



US 20240072400A1

(19) **United States**

(12) **Patent Application Publication**  
**ZHANG et al.**

(10) **Pub. No.: US 2024/0072400 A1**

(43) **Pub. Date: Feb. 29, 2024**

(54) **BATTERY HOUSING AND BATTERY**

*H01M 50/159* (2006.01)

(71) Applicant: **Guoyan New Power (Shenzhen) Technology Co., Ltd., Shenzhen (CN)**

*H01M 50/16* (2006.01)

*H01M 50/164* (2006.01)

*H01M 50/169* (2006.01)

*H01M 50/593* (2006.01)

(72) Inventors: **Fengxue ZHANG, Shenzhen (CN); Zujian XIA, Shenzhen (CN)**

(52) **U.S. Cl.**

CPC ..... *H01M 50/586* (2021.01); *H01M 50/109*

(2021.01); *H01M 50/14* (2021.01); *H01M*

*50/153* (2021.01); *H01M 50/159* (2021.01);

*H01M 50/16* (2021.01); *H01M 50/164*

(2021.01); *H01M 50/169* (2021.01); *H01M*

*50/593* (2021.01)

(73) Assignee: **Guoyan New Power (Shenzhen) Technology Co., Ltd., Shenzhen (CN)**

(21) Appl. No.: **18/497,757**

(22) Filed: **Oct. 30, 2023**

(57)

**ABSTRACT**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2021/141439, filed on Dec. 27, 2021.

Disclosed are a battery housing and a battery. The battery housing includes a bottom shell and a cover. The cover includes an outer contact layer, an insulating layer, and an inner contact layer. The electrode contact portion of the outer contact layer passes through the insulating layer and the inner contact layer to be electrically connected to one pole of a battery cell. The other electrode of the battery cell can be electrically conducted with the bottom shell. The inner contact layer and the bottom shell are configured to be welded for packaging the battery cell. Since the inner contact layer and the outer contact layer of the cover are pre-insulated, the inner contact layer and the bottom shell need to be welded, and the insulating film is not needed, thereby simplifying the packaging process of the battery and improving the packaging efficiency.

**Foreign Application Priority Data**

Apr. 30, 2021 (CN) ..... 202110485304.1

**Publication Classification**

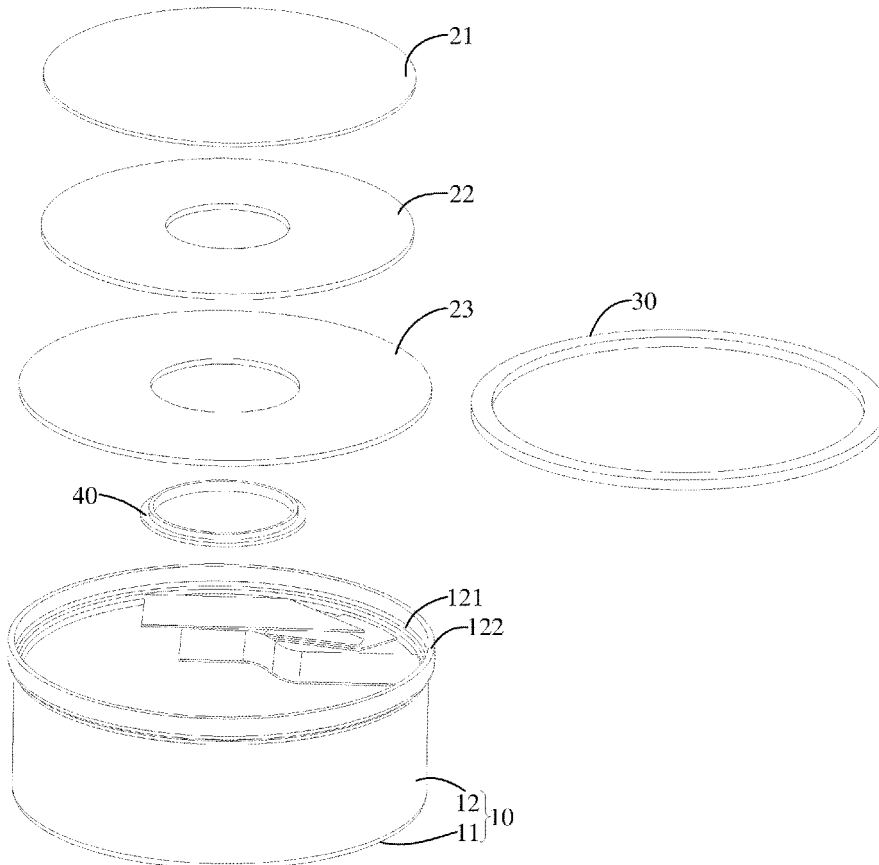
(51) **Int. Cl.**

*H01M 50/586* (2006.01)

*H01M 50/109* (2006.01)

*H01M 50/14* (2006.01)

*H01M 50/153* (2006.01)



