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RECHARGEABLE BATTERY

Abstract

A rechargeable battery includes: an electrode assembly including a first electrode tab and a second electrode tab; a case including an opening and receiving the electrode assembly to be connected to the first electrode tab; a cap assembly including a cap plate coupled to the case and covering the opening, and a terminal plate coupled to the cap plate and connected to the second electrode tab; a first insulating member between the second electrode tab and the cap plate; a second insulating member attached to a surface of the second electrode tab; and a third insulating member between the second electrode tab and the electrode assembly.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a continuation of U.S. application Ser. No. 17/189,730, filed on Mar. 2, 2021, which claims priority to and the benefit of Korean Patent Application No. 10-2020-0075881, filed on Jun. 22, 2020 in the Korean Intellectual Property Office, the entire contents of both of which are incorporated herein by reference.

BACKGROUND
1. Field
[0002] Aspects of embodiments of the present invention relate to a rechargeable battery.
2. Description of the Related Art
[0003] A rechargeable battery can be repeatedly charged and discharged, unlike a primary battery that cannot be recharged. A low-capacity rechargeable battery is used for portable small-sized electronic devices, such as mobile phones, notebook computers, and camcorders. A large-capacity battery is widely used as a power source for driving motors, such as for hybrid vehicles.
[0004] A representative rechargeable battery includes a nickel-cadmium (Ni—Cd) battery, a nickel-hydrogen (Ni-MH) battery, a lithium (Li) battery, and a lithium ion (Li-ion) rechargeable battery. Particularly, the lithium ion secondary battery has a higher operation voltage than the nickel-cadmium battery or the nickel-hydrogen battery that is mainly used as a portable electric equipment power source by about three times. Also, the lithium ion secondary battery is widely used because its energy density per unit weight is high.
[0005] In particular, as a demand for wearable devices, such as headphones, earphones, smartwatches, and body-mounted medical devices which use Bluetooth, has increased, the demand for rechargeable batteries of which energy density is high and which are ultra-small is increasing.
[0006] The ultra-small rechargeable battery has important tasks of securing required electrical capacity within a limited size, implementing an efficient structure while improving an effective low weight, and improving structural stability.
[0007] The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention, and, therefore, it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.
SUMMARY
[0008] According to an aspect of embodiments of the present invention, an ultra-small rechargeable battery is provided. According to another aspect of embodiments of the present invention, a rechargeable battery that prevents or substantially prevents damage to a separator due to heat at an upper part of an electrode assembly when laser-welding a cap assembly to a case is provided.
[0009] According to one or more embodiments, a rechargeable battery includes: an electrode assembly including a first electrode tab and a second electrode tab; a case including an opening and receiving the electrode assembly to be connected to the first electrode tab; a cap assembly including a cap plate coupled to the case and covering the opening, and a terminal plate coupled to the cap plate and connected to the second electrode tab; a first insulating member between the second electrode tab and the cap plate; a second insulating member attached to a surface of the second electrode tab; and a third insulating member between the second electrode tab and the electrode assembly.

[0010] The electrode assembly may include a first electrode, a second electrode, and a separator therebetween, the first electrode may be connected to the first electrode tab, and the second electrode may be connected to the second electrode tab.
[0011] The rechargeable battery may further include an insulating member between the cap plate and the terminal plate to electrically insulate the cap plate and the terminal plate from each other.
[0012] The terminal plate may include: a flange part located outside the cap plate and electrically insulated from and attached to an outer surface of the cap plate; and a tab connection part protruded from a center of the flange part to be protruded toward the electrode assembly through a terminal hole of the cap plate and a through hole of the first insulating member, and electrically connected to the second electrode tab at an inner surface of the tab connection part.
[0013] The first insulating member may include an insulating washer attached to an inner surface of the cap plate and having a through hole.
[0014] The second insulating member may include an insulating tape attached to a surface of the second electrode tab, a part of the tab connection part, and a part of the first insulating member.
[0015] The third insulating member may include an insulating disk attached to a center of an end of the electrode assembly and being larger than the inner surface of the tab connection part to be overlapped around the through hole of the first insulating member.
[0016] The terminal plate may include: a flange part between the cap plate and the electrode assembly and located at an inner side of a step of the first insulating member to be electrically insulated from and attached to an inner surface of the cap plate; and a protruded terminal protruded from a center of the flange part to penetrate a terminal hole of the cap plate and electrically connected to the second electrode tab at an inner surface of the terminal plate.
[0017] The first insulating member may include an insulated washer attached to the inner surface of the cap plate and including the step, and the flange part may be arranged at the step.
[0018] The second insulating member may include an insulating tape attached to a surface of the second electrode tab, a part of the protruded terminal, and a part of the first insulating member.
[0019] The third insulating member may include an insulating disk attached a center of an end of the electrode assembly and being larger than the inner surface of the flange part to be overlapped around the step of the first insulating member.
[0020] As described above, in a rechargeable battery according to one or more embodiments of the present invention, the first insulating member is arranged between the second electrode tab connected to the terminal plate and the cap plate, the second insulating member is attached to a surface of the second electrode tab, and the third insulating member is arranged between the second electrode tab and the electrode assembly, such that the separator may be prevented or substantially prevented from being damaged by heat at an upper part of the electrode assembly when laser-welding the cap assembly to the case.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0021] FIG. **1** is a perspective view of a rechargeable battery according to an embodiment of the present invention.
[0022] FIG. **2** is an exploded perspective view of the rechargeable battery of FIG. **1**.
[0023] FIG. **3** is a cross-sectional view taken along the line III-III of FIG. **1**.
[0024] FIG. **4** is a perspective view of a rechargeable battery according to an embodiment of the present invention.
[0025] FIG. **5** is an exploded perspective view of the rechargeable battery of FIG. **4**.
[0026] FIG. **6** is a cross-sectional view taken along the line VI-VI of FIG. **4**.
DESCRIPTION OF REFERENCE SYMBOLS

