a base member and made of a non-metal material such as synthetic resin, and a fixing ring is arranged surrounding the communication module and attached to a case by screws via the base member and a packing, as described in Japanese Patent Application Laid-Open (Kokai) Publication No. 2004-085232.

SUMMARY

[0004] One embodiment is a component mounting member comprising: a base member which is provided with an attachment hole and attached to a case; an attachment member which is inserted into the attachment hole of the base member so as to be attached to an inner surface of the base member located on an inner side of the case; and a terminal which is provided on the attachment member and exposed from the inner surface of the base member and an outer surface opposite to the inner surface.

[0005] The above and further objects and novel features of the present invention will more fully appear from the following detailed description when the same is read in conjunction with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is an enlarged front view of an embodiment of a wristwatch;

[0007] FIG. 2 is an enlarged side view of the wristwatch shown in FIG. 1;

[0008] FIG. 3 is an enlarged rear view of the wristwatch shown in FIG. 1;

[0009] FIG. 4 is an enlarged cross-sectional view of the wristwatch taken along the A-A arrow view in FIG. 1;

[0010] FIG. 5 is an enlarged planar view showing the inner surface side of a back cover for the wristwatch shown in FIG. 3;

[0011] FIG. 6 is an enlarged perspective view of the back cover shown in FIG. 5, in which a charging terminal section has been disassembled;

[0012] FIG. 7A is an enlarged cross-sectional view of the charging terminal section of the back

cover taken along the B-B arrow view in FIG. 5;

[0013] FIG. 7B is an enlarged cross-sectional view of the charging terminal section of the back cover taken along the C-C arrow view in FIG. 5;

[0014] FIG. 8A is an enlarged cross-sectional view of an A portion of the charging terminal section shown in FIG. 7A;

[0015] FIG. 8B is also an enlarged cross-sectional view of the A portion of the charging terminal section shown in FIG. 7A, in which a terminal attachment member has been detached from the back cover;

[0016] FIG. 9 is an enlarged cross-sectional view of the wristwatch of FIG. 4 which is being charged by a battery charger; and

[0017] FIG. 10 is an enlarged cross-sectional view of the wristwatch taken along the D-D arrow view in FIG. 9 with it being charged.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] An embodiment applied in a wristwatch will hereinafter be described with reference to FIG. 1 to FIG. 10. This wristwatch includes a wristwatch case 1, as shown in FIG. 1 to FIG. 3. On the six o'clock side and twelve o'clock side of the wristwatch case 1, band attachment sections 2 are provided to which watch bands (not shown) are attached. In addition, on the two o'clock side, four o'clock side, eight o'clock side, and ten o'clock side of the wristwatch case 1, switch sections 3 are provided.

[0019] This wristwatch case 1 includes a main body case 4, a first exterior case 5, and a second exterior case 6, as shown in FIG. 1 to FIG. 4. The main body case 4 is made of a lightweight and high-strength synthetic resin acquired by carbon fiber or glass fiber being mixed into a highly rigid polyamide resin. In the circumferential portion of the main body case 4, a metal reinforcement member 4a is embedded, and part of which protrudes into the inside of the main body case 4. Note that this main body case 4 is not necessarily required to be formed using synthetic resin and may be formed using metal.

[0020] The first exterior case 5 is made of a highly rigid metal such as stainless steel or titanium alloy, and arranged covering the upper outer surface of the main body case 4, as shown in FIG. 1 to FIG. 4. On the other hand, the second exterior case 6 is made of an elastic synthetic resin such as urethane resin. This second exterior case 6 is structured to be mounted on the outer circumferential portion of the main body case 4 and hold down a foot section 5a of the first exterior case 5 with the first exterior case 5 being exposed.

[0021] To the upper opening of the wristwatch case 1, that is, to the upper opening of the main body case 4, a watch glass 7 is attached via a glass packing 7a, as shown in FIG. 1 and FIG. 4. Also, to the lower part of the wristwatch case 1, that is, to the lower part of the main body case 4, a back cover 8 is attached by a plurality of screws 8b via a waterproof ring 8a.

[0022] Inside this wristwatch case 1, a timepiece module 9 is provided, as shown in FIG. 4. Although not shown in the drawing, this timepiece module 9 has various components necessary for timepiece functions, such as a timepiece movement for driving pointers to indicate a time of day, a display section for electro-optically displaying various types of information regarding a time of day, a date, a day of the week, and the like, a circuit section for electrically controlling these sections, and a rechargeable battery for supplying electric power to the circuit section.

[0023] The back cover 8 in this embodiment is made of a highly rigid metal such as stainless steel or titanium alloy, as shown in FIG. 3 to FIG. 6. This back cover 8 has a substantially quadrilateral plate shape whose three o'clock side portion and nine o'clock side portion each project in an arc shape. A center portion of the back surface (undersurface in FIG. 4) of this back cover 8 project rearward, and a concave sensor housing section 10 is provided in the inner surface (upper surface in FIG. 4) of this projecting center portion.

[0024] In the sensor housing section 10, a pulse sensor 11 is provided, as shown in FIG. 4 to FIG. 6. In this embodiment, in the bottom part of the sensor housing section 10, a circular opening

section **12** is formed penetrating vertically. This opening section **12** includes a small-diameter hole **12a** located close to the inner side of the sensor housing section **10** and a large-diameter hole **12b** located on the undersurface side of the back cover **8**, that is, the back surface side of the back cover **8**, which are coaxially provided. Into the large-diameter hole **12b** of the opening section **12**, a protective glass **13** is fitted.