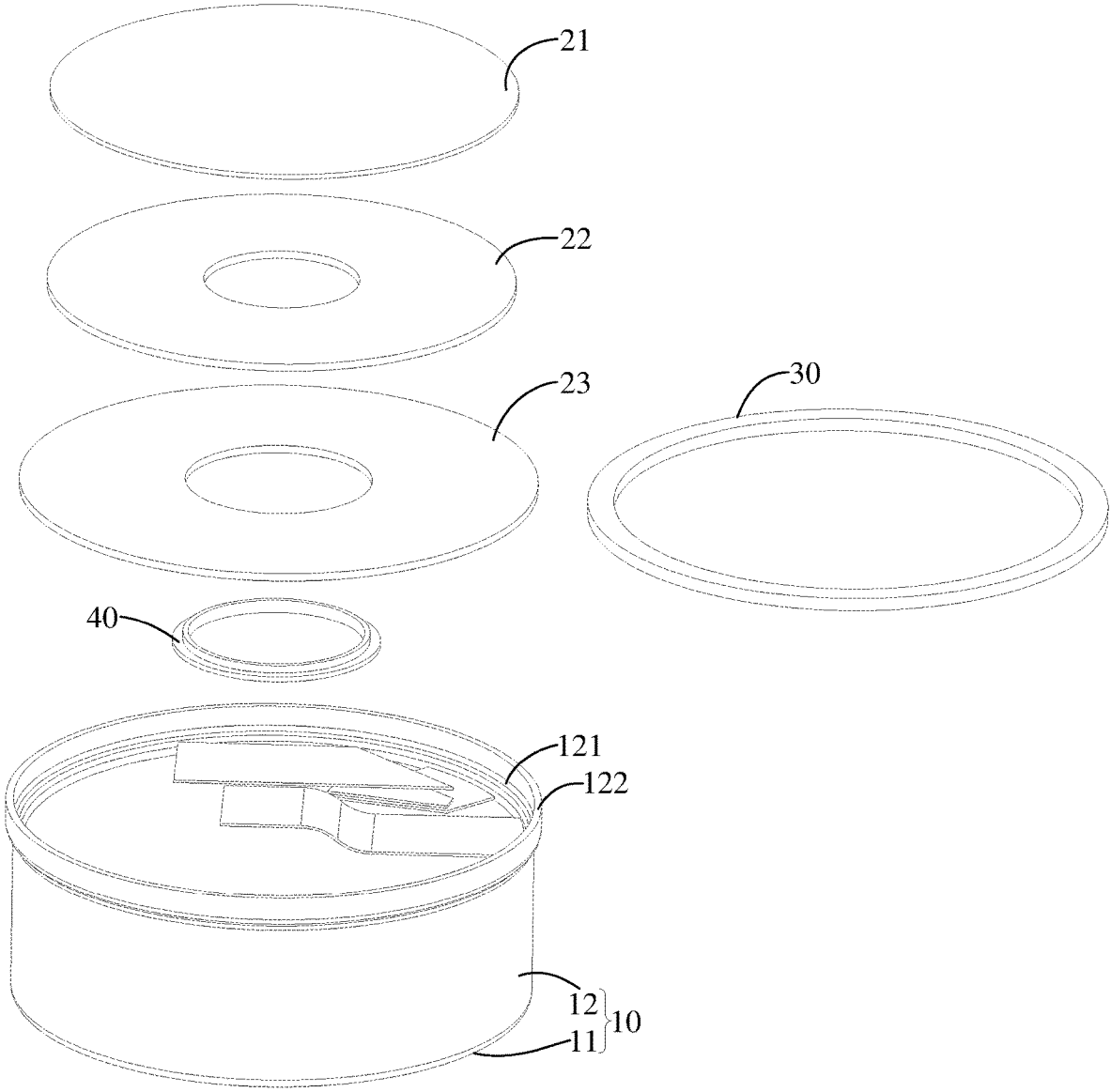


FIG. 1

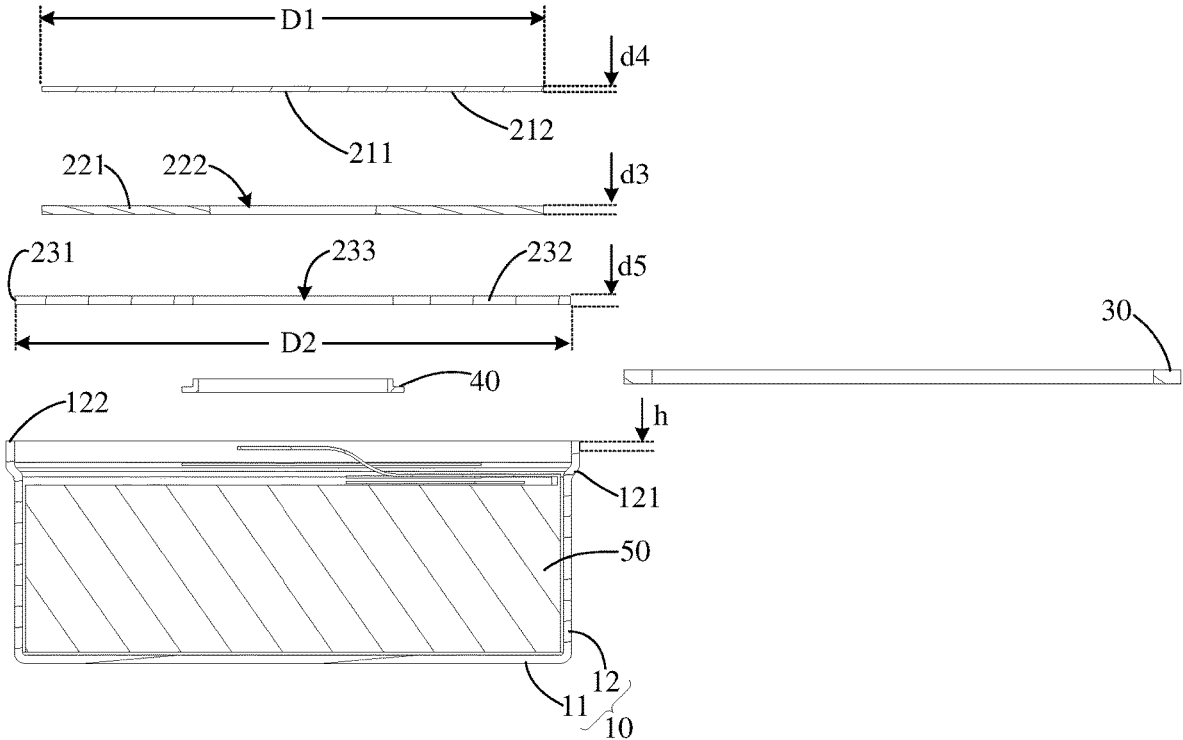


FIG. 2

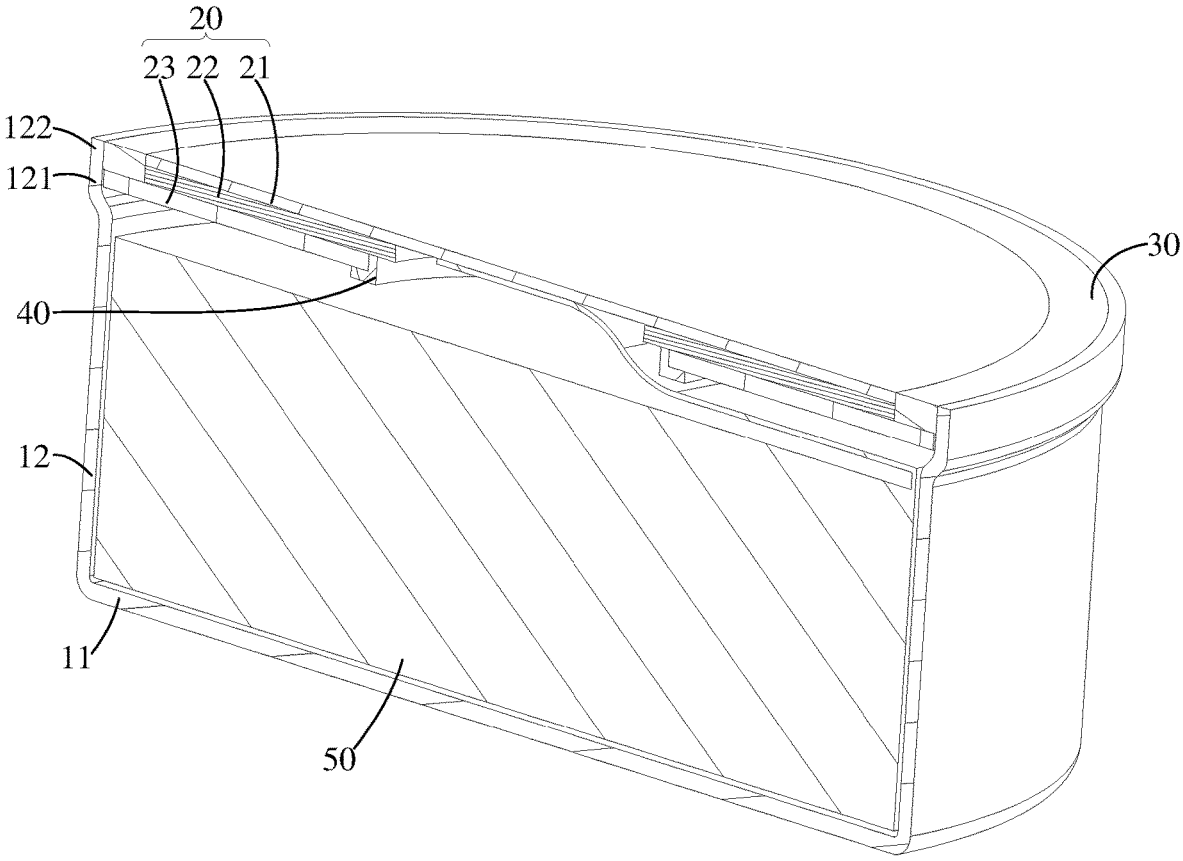


FIG. 3

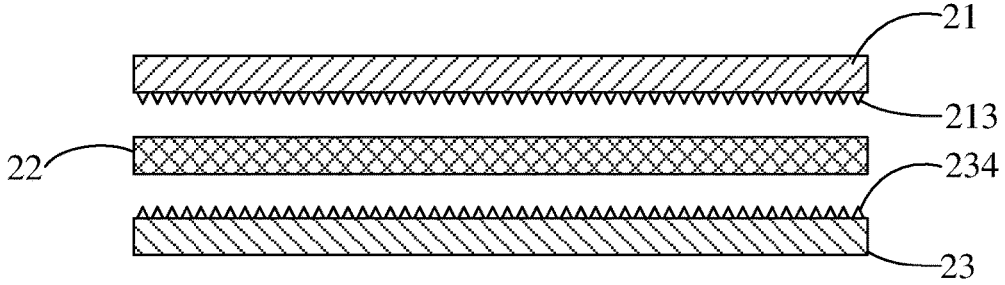


FIG. 4

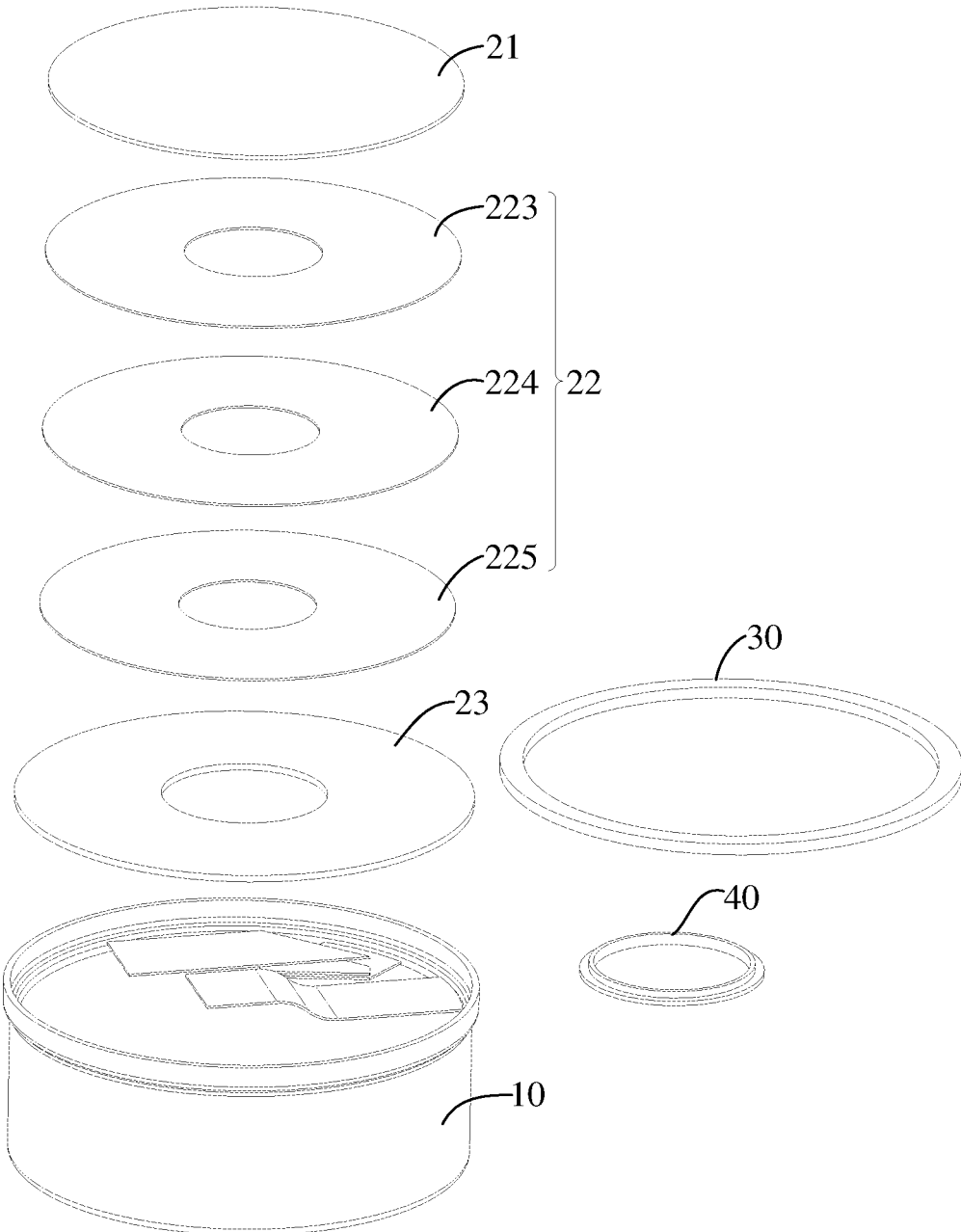


FIG. 5

## BATTERY HOUSING AND BATTERY

### CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of International Application No. PCT/CN2021/141439, filed on Dec. 27, 2021, which claims priority to Chinese Patent Application No. 202110485304.1, filed on Apr. 30, 2021. All of the aforementioned applications are incorporated herein by reference in their entireties.

### TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of batteries, and in particular, to a battery housing and a battery.

### BACKGROUND

[0003] A battery housing of an existing button battery is formed by splicing a positive housing, a negative housing and an insulating plastic sleeve. The positive housing and the negative housing need to be insulated to avoid short circuit of the button battery. The related art achieves insulation by providing an insulating film located between the positive housing and the negative housing. In the related production process, the positive housing and the negative housing extrude the insulating plastic sleeve to complete the sealing of the whole housing, and the positive housing and the negative housing are welded. In the related art, due to extrusion of the positive housing and the negative housing, the sealing effect is poor and a large number of button batteries are caused to be leaked. It is difficult to arrange the insulating film in the battery. The machining difficulty of the button battery is large, which reduces the machining efficiency.

### SUMMARY

[0004] The main purpose of the present invention is to provide a battery housing, which is used for a button battery, and aims to solve the technical problem of how to improve battery processing efficiency and sealing performance.

[0005] In order to achieve the above purpose, the battery housing provided by the present invention includes a cup-shaped bottom shell and a cover. The bottom shell includes a circular or oval bottom wall and an annular side wall. The cover sequentially includes an outer contact layer, an insulating layer, and an inner contact layer from outside to inside. The outer