TABLE-US-00001 1, 2: rechargeable battery 10: electrode assembly 11: first electrode 12: second electrode 13: separator 20: case 30, 60: cap assembly 31: cap plate 33, 63: terminal plate 34: thermal-fusion member 51: first electrode tab 52: second electrode tab 61, 62: first insulating member 101, 102: first, second end 311: terminal hole 331, 631: flange part 332: protruded terminal 341: through hole 611: through hole 612, 622: second insulating member 613, 623: third insulating member 621: step 632: tab connection part D: battery diameter H: height L1, L2: distance ΔH1: first height difference ΔH2: second height difference

DETAILED DESCRIPTION

[0027] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or scope of the present invention. The drawings and description are to be regarded as illustrative in nature and not restrictive. Like reference numerals designate like elements throughout the specification.

[0028] In addition, unless explicitly described to the contrary, it is to be understood that terms such as “comprises,” “includes,” or “have” used in the present specification specify the presence of stated features, numerals, steps, operations, components, parts, or a combination thereof, but do not preclude the presence or addition of one or more other features, numerals, steps, operations, components, parts, or a combination thereof.

[0029] Also, in this specification, it is to be understood that when one component is referred to as being “connected” or “coupled” to another component, it may be connected or coupled directly to the other component or connected or coupled to another component with one or more other components intervening therebetween.

[0030] Singular forms are to include plural forms unless the context clearly indicates otherwise.

[0031] It is to be understood that, although the terms “first,” “second,” etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are used to distinguish one element from another. For example, a first element could be termed a “second” element, and, similarly, a second element could be termed a “first” element, without departing from the scope of example embodiments of the inventive concept. The terms of a singular form may include plural forms unless the context clearly indicates otherwise.

[0032] In addition, terms such as “below,” “lower,” “above,” “upper,” and the like are used to describe the relationship of the configurations shown in the drawings. However, the terms are used as a relative concept and are described with reference to the direction indicated in the drawings.

[0033] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the inventive concept pertains. It is also to be understood that terms defined in commonly used dictionaries should be interpreted as having meanings consistent with the meanings in the context of the related art, and are expressly defined herein unless they are interpreted in an ideal or overly formal sense.

[0034] A rechargeable battery according to an embodiment of the present invention, which is an ultra-compact battery, may be a coin cell or a button cell. Here, the coin cell or the button cell is a thin coin-type or button-type cell, and refers to a battery having a ratio (H/D) of a height (H) to a diameter (D) of 1 or less (see FIG. **1**).

[0035] In an embodiment, the coin cell or the button cell is mainly cylindrical, and a horizontal cross-section is circular, but the present invention is not limited thereto, and a horizontal cross-section may be oval or polygonal. In this case, a diameter is determined as a maximum distance of a case exterior circumference based on the horizontal direction of the battery, and a height is determined as a maximum distance (a distance from a flat bottom to a flat top) based on the vertical direction of the battery.

[0036] However, the present invention is not limited to the coin cell or the button cell that is an

example of the present invention, and a battery of the present invention may be a cylindrical-type or pin-type battery. Herein, a case in which a rechargeable battery according to an embodiment of the present invention is a coin cell or a button cell will be described as an example in further detail.

[0037] FIG. **1** is a perspective view of a rechargeable battery according to an embodiment of the present invention; FIG. **2** is an exploded perspective view of the rechargeable battery of FIG. **1**; and FIG. **3** is a cross-sectional view taken along the line III-III of FIG. **1**.

[0038] Referring to FIG. **1** to FIG. **3**, a rechargeable battery **1** according to an embodiment includes an electrode assembly **10**, a case **20**, a cap assembly **60**, and first, second, and third insulating members **61**, **612**, and **613**.