[0025] The pulse sensor **11** includes a sensor board **14** and a sensor section **15**, as shown in FIG. **4** and FIG. **5**. The sensor board **14** is arranged on the bottom of the sensor housing section **10** and electrically connected to the circuit section (not shown) of the timepiece module **9**. The sensor section **15**, which includes a light emitting element and a light receiving element (not shown in the drawings), is provided on the undersurface of the sensor board **14** and arranged in the small-diameter hole **12a** of the opening section **12**.

[0026] As a result, the pulse sensor **11** is structured such that, light emitted by the light emitting element of the sensor section **15** is applied to blood vessels under the skin of an arm through the protective glass **13**, reflected light resulting from the emitted light is received by the light receiving element of the sensor section **15** through the protective glass **13**, and a pulse is detected on the basis of variation in the amount of the received light, as shown in FIG. **4**.

[0027] The wristwatch case **1** is provided with a component mounting member **16**, as shown in FIG. **3** to FIG. **5**. This component mounting member **16** includes the back cover **8** which is a base member, a terminal attachment member **17** which is an attachment member attached to the six o'clock side of the upper surface of the back cover **8**, or in other words, the six o'clock side of the inner surface of the back cover **8**, a plurality of charging terminals **18** attached to the terminal attachment member **17**, and a reinforcing plate **19** for reinforcing the terminal attachment member **17**, as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**.

[0028] In this embodiment, on the six o'clock side of the back cover **8**, an attachment hole **20** where the terminal attachment member **17** is arranged is formed penetrating from the upper surface of the back cover **8** to the lower surface thereof which is the outer surface (back surface), as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**. This attachment hole **20** is a substantially rectangular through hole which is long from the five o'clock side to the seven o'clock side and of which the four corners have been rounded in arc shapes. As a result, this attachment hole **20** has a substantially oblong shape. Also, this attachment hole **20** includes a small-diameter hole section **20a** located on the upper surface side (inner surface side) of the back cover **8** and a large-diameter hole section **20b** located on the undersurface side (outer surface side) of the back cover **8**.

[0029] The terminal attachment member **17** is made of an insulating non-metal material such as synthetic resin, as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**. This terminal attachment member **17** includes a main body section **21** to which the plurality of charging terminals **18** is attached, and a flange section **22** provided on the outer circumferential portion of the main body section **21**. The main body section **21** is structured to be arranged in the attachment hole **20** of the back cover **8**.

[0030] More specifically, the main body section **21** is formed to have a substantially oblong outer shape which is the same as the shape of the inner circumferential surface of the small-diameter hole section **20a** of the attachment hole **20** in the back cover **8**, as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**. Also, the main body section **21** is formed such that its thickness in a vertical direction is greater than the length (depth) of the attachment hole **20** of the back cover **8** in the vertical direction and substantially equal to the thickness of the six o'clock side of the back cover **8** in the vertical direction. In this main body section **21**, a plurality of through holes **21a** to which the plurality of charging terminals **18** is attached is formed at regular intervals along a longitudinal direction of the main body section **21**.

[0031] The flange section **22** is formed to have a substantially rectangular outer shape which is larger than the shape of the inner circumferential surface of the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8**, as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**. This flange section **22** is provided on the outer circumferential portion of the main body section **21** such that

the undersurface of the flange section **22** is arranged on the counterbore surface of a counterbore section **8d** on the upper surface of the back cover **8** when the lower part of the main body section **21** is arranged in the small-diameter hole section **20a** and the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8**.

[0032] Also, this flange section **22** is formed such that its thickness in the vertical direction is about one-third of the thickness of the main body section **21** in the vertical direction, and is structured such that the upper part of the main body section **21** protrudes above the upper surface of the flange section **22**, as shown in FIG. 6, FIG. 7A, and FIG. 7B. In this embodiment, in the four corners of the flange section **22**, first insertion holes **22a** are formed into which a plurality of screw members **23** is inserted.

[0033] The plurality of charging terminals **18** is each formed in a substantially round stick shape so as to be inserted into the plurality of through holes **21a** formed in the main body section **21** of the terminal attachment member **17**, as shown in FIG. 6 to FIG. 8B. More specifically, each charging terminal **18** is formed such that its outer diameter is substantially equal to the inner diameter of the corresponding through hole **21a** of the main body section **21** and its length in the vertical direction is longer than the length (thickness) of the main body section **21** in the vertical direction.

[0034] In this embodiment, on the lower end of each of the plurality of charging terminals **18**, a head section **18a** whose outer diameter is large is provided so that each charging terminal **18** is not slipped out, as shown in FIG. 7A to FIG. 8B. Accordingly, in the lower part of each through hole **21a** in the main body section **21**, a hole section **21b** is formed of which the diameter is large and into which the corresponding head section **18a** is inserted. Also, in an upper end portion of each of the plurality of charging terminals **18**, a stopper groove **18b** is annularly formed to which a stopper member **24** such as an E ring is attached.