contact layer includes an electrode contact portion and a conductive bonding portion. The insulating layer includes an insulating bonding portion and an insulating opening portion. The inner contact layer includes a welding portion, a welding bonding portion, and a welding opening portion. The side wall includes a welding support portion close to the receiving opening. A maximum outer diameter of the outer contact layer is D1, and a maximum outer diameter of the inner contact layer is D2, and D1 is less than D2. The electrode contact portion passes through the insulating opening portion and the welding opening portion to face towards an inner side of the bottom shell, to be electrically connected to one electrode of a battery cell, thereby electrically connecting the outer contact layer to the battery cell. The conductive bonding portion is configured to be seamlessly bonded to the insulating bonding portion, to enhance a strength of the cover and to prevent external water

from permeating into the battery housing. The welding portion is configured to be welded with the welding supporting portion, thereby enabling the cover and the bottom shell to be sealed. The welding bonding portion is configured to be seamlessly bonded to the insulating bonding portion, to enhance the strength of the cover and reduce a direct contact area between the insulating bonding portion and the inner side of the battery housing, and to prevent external water from permeating into the battery housing. The insulating bonding portion is configured to be seamlessly bonded to the conductive bonding portion and the welding bonding portion by melting an insulating anti-electrolyte corrosion material at  $\geq 100^{\circ}\text{C}$ . before the cover and the bottom shell are sealed. The insulating anti-electrolyte corrosion material has a thermal shrinkage rate of 6%, and the bonding strength between the insulating bonding portion and the conductive bonding portion is greater than or equal to 1.0N per square millimeter after the insulating anti-electrolyte corrosion material is at a room temperature. A thickness of the insulating bonding portion is D3, and D3 is 0.01 mm-2.5 mm. The contact area between the insulating bonding portion and the inner side of the battery housing is S0, and S0 satisfies:  $S0 \leq \pi * D2 * D3^{1/2}$ .