[0039] The cap assembly **60** includes a cap plate **31** and a terminal plate **63** that are coupled to each other. As an example, the cap plate **31** and the terminal plate **63** are thermally fused by a thermal-fusion member **34** disposed therebetween.

[0040] The thermal-fusion member **34** acts as a medium to connect the cap plate **31** and the terminal plate **63** to each other. For example, the thermal-fusion member **34** may be formed of an electrically insulating material, such as a polymer, and may be melted using a laser or the like to be fused to the cap plate **31** and the terminal plate **63**.

[0041] In an embodiment, by coupling the terminal plate **63** to the cap plate **31** with the thermal-fusion member **34**, it is possible to form a stable coupling structure while effectively insulating between the terminal plate **63** and the cap plate **31** without adding a separate insulating configuration.

[0042] Since a coin cell is manufactured in an ultra-compact size, it may have a design limitation in terms of space, and, accordingly, it is desired to secure functionality while simplifying a structure and a manufacturing process thereof. Regarding this, in the embodiment, insulation and coupling between the terminal plate **63** and the cap plate **31** through the heat-fusion member **34** are realized.

[0043] In an embodiment, the electrode assembly **10** includes a first electrode **11** (for example, a negative electrode) and a second electrode **12** (for example, a positive electrode) provided at respective sides of a separator **13** that is an electrically insulating material, and is formed by winding the first electrode **11**, the separator **13**, and the second electrode **12**. Therefore, the electrode assembly **10** may be formed as a jelly roll type. In another embodiment, although not shown separately, the electrode assembly may be formed as a stack type.

[0044] The electrode assembly **10** is configured to charge and discharge a current, and a winding axis of the electrode assembly **10** may be arranged parallel to a height direction (a vertical direction in FIG. **1** to FIG. **3**) of the case **20**. In an embodiment, a first end (a lower surface of the electrode assembly) **101** and a second end (an upper surface of the electrode assembly) **102** of the electrode assembly **10** may be flat and parallel to each other. In an embodiment, the electrode assembly **10** is not provided with a center pin, but, in another embodiment, a center pin (not shown) may be provided at a position of the winding axis.

[0045] The case **20** accommodates the electrode assembly **10** while facing the first end **101** of the electrode assembly **10**. In an embodiment, the electrode assembly **10** is covered with an insulating sheet **14** and embedded in the case **20**. As an example, the case **20** is formed as a cylinder that accommodates the jelly roll type of electrode assembly **10**, and the cap assembly **60** seals an opening **21** of the cylindrical case **20**.

[0046] The electrode assembly **10** includes a first electrode tab **51** connected to the first electrode **11**, and a second electrode tab **52** connected to the second electrode **12**, and the first and second electrodes **11** and **12** are drawn out at the first and second ends **101** and **102**, respectively.

[0047] In a state in which the electrode assembly **10** is accommodated in the case **20**, the first electrode tab **51** is electrically connected to a bottom of the case **20** and the second electrode tab **52** is electrically connected to the terminal plate **63** of the cap assembly **60**.

[0048] In addition, the cap plate **31** of the cap assembly **60**, while facing the second end **102** of the electrode assembly **10**, is coupled to the case **20** to cover the opening **21**. In an embodiment, the

terminal plate **63** is coupled to the second electrode tab **52** while being coupled to the cap plate **31** with the thermal-fusion member **34**.

[0049] Herein, a case in which the first electrode **11** and the second electrode **12** are respectively a negative electrode and a positive electrode will be described as an example, but the present invention is not limited thereto, and the first electrode **11** and the second electrode **12** may respectively be a positive electrode and a negative electrode.

[0050] In an embodiment, the first electrode (negative electrode) **11** is formed in a long extending strip shape, and includes a negative coated portion that is a region in which a negative active material layer is coated to a current collector of a metal foil (for example, a Cu foil), and a negative uncoated portion that is a region in which an active material is not coated. The negative uncoated portion may be disposed at an end portion in a length direction of the negative electrode.

[0051] In an embodiment, the second electrode (the positive electrode) **12** is formed in a long extending strip shape, and includes a positive coated portion that is a region in which a positive active material layer is coated to a current collector of a metal foil (for example, an Al foil), and a positive uncoated portion that is a region in which an active material is not coated. The positive uncoated portion may be disposed at an end portion in a length direction of the positive electrode.

[0052] The case **20** allows the electrode assembly **10** to be inserted into the opening **21** formed at a side thereof, and has a space for accommodating the electrode assembly **10** and an electrolyte therein. In an embodiment, for example, the case **20** is formed in a cylindrical shape having a height H that is less than a diameter D thereof, and has a circular opening **21** such that the cylindrical electrode assembly **10** corresponding to an inner space thereof may be inserted.