[0035] As a result, the plurality of charging terminals **18** is structured such that, when they are inserted from below into the plurality of through holes **21a** formed in the main body section **21** and their head sections **18a** are arranged in the large-diameter hole sections **21b** of the through holes **21a**, the stopper grooves **18b** in their upper end portions are exposed above the main body section **21**, and the stopper members **24** are attached to the exposed stopper grooves **18b**, as shown in FIG. 7A and FIG. 7B.

[0036] That is, the plurality of charging terminals **18** is structured not to be vertically slipped out from the through holes **21a** of the main body section **21** with the head sections **18a** on their lower ends being exposed from the attachment hole **20** of the back cover **8** on the undersurface side of the back cover **8**, that is, the outer surface side of the back cover **8** and their upper ends being exposed on the upper surface side of the back cover **8**, that is, the inner surface side of the back cover **8**, as shown in FIG. 7A and FIG. 7B.

[0037] In this embodiment, on the upper ends of the plurality of charging terminals **18**, small-diameter connection projections **18c** which are electrically connected to the circuit section (not shown) of the timepiece module **9** in the wristwatch case **1** are provided, as shown in FIG. 6 to FIG. 8B. Also, in each outer circumferential surface of the plurality of charging terminals **18**, a plurality of waterproof grooves **18d** is annularly formed.

[0038] In these waterproof grooves **18d**, waterproof rings **25** are provided, as shown in FIG. 7A to FIG. 8B. These waterproof rings **25** are structured such that their portions exposed from the waterproof grooves **18d** come in pressure contact with the inner circumferential surface of the corresponding through hole **21a** in the main body section **21**, so that waterproofing between the outer circumferential surface of each charging terminal **18** and the inner circumferential surface of the corresponding through hole **21a** in the main body section **21** can be achieved.

[0039] On the other hand, the reinforcing plate **19** is made of a highly rigid metal such as stainless steel, and has a frame shape which is the same as the shape of the flange section **22** of the terminal attachment member **17**, as shown in FIG. 6, FIG. 7A, and FIG. 7B. In addition, this reinforcing plate **19** is formed such that its thickness in the vertical direction is equal to the vertical length

(height) of a portion of the main body section **21** upwardly protruding from the upper surface of the flange section **22**. In the four corners of the reinforcing plate **19**, second insertion holes **19a** into which the plurality of screw members **23** is inserted are formed coaxially corresponding to the plurality of first insertion holes **22a** formed in the flange section **22** of the terminal attachment member **17**.

[0040] In this embodiment, in the counterbore surface of the counterbore section **8d** on the upper surface of the back cover **8**, a plurality of screw holes **8e** into which the plurality of screw members **23** is screwed is formed coaxially corresponding to the plurality of first insertion holes **22a** in the flange section **22** of the terminal attachment member **17** and the plurality of second insertion holes **19a** in the reinforcing plate **19**, as shown in FIG. **6**. These screw holes **8e** are formed only on the upper surface side of the back cover **8** without vertically penetrating through the back cover **8**.

[0041] As a result, the reinforcing plate **19** is structured such that, when the plurality of screw members **23** is inserted into the plurality of second insertion holes **19a** from the inner surface side of the back cover **8**, that is, when the plurality of screw members **23** is inserted therein from above, and screwed into the screw holes **8e** of the back cover **8** through the first insertion holes **22a** of the flange section **22** of the terminal attachment member **17**, this reinforcing plate **19** is attached while pressing the flange section **22** against the upper surface of the back cover **8**, as shown in FIG. **6**.

[0042] That is, the above-described reinforcing plate **19** is structured such that, when the plurality of screw members **23** is screwed into the screw holes **8e** of the back cover **8** and tightened, the entire undersurface of this reinforcing plate **19** evenly presses the flange section **22** of the terminal attachment member **17** made of synthetic resin against the counterbore surface of the counterbore section **8d** of the back cover **8**, whereby the terminal attachment member **17** is reliably and firmly fixed to the inner surface of the back cover **8** without being partially deformed, as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**.

[0043] As a result of this structure of the reinforcing plate **19** by which the flange section **22** of the terminal attachment member **17** is evenly pressed by the entire undersurface of the reinforcing plate **19**, the plurality of screw members **23** does not intensively presses on the flange section **22**, so that the flange section **22** is not damaged by the plurality of screw members **23** even though the flange section **22** is made of an insulating synthetic resin, as shown in FIG. **6**, FIG. **7A**, and FIG. **7B**.

[0044] In this embodiment, in the counterbore surface of the counterbore section **8d** on the upper surface of the back cover **8**, a packing groove **26** is formed in a manner to surround the main body section **21** of the terminal attachment member **17**, as shown in FIG. **6** to FIG. **8B**. More specifically, this packing groove **26** is formed in a substantially oblong annular shape along the rim of the small-diameter hole section **20a** of the attachment hole **20** in the back cover **8**, and located closer to the rim of the attachment hole **20** than the plurality of screw holes **8e** in the counterbore surface of the counterbore section **8d** on the upper surface of the back cover **8** while avoiding these screw holes **8e**.

[0045] Into this packing groove **26**, a waterproof packing **27** is fitted, as shown in FIG. **8A** and FIG. **8B**. This waterproof packing **27** has a D-shaped cross section. That is, its undersurface to be arranged on the bottom of the packing groove **26** is flat and its upper surface has a shape to protrude from the packing groove **26** in an arc shape.