[0006] Optionally, the outer contact layer is made of stainless steel, and a thickness of the outer contact layer is D4 and D4 is 0.1 mm-0.25 mm; and/or the inner contact layer is made of stainless steel, and a thickness of the inner contact layer is D5 and D5 is 0.1 mm-0.25 mm.

[0007] Optionally, the insulating layer is made of one or more of PP, PFA, PVDF, PTFE, ETFE and PVC.

[0008] Optionally, a bonding strength between the insulating bonding portion and the conductive bonding portion, or between the insulating bonding portion and the bonding portion, is less than or equal to 5.0 N/mm at a room temperature.

[0009] Optionally, an area of the insulating bonding portion is S1, and an area of the insulating layer is S2, and an area of the outer contact layer is S3, and S1, S2, S3 satisfy:  $S1/S2 \geq 0.6$  and/or  $S1/S3 \geq 0.5$ .

[0010] Optionally, a first bonding enhancement layer is placed on a first surface of the conductive bonding portion close to the insulating bonding portion; the first bonding enhancement layer is configured to reinforce a bonding strength between the insulating bonding portion and the conductive bonding portion; and/or a second bonding enhancement layer is placed on a second surface of the welding bonding portion close to the insulating bonding portion, and the second bonding enhancement layer is configured to reinforce a bonding strength between the insulating bonding portion and the welding bonding portion.

[0011] Optionally, a thickness of the outer contact layer is D4; the side wall further includes an extending portion protruding from the welding support portion, a height of the extending portion is H, and H satisfies:  $H \geq D3 + D4$ .

[0012] Optionally, the battery housing further includes a protection member, and the protection member is formed by curing a liquid glue received in a groove at a room temperature after the cover and the bottom shell are sealed, and the groove is formed by the outer edge portions of the extending portion, the welding portion, the insulation bonding portion and the outer contact layer.

[0013] Optionally, the inner side of the welding opening portion is provided with an insulating unit, and the insulating unit is configured to prevent a pole of the battery cell from

contacting the inner contact layer to form a short circuit when the pole of the battery cell is electrically connected to the electrode contact portion.

**[0014]** The present invention further provides a battery. The battery includes a battery cell and the battery housing as described above. One electrode of the battery cell is electrically connected to the outer contact layer of the battery housing, and the other electrode is electrically connected to the inner contact layer and/or the bottom shell of the battery housing.

**[0015]** In the present invention, the battery housing includes the bottom shell and the cover, and the cover includes an outer contact layer, an insulating layer and an inner contact layer. The electrode contact portion of the outer contact layer can pass through the insulating layer and the inner contact layer to be electrically connected with one pole of the battery cell. The other electrode of the battery cell can be electrically connected with the bottom shell. The inner contact layer and the bottom shell can be packaged after being welded, and the inner contact layer and the outer contact layer are insulated through the insulating layer. The bottom shell is also insulated from the outer contact layer, and the two electrodes of the battery cell can be prevented from being mutually conducted and short-circuited. Since the inner contact layer and the outer contact layer of the cover are pre-insulated, the inner contact layer and the bottom shell just need to be welded when the bottom shell is packaged by the cover, and the insulating film does not need to be arranged, so that the packaging process of the battery can be simplified, and the packaging efficiency is improved. In addition, the contact area between the insulating bonding portion and the inner side of the battery housing is  $S_0$  and  $S_0$  satisfies:  $S_0 \leq \pi * D_2 * D_3 * \frac{1}{2}$ , which enables the area of the insulating bonding part exposed in the electrolyte to be reduced, thereby reducing the corrosion of the electrolyte to the insulating layer, and ensuring the bonding stability of the insulating layer to the outer contact layer and the inner contact layer.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0016]** FIG. 1 is an exploded view of an embodiment of a battery housing.

**[0017]** FIG. 2 is a cross-sectional and exploded view of an embodiment of a battery housing.

**[0018]** FIG. 3 is a schematic cross-sectional view of an embodiment of a battery housing of the present disclosure.

**[0019]** FIG. 4 is a schematic cross-sectional view of an embodiment of a cover of the present disclosure.

**[0020]** FIG. 5 is a structural exploded view of another embodiment of a battery housing of the present disclosure.

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

**[0021]** The following content combines with the figures and the embodiments for describing the present disclosure in detail. It is obvious that the following embodiments are only some embodiments of the present invention. For an ordinary person skilled in the art without any creative effort, other embodiments obtained thereby are still covered by the present invention.

**[0022]** It should be noted that, if the embodiments of the present disclosure relate to directional indication (such as up, down, left, right, front, and back). For example, the

directivity indication is only used to explain the relative position relationship, the motion situation, etc. between the components under a certain specific posture (as shown in the drawings), and if the specific posture changes, the directional indication also changes accordingly.

**[0023]** In addition, if the embodiments of the present disclosure relate to descriptions such as “first” and “second”, the descriptions of “first”, “second” and the like are only used for descriptive purposes, and cannot be understood as indicating or implying their relative importance or implicitly indicating the number of indicated technical features. Thus, the features defined with “first” and “second” may explicitly or implicitly include at least one of the features. In addition, the meaning of “and/or” appearing in the entire text is, including three parallel solutions, using “A and/or B as an example”, including solution A, or solution B, or solutions A and B satisfied at the same time. In addition, the technical solutions between the various embodiments may be combined with each other, but must be based on those of ordinary skill in the art, and when the combination of the technical solutions is contradictory or cannot be implemented, it should be considered that the combination of the technical solutions does not exist or is not within the protection scope of the present disclosure.

**[0024]** The present disclosure provides a battery housing for a button battery.

**[0025]** In the embodiment of the present disclosure, as shown in FIG. 1 to FIG. 5, the battery housing includes a cup-shaped bottom shell 10 and a cover 20. The bottom shell 10 defines a receiving opening. The bottom shell 10 includes a circular or oval bottom wall 11 and an annular side wall 12. The cover 20 sequentially includes an outer contact layer 21, an insulating layer 22, and an inner contact layer 23 from outside to inside. A maximum outer diameter of the outer contact layer 21 is  $D_1$ , a maximum outer diameter of the inner contact layer 23 is  $D_2$ , and  $D_1$  is less than  $D_2$ . The outer contact layer 21 includes an electrode contact portion 211 and a conductive bonding portion 212. The insulating layer 22 includes an insulating bonding portion 221 and an insulating opening portion 222. The inner contact layer 23 includes a welding portion 231, a welding bonding portion 232, and a welding opening portion 233. The side wall includes a welding support portion 121 close to the receiving opening. The electrode contact portion 211 passes through the insulating opening portion 222 and the welding opening portion 233 to face towards an inner side of the bottom shell 10, to be electrically connected to one electrode of the battery cell 50, thereby electrically connecting the outer contact layer 21 to the battery cell 50. The conductive bonding portion 212 is configured to be seamlessly bonded to the insulating bonding portion 221, so as to enhance the strength of the cover 20 and to prevent external water from permeating into the battery housing. The welding portion 231 is configured to be welded and connected with the welding support portion 121, thereby enabling the cover 20 and the bottom shell 10 to be sealed. The welding bonding portion 232 is configured to be seamlessly bonded to the insulating bonding portion 221, to enhance the strength of the cover 20 and to reduce the direct contact area between the insulating bonding portion 221 and the inner side of the battery housing, and to prevent external water from permeating into the battery housing.