[0046] The above-described waterproof packing **27** is structured such that, when the plurality of screw members **23** is tightened on the reinforcing plate **19** with the waterproof packing **27** being arranged in the packing groove **26**, the upper surface of the waterproof packing **27** protruding in an arc shape from the packing groove **26** is pressed into the packing groove **26** by the flange section **22** of the terminal attachment member **17**, as shown in FIG. **8A** and FIG. **8B**.

[0047] As a result of this structure, the waterproof packing **27** achieves waterproofing between the upper surface of the back cover **8**, or more specifically, the counterbore surface of the counterbore section **8d** of the back cover **8** and the undersurface of the flange section **22** of the terminal

attachment member **17**, as shown in FIG. **6** to FIG. **8B**. In this embodiment, the packing groove **26** has a substantially oblong outer shape whose four corners have been rounded in arc shapes, and the waterproof packing **27** is arranged to fill the entire packing groove **26** including these rounded four corners so as to unfailingly and favorably achieve waterproofing between the upper surface of the back cover **8**, or more specifically, the counterbore surface of the counterbore section **8d** of the back cover **8** and the undersurface of the flange section **22** of the terminal attachment member **17**. [0048] The component mounting member **16** is structured such that a battery charging device **30** which charges the rechargeable battery (not shown) of the timepiece module **9** is connected to this component mounting member **16**, as shown in FIG. **9** and FIG. **10**. This battery charging device **30**, which has an alligator-mouth shape, includes a device main body **31** and a hold-down section **32**, and is structured such that the device main body **31** and the hold-down section **32** are rotatably coupled to each other by a holding shaft **33**.

[0049] The device main body **31** includes a connection section **34** which is connected to the component mounting member **16**, as shown in FIG. **9** and FIG. **10**. This connection section **34** includes a position restriction section **35** which is inserted into the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8** while avoiding an area corresponding to the main body section **21** of the terminal attachment member **17**, and a plurality of electrode terminals **36** which is provided in the position restriction section **35** and comes in contact with and electrically connected to the plurality of charging terminals **18** of the component mounting member **16**.

[0050] In this embodiment, the position restriction section **35** is provided protruding outward from the inside of the device main body **31**, and a frame-shaped projection **35a** is provided on the leading end of this protruding portion, as shown in FIG. **9** and FIG. **10**. This frame-shaped projection **35a** is formed such that its outer circumferential surface has the same shape as the inner circumferential surface of the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8**, and its inner circumferential surface has the same shape as the outer circumferential surface of the lower part of the main body section **21** of the terminal attachment member **17**.

[0051] As a result, the position restriction section **35** is structured to restrict the position of the device main body **31** with respect to the back cover **8** by the frame-shaped projection **35a** on the leading end of the position restriction section **35** being held between the inner circumferential surface of the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8** and the outer circumferential surface of the lower part of the main body section **21** of the terminal attachment member **17** when the frame-shaped projection **35a** is inserted into the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8**, as shown in FIG. **9** and FIG. **10**.

[0052] The plurality of electrode terminals **36** is provided by being embedded in the inner area of the position restriction section **35** while corresponding to the plurality of charging terminals **18** of the component mounting member **16** with the leading ends of these electrode terminals **36** protruding and being exposed inside the frame-shaped projection **35a** of the position restriction section **35**, as shown in FIG. **9** and FIG. **10**. As a result, this plurality of electrode terminals **36** is structured to be pressed corresponding to and against the undersurfaces of the head sections **18a** on the lower ends of the plurality of charging terminals **18** of the component mounting member **16**.

[0053] In this embodiment, the plurality of electrode terminals **36** is connected to an A/C converter (not shown) in the device main body **31** via lead wires **36a**, as shown in FIG. **9** and FIG. **10**. To this A/C converter, a power cord **37** is connected. As a result, the plurality of electrode terminals **36** is structured to supply electric power supplied from the power cord **37** and converted in the A/C converter to the plurality of charging terminals **18** of the component mounting member **16**.

[0054] On the other hand, the hold-down section **32** of the battery charging device **30** is to hold down the wristwatch case **1** on the device main body **31** so as to pinch the wristwatch case **1**, and is rotatably attached to the device main body **31** by the holding shaft **33**, as shown in FIG. **9** and FIG. **10**. On the end of this hold-down section **32** on the holding shaft **33** side, a lever section **32a** is provided projecting rightward relative to the holding shaft **33** in FIG. **9**.

[0055] In this embodiment, the hold-down section **32** is forced in a direction to be rotated toward the device main body **31** by a spring member **38** provided around the holding shaft **33**, as shown in FIG. **9** and FIG. **10**. This spring member **38**, which is a coil spring provided on the outer circumferential surface of the holding shaft **33**, is structured such that its one end portion **38a** engages with the hold-down section **32** and the other end portion **38b** engages with the device main body **31**.

[0056] As a result, the battery charging device **30** is structured such that, when the lever section **32a** of the hold-down section **32** is pressed against the spring force of the spring member **38**, the hold-down section **32** is rotated in a direction away from the device main body **31**, the space between the device main body **31** and the hold-down sections **32** is increased, and the wristwatch case **1** is arranged between the device main body **31** and the hold-down section **32** in this state, as shown in FIG. **9** and FIG. **10**.