**[0026]** Before the cover 20 and the bottom shell 10 are sealed, the insulating bonding portion 221 is seamlessly

bonded to the conductive bonding portion 212 and the welding bonding portion 232 by melting an insulating anti-electrolyte corrosion material at  $\geq 100^\circ\text{C}$ ., and the insulating anti-electrolyte corrosion material has a thermal shrinkage rate of 6%. The bonding strength, between the insulating bonding portion 221 and the conductive bonding portion 212 or between the insulating bonding portion 221 and the welding bonding portion 232, is greater than or equal to 1.0 N per square millimeter at a room temperature. The thickness of the insulating bonding portion 221 is D3, and D3 is 0.01 mm-2.5 mm. The contact area between the insulating bonding portion 221 and the inner side of the battery housing is S0, and S0 satisfies:  $S0 \leq \pi \cdot D2 \cdot D3^{1/2}$ . Specifically, D3 may be one of 0.01 mm, 0.05 mm, 0.1 mm, 0.15 mm, 0.2 mm, 0.25 mm, 0.3 mm, 0.35 mm, 0.5 mm, 1.0 mm, 1.2 mm, 1.4 mm, 1.6 mm, 1.8 mm, 2.0 mm, and 2.5 mm. For a small button battery, D1 is preferred to be 0.15 mm-0.25 mm. It should be understood that the specific thickness of the insulation bonding portion may be specifically designed according to a specific product.

[0027] Compared with the prior art, the battery housing of the present disclosure is sealed by welding instead of being sealed by means of physical stress extrusion between the housings, which improves the sealing performance and the stability. Since the cover 20 is made in advance and is insulated by the insulating bonding portion 221, the insulativity is improved, and the protective effect can be achieved under a certain condition. In addition, the cover 20 of the battery housing of the present disclosure adopts a three-layer structure which has strong structural stability and firmness. Since the insulating bonding portion is located between the two layers of stainless steel, the waterproof and anti-electrolyte corrosion properties of the cover are very strong. The contact area between the insulating bonding portion and the outer side of the battery housing is very small, so that external water can be effectively prevented from entering the battery housing. The path length between one part of the insulating bonding portion 221, out of the battery housing and another part of the insulating bonding portion 221 in the battery housing is long and the contact area is small, thereby further avoiding the influence of external water and the like on the battery cell and the electrolyte in the battery housing. In the same reasoning, only the inner edge of the insulating bonding portion 221 can be in contact with the electrolyte in the battery housing, so that the contact area between the electrolyte and the insulating bonding portion 221 can be effectively reduced and the insulating bonding portion 221 can be effectively protected. The influence of softening, corrosion and the like of the electrolyte on the insulating bonding portion 221 is avoided, the service life of the battery is effectively prolonged, the path of insulating bonding portion 221 from the inner side of the battery housing to the outer side of the battery housing is longer, and the service life of the battery can be further prolonged.

[0028] The bottom shell 10 may be made of a stainless steel plate, and the receiving opening of the bottom shell 10 faces upwards to receive the battery cell 50 and the electrolyte. The bottom wall 11 and the side wall 12 may be integrally formed by injection molding, or may be welded, which is not limited herein. The outer contact layer 21 and the inner contact layer 23 of the cover 20 may be made of a stainless steel plate. The outer contact layer 21 is configured to be connected to one electrode of the battery cell 50, and the inner contact layer 23 is connected to the other

electrode of the battery cell 50 by being connected to the bottom shell 10. Since the insulating layer 22 is located between the outer contact layer 21 and the inner contact layer 23, the outer contact layer 21 and the inner contact layer 23 are insulated from each other, thereby enabling the bottom shell 10 and the cover 20 to be insulated from each other to prevent the two electrodes of the battery cell 50 from being conducted with each other. The bottom walls 11 of the cover 20 and the bottom shell 10 are respectively used as two output electrodes of the battery, and the two output electrodes can be prevented from being conducted with each other to be short-circuited. In the related art, the housing of the current button battery is matched with the upper shell and the lower shell and a plastic insulating ring is located between them, and the side wall of the battery housing has a three-layer structure. While, the side wall 12 of the present disclosure can only be a layer. The battery housing of the present application improves the internal available space and the capacity of the entire battery.

[0029] The welding portion 231 is the position where the inner contact layer 23 is used for welding with the welding support portion 121, and the welding portion 231 is disposed on the peripheral wall of the inner contact layer 23. The maximum outer diameter of the outer contact layer 21 is less than the maximum outer diameter of the inner contact layer 23, that is, the welding portion 231 protrudes out of the peripheral wall of the outer contact layer 21 in the radial direction, thereby enabling the peripheral wall of the outer contact layer 21 and the welding support portion 121 to keep a distance therebetween to prevent the outer contact layer 21 from being in contact with the side wall 12. The welding opening portion 233 is a position of the opening of the inner contact layer 23, and the welding bonding portion 232 is configured to bond with the insulating layer 22. The welding portion 231 is welded to the side wall 12, to enable the cover 20 and the bottom shell 10 to be fixed to each other, and to enable the inner contact layer 23 and the side wall 12 to be electrically connected. The insulating opening portion 222 of the insulating layer 22 corresponds to the welding opening portion 233 of the inner contact layer 23, so that the electrode contact portion 211 of the outer contact layer 21 may pass through the insulating opening portion 222 and the welding opening portion 233 to face towards the inner side of the battery housing. The insulating opening portion 222 and the welding opening portion 233 may be disposed in the middle of the cover 20, so that the electrode contact portion 211 and each position of the side wall 12 can maintain a sufficient distance.

[0030] The electrode of the battery cell 50 may extend through the insulating opening portion 222 and the welding opening portion 233 to be in contact with the electrode contact portion 211. Maybe the electrode contact portion 211 protrudes downward to be in contact with the electrode of the battery cell 50. It should be noted that, if the electrode of the battery cell 50 extends upwards to be in contact with the electrode contact portion 211, the battery cell 50 need to keep a gap with the inner contact layer 23. The top surface and the bottom surface of the insulating bonding portion 221 are adhered to the conductive bonding portion 212 and the welding bonding portion 232 respectively, so as to enable the outer contact layer 21 and the inner contact layer 23 to be insulated from each other. The inner contact layer 23 and the side wall 12 are welded to be sealed, and the outer contact layer 21 and the inner contact layer 23 are seam-



lessly bonded through the insulating layer 22, so that the bottom shell 10 can be sealed by the cover 20. When the inner contact layer 23 and the side wall 12 are welded, the inner contact layer 23 and the outer contact layer 21 have been insulated and connected in advance, and therefore there is no need to additionally provide an insulating film.

[0031] The insulating layer 22 is made of a material having insulation performance and electrolyte corrosion resistance and having a thermal shrinkage of 6% or less at a temperature greater than or equal to 100° C. The thermal shrinkage rate refers to a volume change of the thermoplastic material due to its inherent thermal expansion rate. That is, when the temperature is greater than or equal to 100° C., the volume variation of the insulating layer 22 does not exceed 6% of the original volume, so that the insulating layer 22 can be fully melted and then fully connected to the inner contact layer 23 and the outer contact layer 21 to ensure the bonding effect. The bonding strength, between the insulating layer 22 and the conductive bonding portion 212 or between the insulating layer 22 and the welding bonding portion 232, is greater than or equal to 1.0 N/square mm, which may ensure the bonding stability between the insulating layer 22 and the inner contact layer 23 or between the insulating layer 22 and the outer contact layer 21. Specifically, the bonding strength between the insulating bonding portion 221 and the conductive bonding portion 212, between the insulating bonding portion 221 and the bonding portion 232 is less than or equal to 5.0 N/mm, so as to prevent the internal stress of the cover 20 from being too high, thereby preventing the cover 20 from being damaged due to an internal force during subsequent processing or use. The thickness of the insulating bonding portion 221 is D3 and D3 is set to be 0.01 mm-2.5 mm, so that the insulating bonding portion 221 can stably bear the change of the temperature or external force to improve the bonding stability of the insulating bonding portion 221, and at the same time, the overall thickness of the cover 20 can be reasonably controlled.

[0032] The contact area between the insulating bonding portion 221 and the inner side of the battery housing is S0, and S0 satisfies:  $S0 \leq \pi * D2 * D3^{1/2}$ . It should be noted that the contact area between the insulating bonding portion 221 and the inner side of the battery housing is the area of the insulating opening portion 222 exposed to the electrolyte. That is the hole wall area of the insulating opening portion 222. The hole wall area of the insulating opening portion 222 is equal to  $\pi * D3 * D8$ , where the aperture of the insulating opening portion 222 is D8. That is, the aperture of the insulating opening portion 222 should satisfy  $D8 = D2^{1/2}$ . On the basis of ensuring that the thickness D3 of the insulating layer 22 is sufficient, the area of the insulating layer 22 exposed in the electrolyte can be effectively controlled to reduce the corrosion of the electrolyte to the insulating layer 22, or the corrosion of the bonding surface between the insulating layer 22 and the inner contact layer 23. The structural stability of the insulating layer 22 and the stability of the bonding strength is thus improved, and the insulating layer 22 is prevented from falling off from the inner contact layer 23, so as to effectively improve the overall stability of the battery housing.

[0033] The battery housing includes the bottom shell 10 and the cover 20, and the cover 20 includes the outer contact layer 21, the insulating layer 22 and the inner contact layer 23. The electrode contact portion 211 of the outer contact

layer 21 can pass through the insulating layer 22 and the inner contact layer 23 to be electrically connected with one pole of the battery cell 50, and another pole of the battery cell 50 is electrically connected to the bottom shell 10. The inner contact layer 23 and the bottom shell 10 are welded to enable the battery cell 50 to be sealed. The inner contact layer 23 and the outer contact layer 21 are insulated by the insulating layer 22, so that the bottom shell 10 is also insulated from the outer contact layer 21, thereby preventing the two electrodes of the battery cell 50 from being mutually conducted and short-circuited. Since the inner contact layer 23 and the outer contact layer 21 of the cover 20 are pre-insulated, the inner contact layer 23 and the bottom shell 10 just need to be welded when the bottom shell 10 is packaged by the cover 20, and an insulating film does not need to be arranged. Therefore, the packaging process of the battery can be simplified, and the packaging efficiency is improved. In addition, S0 satisfies:  $S0 \leq \pi * D2 * D3^{1/2}$ , so that the area of the insulating bonding portion 221 exposed in the electrolyte can be reduced, and the corrosion of the electrolyte to the insulating layer 22 is reduced, thereby ensuring the bonding stability of the insulating layer 22 to the outer contact layer 21 and the inner contact layer 23.

[0034] Specifically, the outer contact layer 21 is made of stainless steel, and the thickness of the outer contact layer 21 is D4 and D4 is 0.1 mm-0.25 mm; and/or, the inner contact layer 23 is made of stainless steel, and the thickness of the inner contact layer 23 is D5 and D5 is 0.1 mm-0.25 mm. For example, D4 and D5 may be one of 0.1 mm, 0.15 mm, 0.2 mm, 0.25 mm, 0.3 mm, 0.35 mm, 0.5 mm, 1.0 mm, 1.2 mm, 1.4 mm, 1.6 mm, 1.8 mm, 2.0 mm, and 2.5 mm. The stainless steel can be 304 stainless steel. The 304 stainless steel, containing high nickel, is in an austenite single-phase structure at room temperature, and has high corrosion resistance, good cold forming and weldability. The 304 stainless steel has high plasticity and toughness at low temperature, room temperature and high temperature. The outer contact layer 21 and the inner contact layer 23 are arranged to be SUS 304, so that the structural stability of the cover 20 in the processing process can be ensured, and the chemical stability of the cover 20 in use can be ensured.

[0035] D4 and D5 are set to be 0.1 mm-0.25 mm, so that the outer contact layer 21 and the inner contact layer 23 can have sufficient structural strength, and the overall thickness of the cover 20 can be reasonably controlled. In practical applications, the insulating layer 22 is made of one or more of PP (polypropylene), PFA (a copolymer of a small amount of perfluoropropyl perfluorovinyl ether and polytetrafluoroethylene), PVDF (polyvinylidene fluoride), PTFE (polytetrafluoroethylene), ETFE (ethylene-tetrafluoroethylene copolymer), and PVC (polyvinyl chloride).

[0036] In an embodiment, the area of the insulating bonding portion 221 is S1, the area of the insulating layer 22 is S2, and the area of the outer contact layer 21 is S3. S1, S2 satisfy:  $S1/S2 \geq 0.6$ ; and/or S1, S3 satisfy  $S1/S3 \geq 0.5$ . Thus, the bonding area of the insulating layer 22 and the outer contact layer 21 is effectively ensured, and the connection stability of the insulating layer 22 and the outer contact layer 21 is improved. Meanwhile, the size of the insulating opening portion 222 can be reasonably controlled, thereby effectively controlling the area of the electrode contact portion 211, and increasing the area utilization rate of the outer contact layer 21.

[0037] In an embodiment, as shown in FIG. 3, the first surface of the conductive bonding portion 212, close to the insulating bonding portion 221, is provided with a first bonding enhancement layer 213 for reinforcing the bonding strength between the conductive bonding portion 212 and the insulating bonding portion 221; and/or the second surface of the welding bonding portion 232, close to the insulating bonding portion 221, is provided with a second bonding enhancement layer 234 for reinforcing the bonding strength between the welding bonding portion 232 and the insulating bonding portion 221. The specific form of the first bonding enhancement layer 213 is not limited, and the connection area of the first bonding enhancement layer 213 is just increased to enhance the bonding strength. For example, the first bonding enhancement layer 213 may be configured as a protrusion. The specific form and function of the second bonding enhancement layer 234 may refer to the first bonding enhancement layer 213, and it should be noted that the first bonding enhancement layer 213 and the second bonding enhancement layer 234 may be indirectly matched with each other via the insulating layer 22 to further improve the bonding stability of the outer contact layer 21, the insulating layer 22, and the inner contact layer 23.

[0038] Specifically, as shown in FIG. 4, the first bonding enhancement layer 213 is a first uniform rough layer which is formed by performing sand blasting on the first surface of the first stainless steel layer close to the insulating bonding portion 221, and/or the second bonding enhancement layer 234 is a second uniform rough layer which is formed by performing sand blasting on the first surface of the first stainless steel layer close to the insulating bonding portion 221. It can be understood that the uniformity in this embodiment is not absolutely uniform. The first surface is subjected to sand blasting to form a natural uniform rough surface. The first rough surface enables the bonding force between different parts of the first surface and the insulating bonding portion 221 to be more uniform, thereby avoiding stress concentration. Similarly, the second rough surface can also make the bonding force between different parts of the second surface and the insulating bonding portion 221 more uniform. The first bonding enhancement layer 213 and the second bonding enhancement layer 234 are formed by sandblasting, so that the processing modes of the first bonding enhancement layer 213 and the second bonding enhancement layer 234 can be simplified, so as to improve the processing efficiency.