[0057] Also, this battery charging device **30** is structured such that, when the wristwatch case **1** is arranged between the device main body **31** and the hold-down section **32**, the hold-down section **32** is rotated centering on the holding shaft **33** by the spring force of the spring member **38**, and presses the wristwatch case **1** against the device main body **31** so as to cause the plurality of electrode terminals **36** to be pressed against the plurality of charging terminals **18** of the component mounting member **16**, whereby the rechargeable battery (not shown) of the timepiece module **9** mounted in the wristwatch case **1** is charged in this state, as shown in FIG. **9** and FIG. **10**.

[0058] Next, the assembly of the component mounting member **16** for this wristwatch is described.

[0059] In this assembly, first, the plurality of charging terminals **18** is attached to the terminal attachment member **17**. Here, before this attachment, the waterproof rings **25** are attached to the plurality of waterproof grooves **18d** formed in the outer circumferential surfaces of the plurality of charging terminals **18**. In this state, the plurality of charging terminals **18** is inserted from below into the plurality of through holes **21a** formed in the main body section **21** of the terminal attachment member **17**.

[0060] Accordingly, the head sections **18a** of the plurality of charging terminals **18** are arranged in the large-diameter hole sections **21b** formed in the lower parts of the through holes **21a** in the main body section **21**. Consequently, the connection projections **18c** on the upper ends of the plurality of charging terminals **18** protrude above the main body section **21**, and the stopper grooves **18b** of the plurality of charging terminals **18** are exposed above the main body section **21**. In this state, the stopper members **24** are attached to the stopper grooves **18b** of the plurality of charging terminals **18**. As a result, the plurality of charging terminals **18** is attached to the main body section **21** without being vertically slipped out from the through holes **21a** of the main body section **21**.

[0061] Then, the terminal attachment member **17** having the plurality of charging terminals **18** attached thereto is attached to the attachment hole **20** formed on the six o'clock side of the back cover **8**. Here, before this attachment, the waterproof packing **27** is arranged in the packing groove **26** formed in the counterbore section **8d** on the upper surface of the back cover **8**. More specifically, by having the D-shaped cross section, that is, by having the flat undersurface and the arc-shaped upper surface, the waterproof packing **27** is arranged such that its bottom surface is arranged on the bottom of the packing groove **26** and its arc-shaped upper surface is arranged protruding from the packing groove **26**.

[0062] In this state, the main body section **21** of the terminal attachment member **17** is inserted into the small-diameter hole section **20a** of the attachment hole **20** of the back cover **8** from the upper surface side (inner surface side) of the back cover **8**, whereby the flange section **22** provided on the outer circumferential portion of the main body section **21** is placed on the arc-shaped upper surface of the waterproof packing **27** protruding from the counterbore surface of the counterbore section **8d** provided on the upper surface of the back cover **8**. That is, the flange section **22** is arranged in a slightly floating state above the counterbore surface of the counterbore section **8d** of the back cover **8**.

[0063] Here, the lower part of the main body section **21** is arranged in a slightly floating state in the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8** and the upper part of the main body section **21** is arranged protruding above the flange section **22**. In addition, the plurality of first insertion holes **22a** formed in the four corners of the flange section **22** coaxially correspond to the plurality of screw holes **8e** formed in the four corners of the counterbore section **8d** of the back cover **8**.

[0064] In this state, the reinforcing plate **19** is arranged on the flange section **22** such that the plurality of second insertion holes **19a** formed in the four corners of the reinforcing plate **19** coaxially correspond to the plurality of first insertion holes **22a** formed in the four corners of the flange section **22** and the plurality of screw holes **8e** formed in the four corners of the counterbore section **8d** of the back cover **8**. Then, from above the reinforcing plate **19**, that is, from above the upper surface side of the back cover **8**, the plurality of screw members **23** is inserted into the second insertion holes **19a** of the reinforcing plate **19** and the first insertion holes **22a** of the flange section **22**, and screwed into the plurality of screw holes **8e** in the counterbore section **8d** of the back cover **8** so as to be tightened.

[0065] Accordingly, by the plurality of screw members **23** being tightened, the flange section **22** of the terminal attachment member **17** is pressed against the counterbore surface of the counterbore section **8d** of the back cover **8** by the reinforcing plate **19**. Here, the flange section **22** of the terminal attachment member **17**, which is made of synthetic resin, is evenly pressed against the counterbore surface of the counterbore section **8d** of the back cover **8** by the entire undersurface of the reinforcing plate **19**. Therefore, the terminal attachment member **17** is prevented from being partially deformed, and reliably and firmly fixed to the inner surface of the back cover **8**.

[0066] As a result of this structure, even though the flange section **22** of the terminal attachment member **17** is made of an insulating synthetic resin, the plurality of screw members **23** does not bite into the flange section **22** since the entire undersurface of the reinforcing plate **19** evenly presses the flange section **22** and the flange section **22** is not partially pressed by the plurality of screw members **23**. Therefore, damages to the flange section **22** due to the plurality of screw members **23** can be prevented.