[0039] In another embodiment, the first bonding enhancement layer 213 is a first inclined piece protruding from the first surface and having a certain inclination angle with the first surface, the height of the first inclined piece is smaller than the thickness of the insulating bonding portion 221. The second bonding enhancement layer 234 is a second inclined piece protruding from the second surface and having a certain inclination angle with the second surface, the height of the second inclined piece is smaller than the thickness of the insulating bonding portion 221. The first inclined piece and the second inclined piece are opposite in inclination direction and are alternately arranged with each other. The plurality of first inclined pieces are distributed on the first surface, and the melted bonding insulating layer 22 can be filled in a space between two adjacent first inclined pieces so as to be adhered and connected to the side surfaces of the first inclined pieces. The height of the first inclined piece is the vertical distance between the end of the first inclined

piece and the first surface, the height of the first inclined piece is smaller than the thickness of the insulating bonding portion 221, and the first inclined piece can be prevented from contacting with the second stainless steel layer after passing through the insulating bonding portion 221. The distribution manner and function of the second inclined piece may refer to the first inclined piece. The first inclined piece and the second inclined piece are alternately arranged in the length direction, so that the first inclined piece and the second inclined piece which are inserted into the insulating bonding portion 221 can be adjacent to each other. On the basis of not reducing the thickness of the insulating bonding portion 221, the outer contact layer 21 and the inner contact layer 23 can be closer to each other to improve the structural strength of the cover 20.

[0040] In another embodiment, the first bonding enhancement layer 213 is a first groove recessed in the first surface, and the recess direction of the first groove is far away from the insulating bonding layer; and/or the second bonding enhancement layer 234 is a second groove recessed in the second surface, and the recess direction of the second groove is far away from the insulating bonding layer. There is a plurality of first grooves distributed on the first surface, and the melted insulating bonding portion 221 can be filled in the plurality of first grooves to increase the connection area with the first surface, thereby enhancing the bonding strength between the outer contact layer 21 and the insulating bonding portion 221. The arrangement manner and function of the second groove may refer to the first groove, and details are not described herein.

[0041] In an embodiment, as shown in FIGS. 1 to 3, the sidewall 12 is further provided with an extending portion 122. The extending portion 122 protrudes from the welding support portion 121 and extends outward by a height H, and the H satisfies:  $H \geq D3 + D4$ . The extending portion 122 extends upward from the top of the welding support portion 121, and the top of the extending portion 122 protrudes from the top surface of the outer contact layer 21, to enable the extending portion 122 to be connected to the protective cover covering the outer contact layer 21, thereby effectively protecting the cover 20.

[0042] Specifically, as shown in FIGS. 1 to 3, the battery housing further includes a protection member 30, and the protection member 30 is formed by curing a liquid glue in a groove formed by outer edge portions of the extending portion 122, the welding portion 231, the insulating bonding portion 221, and the outer contact layer 21 after the cover 20 and the bottom housing 10 are sealed. The insulating bonding portion 221 protrudes from the top surface of the portion of the peripheral wall of the outer contact layer 21 to form a groove bottom of the groove, and the peripheral wall of the outer contact layer 21 and the inner peripheral wall of the extending portion 122 form a groove wall of the groove, to enable the groove extends in the circumferential direction of the outer contact layer 21. The protection member 30 may not only cover the top surface of the protruding portion of the insulating bonding layer, but also effectively isolate the outer contact layer 21 from the extending portion 122, thereby preventing the outer contact layer 21 from electrically connected to the inner contact layer 23 or the side wall 12. It can be understood that the protection member 30 is configured to be formed by curing the liquid glue, so that the insulation of the outer contact layer 21 and the inner contact layer 23 or the extending portion 122 can be realized, and the

acting force of the protection member 30 on the outer contact layer 21 or the extending portion 122 can be reduced to facilitate the deformation of the outer contact layer 21 or the extending portion 122, thereby ensuring the structural stability of the battery housing.

**[0043]** In an actual application, as shown in FIG. 1 to FIG. 3, an insulating unit 40 is provided on an inner side of the welding opening portion 233, and the insulating unit 40 is configured to prevent a pole of the battery cell 50 from contacting the inner contact layer 23 to form a short circuit when the pole of the battery cell 50 is electrically connected to the electrode contact portion 211. The insulating unit 40 may be annularly arranged and extend along the circumferential direction of the welding opening portion 233, and the insulating unit 40 may be close to the hole wall of the welding opening portion 233 to cover the welding opening portion 233, thereby preventing the electrode connected with the electrode contact portion 211 from contacting the inner contact layer 23, so as to further avoid two electrodes of the battery cell 50 from forming a short circuit.

**[0044]** In an embodiment, as shown in FIG. 5, the insulating layer 22 may include a first bonding layer 223, an anti-conduction layer 224, and a second bonding layer 225. The first bonding layer 223 bonds the outer contact layer 21 with the anti-conduction layer 224, the second bonding layer 225 bonds the inner contact layer 23 with the anti-conduction layer 224, and the anti-conduction layer 224 can ensure that the outer contact layer 21 and the inner contact layer 23 are insulated from each other. In this way, the first bonding layer 223 and the second bonding layer 225 only need to have bonding performance, the anti-conduction layer 224 only needs to have insulating performance. The two performances of the insulating layer 22 are realized through different functional layers, thereby enabling the bonding performance and the insulating performance of the corresponding layers to be enhanced to improve the overall performance of the insulating layer 22.

**[0045]** The present disclosure further provides a battery. The battery includes a battery cell 50 and a battery housing. The specific structure of the battery housing refers to the above-mentioned embodiments. Since the battery adopts all the technical solutions of all the above embodiments, all of the beneficial effects brought by at least the technical solution of the above embodiments are not repeated herein. One electrode of the battery cell 50 is electrically connected to the outer contact layer 21 of the battery housing, and the other electrode is electrically connected to the inner contact layer 23 and/or the bottom shell 10 of the battery housing. The battery may be configured as a button battery, and the button battery is mainly applied to an electronic product to provide electrical energy for the electronic product. The electronic product may be an earphone, a watch, or the like, with a small voltage.

**[0046]** The above description is merely an alternative embodiment of the present invention, and is not therefore intended to limit the patent scope of the present invention, and any equivalent structural transformation made by using the description and drawings of the present invention, or directly/indirectly applied to other related technical fields, is included within the scope of the patent protection of the present invention under the inventive concept of the present invention.

**[0047]** Besides, it can be understood that, although the present disclosure is describe according to the embodiments,

each embodiment does not include only on dependent technology solution. The description of the present disclosure is only for clarity. The person skilled in the art should regard the present disclosure as an entirety. Technology solutions in the embodiments can be adequately combined to form other embodiments that can be understood by the person skilled in the art.

What is claimed is:

1. A battery housing for a button battery, comprising:
  - a cup-shaped bottom shell, the cup-shaped bottom shell comprising a circular or oval bottom wall and an annular side wall, and the cup-shaped bottom shell defining a receiving opening; and
  - a cover configured to seal the receiving opening, the cover comprising an outer contact layer, an insulating layer, and an inner contact layer from outside to inside; the outer contact layer comprising an electrode contact portion and a conductive bonding portion; the insulating layer comprising an insulating bonding portion and an insulating opening portion; the inner contact layer comprising a welding portion, a welding bonding portion, and a welding opening portion; the side wall comprising a welding support portion close to the receiving opening, wherein a maximum outer diameter of the outer contact layer is D1, a maximum outer diameter of the inner contact layer is D2, and D1 is less than D2;

wherein the electrode contact portion passes through the insulating opening portion and the welding opening portion to face towards an inner side of the bottom shell, to be electrically connected to one electrode of a battery cell, thereby electrically connecting the outer contact layer to the battery cell; the conductive bonding portion is configured to be seamlessly bonded to the insulating bonding portion, to enhance a strength of the cover and to prevent external water from permeating into the battery housing; the welding portion is configured to be welded with the welding supporting portion, thereby enabling the cover and the bottom shell to be sealed; the welding bonding portion is configured to be seamlessly bonded to the insulating bonding portion, to enhance the strength of the cover and to reduce a direct contact area between the insulating bonding portion and the inner side of the battery housing, and to prevent external water from permeating into the battery housing;

wherein the insulating bonding portion is configured to be seamlessly bonded to the conductive bonding portion and the welding bonding portion by melting an insulating anti-electrolyte corrosion material at  $\geq 100^\circ\text{C}$ . before the cover and the bottom shell are sealed, the insulating anti-electrolyte corrosion material has a thermal shrinkage rate of 6%, and a bonding strength, between the insulating bonding portion and the conductive bonding portion or between the insulating bonding portion and the welding bonding portion, is greater than or equal to 1.0 N per square millimeter after the insulating anti-electrolyte corrosion material is at a room temperature; a thickness of the insulating bonding portion is D3, and D3 is 0.01 mm-2.5 mm; the contact area between the insulating bonding portion and the inner side of the battery housing is S0, and S0 satisfies:  $S0 \leq \pi * D2 * D3^{*1/2}$ .