[0067] Also, here, the undersurface of the flange section **22** presses the arc-shaped upper surface of the waterproof packing **27** protruding from the counterbore surface of the counterbore section **8d** of the back cover **8** into the packing groove **26**. Consequently, the undersurface of the flange section **22** comes in close contact with the counterbore surface of the counterbore section **8d** of the back cover **8**, and the lower part of the main body section **21** is arranged at its proper position in the large-diameter hole section **20b** of the attachment hole **20** in the back cover **8**. As a result, the terminal attachment member **17** is attached to the back cover **8**, whereby the assembly of the component mounting member **16** is completed.

[0068] Next, the pulse sensor **11** is arranged in the sensor housing section **10** formed in the central portion of the back cover **8**. Here, before this arrangement, the protective glass **13** is fitted into the large-diameter hole **12b** of the opening section **12** of the back cover **8**. In this state, the sensor section **15** provided on the sensor board **14** of the pulse sensor **11** is arranged in the small-diameter hole **12a** of the opening section **12** of the back cover **8**, whereby the sensor board **14** is arranged and fixed in the sensor housing section **10**. As a result, the pulse sensor **11** is attached to the back cover **8**.

[0069] Then, the timepiece module **9** is mounted in the wristwatch case **1**, and the back cover **8** is attached to the lower part of the wristwatch case **1** together with the waterproof ring **8a**. Here, the connection projections **18c** of the plurality of charging terminals **18** of the component mounting member **16** and the sensor board **14** of pulse sensor **11** are electrically connected to the circuit section (not shown) of the timepiece module **9**. As a result, the assembly of the wristwatch which can be charged by the battery charging device **30** is completed.

[0070] Next, the battery charging of the wristwatch by the battery charging device **30** is described.

[0071] When the wristwatch is to be charged, the lever section **32a** of the hold-down section **32** of the battery charging device **30** is pressed against the spring force of the spring member **38**. As a result, the hold-down section **32** is rotated in the direction away from the device main body **31**, and the space between the device main body **31** and the hold-down sections **32** is increased. Then, in this state, the wristwatch case **1** is arranged between the device main body **31** and the hold-down section **32**.

[0072] Here, the frame-shaped projection **35a** of the position restriction section **35** provided outwardly protruding from the inside of the device main body **31** is positioned corresponding to the large-diameter hole section **20b** of the attachment hole **20** of the back cover **8**. In this state, the hold-down section **32** is rotated centering on the holding shaft **33** by the spring force of the spring member **38** so as to press the wristwatch case **1** against the device main body **31**. As a result, the frame-shaped projection **35a** of the position restriction section **35** is inserted into the large-diameter hole section **20b** of the attachment hole **20** of the back cover **8**.

[0073] Here, the frame-shaped projection **35a** is held between the inner circumferential surface of the large-diameter hole section **20b** of the attachment hole **20** of the back cover **8** and the outer circumferential surface of the lower part of the main body section **21** of the terminal attachment member **17**, whereby the position of the device main body **31** with respect to the back cover **8** is fixed. In addition, the leading ends of the plurality of electrode terminals **36** embedded in the position restriction section **35** are pressed corresponding to and against the undersurfaces of the head sections **18a** on the lower ends of the plurality of charging terminals **18** of the component mounting member **16**.

[0074] As a result, the plurality of electrode terminals **36** of the battery charging device **30** is electrically connected to the plurality of charging terminals **18** of the component mounting member **16**. Here, since the plurality of electrode terminals **36** has been connected to the A/C converter (not shown) in the device main body **31** by the lead wires **36a**, electric power from the power cord **37** is converted by the A/C converter and supplied to the plurality of charging terminals **18** of the component mounting member **16**, whereby the rechargeable battery (not shown) of the timepiece module **9** mounted in the wristwatch case **1** is charged.

[0075] In the case of the wristwatch described in Japanese Patent Application Laid-Open (Kokai) Publication No. 2004-085232, the base member, which is made using a non-metal material such as synthetic resin, is required to be thickly formed so as to ensure its strength. Accordingly, this wristwatch has a problem in that it is thick as a whole and cannot be slimmed or downsized.

[0076] In contrast, the component mounting member **16** of the wristwatch according to the present embodiment includes the back cover **8** which is a rigid base member provided with the attachment hole **20** and attached to the wristwatch case **1**, the terminal attachment member **17** with insulation properties which is inserted into the attachment hole **20** of the back cover **8** so as to be attached to the upper surface of the back cover **8**, that is, the inner surface of the back cover **8** on the inner side of the wristwatch case **1**, and the plurality of charging terminals **18** provided in the terminal attachment member **17** and exposed from the upper surface of the back cover **8** and the lower surface thereof opposite to the upper surface, that is, the outer surface thereof, whereby the wristwatch case **1** can be slimmed and downsized.

[0077] More specifically, in the component mounting member **16** of this wristwatch, the terminal attachment member **17** is made of an insulating material, whereby insulation between the plurality of charging terminals **18** and the back cover **8** can be achieved. In addition, even though the terminal attachment member **17** is formed to be thick in the vertical direction so as to ensure its strength, the back cover **8**, which is formed using a rigid material, can be formed to be thin in the vertical direction because of the structure where the terminal attachment member **17** is attached to the upper surface of the back cover **8**, that is, the inner surface of the back cover **8**, whereby the entire wristwatch case **1** can be slimmed and downsized.

[0078] In the case of the component mounting member **16** of this wristwatch, since the back cover

8 serving as a base member is made of a highly rigid metal and the terminal attachment member **17** is made of an insulating non-metal material such as synthetic resin, the strength of the back cover **8** can be ensured even though the back cover **8** is thinly formed, whereby the slimming of the entire wristwatch case **1** can be achieved. In addition, since the terminal attachment member **17** is made of an insulating non-metal material, insulation between the plurality of charging terminals **18** and the back cover **8** can be reliably and favorably achieved, whereby electrically reliable products can be provided.

[0079] Also, in the component mounting member **16** of this wristwatch, the terminal attachment member **17** includes the main body section **21** which is arranged in the attachment hole **20** of the back cover **8** and to which the plurality of charging terminals **18** is attached, and the flange section **22** which is provided on the outer circumferential portion of the main body section **21** and arranged on the upper surface of the back cover **8**, that is, the inner surface of the back cover **8**. As a result of this structure, the main body section **21** which is arranged in the attachment hole **20** of the back cover **8** can be formed to be sufficiently thick in the vertical direction, whereby the plurality of charging terminals **18** can be reliably and favorably attached. In addition, by the flange section **22**, the main body section **21** can be reliably and favorably attached to the back cover **8**.

[0080] Moreover, in the component mounting member **16** of this wristwatch, the flange section **22** of the terminal attachment member **17** is attached to the upper surface of the back cover **8**, that is, the inner surface of the back cover **8** by the plurality of screw members **23** being inserted through the reinforcing plate **19** arranged on the flange section **22**. As a result of this structure, by being reinforced by the reinforcing plate **19**, the flange section **22** can be reliably and firmly attached to the upper surface of the back cover **8** by the plurality of screw members **23** even though the flange section **22** is made of an insulating synthetic resin and is thin in the vertical direction.

[0081] More specifically, in the component mounting member **16** of this wristwatch, when the plurality of screw members **23** is screwed into the plurality of screw holes **8e** of the back cover **8** and tightened, the entire lower surface of the reinforcing plate **19** evenly presses the flange section **22** of the terminal attachment member **17** made of synthetic resin against the counterbore surface of the counterbore section **8d** on the upper surface of the back cover **8** by surface contact. As a result of this structure, the terminal attachment member **17** is prevented from being partially deformed, and reliably and firmly fixed to the inner surface of the back cover **8**. In the case of this reinforcing plate **19**, even though the flange section **22** of the terminal attachment member **17** is made of an insulating synthetic resin, damages to the flange section **22** due to the plurality of screw members **23** can be prevented since the plurality of screw members **23** is not intensively pressed onto the flange section **22**.

[0082] Also, in the component mounting member **16** of this wristwatch, since the packing groove **26** where the waterproof packing **27** is arranged is formed around the rim of the attachment hole **20** in the upper surface of the back cover **8** and the waterproof packing **27** is pressed into this packing groove **26** by the flange section **22** of the terminal attachment member **17**, waterproofing between the upper surface of the back cover **8** and the undersurface of the flange section **22** of the terminal attachment member **17** can be reliably and favorably achieved. That is, even though the flange section **22** of the terminal attachment member **17** is made of an insulating synthetic resin, the waterproof packing **27** can be unfailingly pressed into the packing groove **26** by the flange section **22** since the flange section **22** is unfailingly pressed against the upper surface of the back cover **8** by the reinforcing plate **19**.

[0083] In the present embodiment, the waterproof packing **27** has a D-shaped cross section. That is, its undersurface to be arranged on the bottom of the packing groove **26** is flat, and its upper surface has a shape to protrude from the packing groove **26** in an arc shape. As a result of this structure, when the flange section **22** of the terminal attachment member **17** is pressed with the waterproof packing **27** being arranged in the packing groove **26**, the arc-shaped upper surface of the waterproof packing **27** protruding from the packing groove **26** is unfailingly pressed into the

packing groove **26** by the flange section **22**, whereby waterproofing between the upper surface of the back cover **8** and the undersurface of the flange section **22** of the terminal attachment member **17** can be reliably and favorably achieved.

[0084] In the above-described embodiment, the terminal attachment member **17** is made of an insulating synthetic resin. However, the present invention is not limited thereto. For example, it may be formed using a non-metal material such as insulating ceramics.

[0085] Also, in the above-described embodiment, the charging terminals **18** serve as terminals for the present invention. However, the terminals for the present invention are not necessarily required to be charging terminals, and any terminal may be used as long as it is a connection terminal such as a communication terminal.

[0086] Moreover, in the above-described embodiment, the present invention has been applied in a wristwatch. However, the present invention is not necessarily required to be applied in a wristwatch. For example, the present invention is applicable to various types of timepieces such as a travel watch, an alarm clock, a table clock, and a wall clock.

[0087] Furthermore, the present invention is not necessarily required to be applied in timepieces, and can be applied in electronic devices such as a portable telephone and a portable terminal device. In that case, unlike the above-described embodiment where the back cover **8** serves as a base member for the present invention, the base member is not necessarily required to be a back cover, and may be any member as long as it is a member to be attached to a case.

[0088] While the present invention has been described with reference to the preferred embodiments, it is intended that the invention be not limited by any of the details of the description therein but includes all the embodiments which fall within the scope of the appended claims.