2. The battery housing according to claim 1, wherein the outer contact layer is made of stainless steel, and a thickness of the outer contact layer is D4 and D4 is 0.1 mm-0.25 mm; and/or the inner contact layer is made of stainless steel, and a thickness of the inner contact layer is D5 and D5 is 0.1 mm-0.25 mm.

3. The battery housing according to claim 1, wherein the insulating layer is made of one or more of PP, PFA, PVDF, PTFE, ETFE and PVC.

4. The battery housing according to claim 1, wherein a bonding strength between the insulating bonding portion and the conductive bonding portion, or between the insulating bonding portion and the bonding portion, is less than or equal to 5.0 N/mm at a room temperature.

5. The battery housing according to claim 1, wherein an area of the insulating bonding portion is S1, and an area of the insulating layer is S2, and an area of the outer contact layer is S3, and S1, S2, S3 satisfy:  $S1/S2 \geq 0.6$  and/or  $S1/S3 \geq 0.5$ .

6. The battery housing according to claim 1, wherein a first bonding enhancement layer is placed on a first surface of the conductive bonding portion close to the insulating bonding portion; the first bonding enhancement layer is configured to reinforce a bonding strength between the insulating bonding portion and the conductive bonding portion; and/or a second bonding enhancement layer is placed on a second surface of the welding bonding portion close to the insulating bonding portion, and the second bonding enhancement layer is configured to reinforce a bonding strength between the insulating bonding portion and the welding bonding portion.

7. The battery housing according to claim 2, wherein a thickness of the outer contact layer is D4; the side wall further comprises an extending portion protruding from the welding support portion, a height of the extending portion is H, and H satisfies:  $H \geq D3 + D4$ .

8. The battery housing according to claim 7, wherein the battery housing further comprises a protection member, and the protection member is formed by curing a liquid glue received in a groove at a room temperature after the cover and the bottom shell are sealed, and the groove is formed by the outer edge portions of the extending portion, the welding portion, the insulating bonding portion and the outer contact layer.

9. The battery housing according to claim 1, wherein the inner side of the welding opening portion is provided with an insulating unit, and the insulating unit is configured to prevent a pole of the battery cell from contacting the inner contact layer to form a short circuit when the pole of the battery cell is electrically connected to the electrode contact portion.

10. A battery, comprising:

a battery cell; and

a battery housing, the battery housing comprising a bottom shell and a cover, the bottom shell comprising a bottom wall and an annular side wall, and the bottom shell defining a receiving opening; the cover configured to sealing an opening of the bottom shell; the cover comprising an outer contact layer, an insulating layer, and an inner contact layer from outside to inside; the outer contact layer comprising an electrode contact portion and a conductive bonding portion; the insulating layer comprising an insulating bonding portion and an insulating opening portion; the inner contact layer

comprising a welding portion, a welding bonding portion, and a welding opening portion; the side wall comprising a welding support portion close to the receiving opening, wherein a maximum outer diameter of the outer contact layer is D1, a maximum outer diameter of the inner contact layer is D2, and D1 is less than D2;

wherein the electrode contact portion passes through the insulating opening portion and the welding opening portion to face towards an inner side of the bottom shell, to be electrically connected to one electrode of a battery cell, thereby electrically connecting the outer contact layer to the battery cell; the conductive bonding portion is configured to be seamlessly bonded to the insulating bonding portion, to enhance a strength of the cover and to prevent external water from permeating into the battery housing; the welding portion is configured to be welded with the welding supporting portion, thereby enabling the cover and the bottom shell to be sealed; the welding bonding portion is configured to be seamlessly bonded to the insulating bonding portion, to enhance the strength of the cover and reduce a direct contact area between the insulating bonding portion and the inner side of the battery housing, and to prevent external water from permeating into the battery housing;

wherein the insulating bonding portion is configured to be seamlessly bonded to the conductive bonding portion and the welding bonding portion by melting an insulating anti-electrolyte corrosion material at  $\geq 100^\circ \text{C}$ . before the cover and the bottom shell are sealed, the insulating anti-electrolyte corrosion material has a thermal shrinkage rate of 6%, and the bonding strength between the insulating bonding portion and the conductive bonding portion is greater than or equal to 1.0 N per square millimeter after the insulating anti-electrolyte corrosion material is at a room temperature; a thickness of the insulating bonding portion is D3, and D3 is 0.01 mm-2.5 mm; the contact area between the insulating bonding portion and the inner side of the battery housing is S0, and S0 satisfies:  $S0 \leq \pi * D2 * D3^{1/2}$ ;

wherein one electrode of the battery cell is electrically connected to the outer contact layer of the battery housing, and the other electrode is electrically connected to the inner contact layer and/or the bottom shell of the battery housing.

11. The battery according to claim 10, wherein the outer contact layer is made of stainless steel, and a thickness of the outer contact layer is D4 and D4 is 0.1 mm-0.25 mm; and/or the inner contact layer is made of stainless steel, and a thickness of the inner contact layer is D5 and D5 is 0.1 mm-0.25 mm.

12. The battery according to claim 10, wherein the insulating layer is made of one or more of PP, PFA, PVDF, PTFE, ETFE and PVC.

13. The battery according to claim 10, wherein a bonding strength between the insulating bonding portion and the conductive bonding portion, or between the insulating bonding portion and the bonding portion, is less than or equal to 5.0 N/mm at a room temperature.

14. The battery according to claim 10, wherein an area of the insulating bonding portion is S1, and an area of the

insulating layer is S2, and an area of the outer contact layer is S3, and S1, S2, S3 satisfy:  $S1/S2 \geq 0.6$  and/or  $S1/S3 \geq 0.5$ .

**15.** The battery according to claim **10**, wherein a first bonding enhancement layer is placed on a first surface of the conductive bonding portion close to the insulating bonding portion; the first bonding enhancement layer is configured to reinforce a bonding strength between the insulating bonding portion and the conductive bonding portion; and/or a second bonding enhancement layer is placed on a second surface of the welding bonding portion close to the insulating bonding portion, and the second bonding enhancement layer is configured to reinforce a bonding strength between the insulating bonding portion and the welding bonding portion.

**16.** The battery according to claim **11**, wherein a thickness of the outer contact layer is D4; the side wall further comprises an extending portion protruding from the welding

support portion, a height of the extending portion is H, and H satisfies:  $H \geq D3 + D4$ .

**17.** The battery according to claim **16**, wherein the battery housing further comprises a protection member, and the protection member is formed by curing a liquid glue received in a groove at a room temperature after the cover and the bottom shell are sealed, and the groove is formed by the outer edge portions of the extending portion, the welding portion, the insulation bonding portion and the outer contact layer.

**18.** The battery according to claim **10**, wherein the inner side of the welding opening portion is provided with an insulating unit, and the insulating unit is configured to prevent a pole of the battery cell from contacting the inner contact layer to form a short circuit when the pole of the battery cell is electrically connected to the electrode contact portion.

\* \* \* \* \*