Claims

1. A component mounting member comprising: a base member which is provided with an attachment hole and attached to a case; an attachment member which is inserted into the attachment hole of the base member so as to be attached to an inner surface of the base member located on an inner side of the case; and a terminal which is provided on the attachment member and exposed from the inner surface of the base member and an outer surface opposite to the inner surface, wherein a lower surface of the attachment member and a lower surface of the terminal which are on an outer surface side of the base member are located on an upper surface side which is on an inner surface side with respect to at least a portion of a lower surface which is on the outer surface side of the base member in a thickness direction of the base member, and wherein a packing groove where a waterproof packing is arranged is formed around rim of the attachment hole in the inner surface of the base member, and the waterproof packing is pressed into the packing groove by the attachment member.

2. The component mounting member according to claim 1, wherein the lower surface which is on the outer surface side of the base member includes a first lower surface and a second lower surface located on the outer surface side of the base member with respect to the first lower surface, and wherein the lower surface of the attachment member and the lower surface of the terminal are located between the first lower surface and the second lower surface of the base member in a thickness direction of the base member.

3. The component mounting member according to claim 2, wherein the attachment hole of the base member includes a small-diameter hole section located on the inner surface side of the base member and a large-diameter hole section located on the outer surface side of the base member, wherein the first lower surface of the base member is located on an inside area of large-diameter hole section of the base member, and wherein the second lower surface of the base member is located on an outside area of large-diameter hole section.

4. The component mounting member according to claim 1, wherein a waterproof groove is

- annularly formed in an outer circumferential surface of the terminal, and wherein a waterproof ring is provided in the waterproof groove.
- 5.** The component mounting member according to claim 1, wherein the base member is formed of a metal that is more rigid than the attachment member, and the attachment member is formed of an insulating non-metal material.
- 6.** The component mounting member according to claim 1, wherein the attachment member includes a main body to which the terminal is attached and which is arranged in the attachment hole of the base member, and a flange which is provided on an outer circumferential portion of the main body and attached to the inner surface of the base member.
- 7.** The component mounting member according to claim 6, wherein the flange of the attachment member is arranged on a counterbore section provided on the base member.
- 8.** The component mounting member according to claim 6, wherein the attachment member has a reinforcing plate arranged on the flange, and the flange is attached to the inner surface of the base member by a plurality of screw members being inserted through the reinforcing plate.
- 9.** A case comprising the component mounting member according to claim 1.
- 10.** A timepiece comprising the case according to claim 9,
- 11.** A component mounting member comprising: a base member which is provided with an attachment hole and attached to a case; an attachment member which is inserted into the attachment hole of the base member so as to be attached to an inner surface of the base member located on an inner side of the case; and a terminal which is provided on the attachment member and exposed from the inner surface of the base member and an outer surface opposite to the inner surface, wherein a lower surface of the terminal provided on the attachment member which is on an outer surface side of the base member are located on an upper surface side which is on an inner surface side with respect to at least a portion of a lower surface which is on the outer surface side of the base member in a thickness direction of the base member.
- 12.** The component mounting member according to claim 11, wherein a waterproof groove is annularly formed in an outer circumferential surface of the terminal, and wherein a waterproof ring is provided in the waterproof groove.
- 13.** The component mounting member according to claim 11, wherein a packing groove where a waterproof packing is arranged is formed around rim of the attachment hole in the inner surface of the base member, and the waterproof packing is pressed into the packing groove by the attachment member.
- 14.** The component mounting member according to claim 13, wherein the waterproof packing is formed such that an undersurface thereof to be arranged on bottom of the packing groove is flat and an upper surface thereof has a shape to protrude from the packing groove in an arc shape.
- 15.** A component mounting member comprising: a base member which is provided with an attachment hole and attached to a case; an attachment member which is inserted into the attachment hole of the base member so as to be attached to an inner surface of the base member located on an inner side of the case; and a terminal which is provided on the attachment member and exposed from the inner surface of the base member and an outer surface opposite to the inner surface, wherein the attachment hole provided in the base member includes a small-diameter hole section located on one surface side of the base member and a large-diameter hole section located on an other surface side of the base member, and wherein the attachment member includes a main body arranged in the small-diameter hole section of the base member.
- 16.** The component mounting member according to claim 15, wherein the main body of the attachment member and the terminal are provided on the one surface side with respect to the other surface side of the base member in a thickness direction of the base member.
- 17.** The component mounting member according to claim 16, wherein the terminal is provided on the one surface side with respect to the attachment member in a thickness direction of the base member.

18. The component mounting member according to claim 15, wherein on the other surface side of a through hole of the main body of the attachment member, a hole section is formed into which a head section of the terminal is inserted, and wherein the head section of the terminal is provided in the hole section.

19. The component mounting member according to claim 15, wherein a waterproof groove is annularly formed in an outer circumferential surface of the terminal, and wherein a waterproof ring is provided in the waterproof groove.

20. A timepiece comprising a case including a component mounting member, the component mounting member comprising: a base member which is provided with an attachment hole and attached to a case; an attachment member which is inserted into the attachment hole of the base member so as to be attached to an inner surface of the base member located on an inner side of the case; and a terminal which is provided on the attachment member and exposed from the inner surface of the base member and an outer surface opposite to the inner surface, wherein a lower surface of the attachment member and a lower surface of the terminal which are on an outer surface side of the base member are located on an upper surface side which is on an inner surface side with respect to a lower surface which is on the outer surface side of the base member in a thickness direction of the base member.