[0053] The terminal plate **63** of the cap assembly **60** includes a flange part **631** and a tab connection part **632**. The flange part **631** is disposed on the outside of the cap plate **31** and is electrically insulated and attached to an outer surface of the cap plate **31** via the thermal-fusion member **34**.

[0054] In the terminal plate **63**, the tab connection part **632** is protruded from a center of the flange part **631** to the inside and penetrates through a through hole **341** of the thermal-fusion member **34** and a terminal hole **311** of the cap plate **31** to be protruded toward the electrode assembly **10**, and the second electrode tab **52** is electrically connected to an inner surface of the tab connection part **632**.

[0055] The flange part **631** is more protruded with a first height difference ΔH**1** than the outer surface of the cap plate **31** to form an outer surface of the rechargeable battery **1**. In other words, the outer surface of the flange part **631** is more protruded with reference to a bottom of the case **20** than the outer surface of cap plate **31**. Also, the outer surface of flange part **631** and the outer surface of the cap plate **31** have the first height difference ΔH**1**.

[0056] Herein, the first, second, and third insulating members **61**, **612**, and **613** are described. The first insulating member **61** is formed between the second electrode tab **52** and the cap plate **31**. As an example, the first insulating member **61** is disposed on an upper side of the second electrode tab **52** and attached to an inner surface of the cap plate **31**. The first insulating member **61** may form an electrically insulating structure between the cap plate **31** and the second electrode tab **52** and between the cap plate **31** and the electrode assembly **10**.

[0057] As an example, the first insulating member **61** may be formed of an insulating washer having a through hole **611** corresponding to the terminal hole **311** of the cap plate **31**. Therefore, the tab connection part **632** is protruded from the center of the flange part **631** to the inside, penetrates through the terminal hole **311** of the cap plate **31** and the through hole **611** of the first insulating member **61** to be protruded toward the electrode assembly **10**, and is electrically connected to the second electrode tab **52** at an inner surface thereof.

[0058] The second insulating member **612** is attached to a surface of the second electrode tab **52**. As an example, the second insulating member **612** is attached to an underside of the second electrode tab **52**. As an example, the second insulating member **612** may be formed of an insulating

tape attached to the surface of the second electrode tab **52**, a part of the tab connection part **632**, and a part of the first insulating member **61**. The second insulating member **612** may form an electrically insulating structure between the second electrode tab **52** and the second end **102** of the electrode assembly **10**.

[0059] The third insulating member **613** is formed between the second electrode tab **52** and the electrode assembly **10**. As an example, the third insulating member **613** is attached to the second end **102** of the electrode assembly **10** at the side of the second electrode tab **52**. As an example, the third insulating member **613** is attached to a center of the second end **102** of the electrode assembly **10** and may be formed of an insulating disk that is larger than the inner surface of the tab connection part **632** so as to be overlapped by a distance (e.g., a predetermined distance) L**1** around the through hole **611** of the first insulating member **61**.

[0060] The first and second insulating members **61** and **612** electrically insulate both sides of the second electrode tab **52** from the cap plate **31** and the electrode assembly **10**. In addition, the third insulating member **613** may further electrically insulate the second electrode tab **52** and the electrode assembly **10** in the opened portion of the electrode assembly **10** on the second end **102** despite the use of the first and second insulating members **61** and **612**.

[0061] Referring to FIG. **1**, in the rechargeable battery **1** according to an embodiment, in a state that the opening **21** of the case **20** is closed and sealed by the cap assembly **60**, the height H is set as the distance between the case **20** and an outer plane of the flange part **631**, and the diameter D of the battery is set as the exterior circumference of the case **20**. In an embodiment, a ratio of the height H to the battery diameter D is 1 or less ($H/D \leq 1$). Therefore, the rechargeable battery **1** according to the embodiment is a coin-type battery or a button-type battery and may form a thin coin or button shape.

[0062] Herein, another embodiment of the present invention is described. By comparing the first and second embodiments, the description for the same configurations may be omitted, and different configurations are mainly described regarding the second embodiment.

[0063] FIG. **4** is a perspective view showing a rechargeable battery according to an embodiment of the present invention; FIG. **5** is an exploded perspective view of the rechargeable battery of FIG. **4**; and FIG. **6** is a cross-sectional view taken along the line VI-VI of FIG. **4**.

[0064] Referring to FIG. **4** to FIG. **6**, in a cap assembly **30**, a terminal plate **33** includes a flange part **331** and a protruded terminal **332**. The rechargeable battery according to an embodiment further includes an insulating member that is disposed between the cap plate **31** and the terminal plate **33** to electrically insulate the cap plate **31** and the terminal plate **33** from each other.

[0065] The flange part **331** is disposed between the cap plate **31** and the electrode assembly **10**, is disposed inside a step **621** of a first insulating member **62**, and is electrically insulated from and attached to an inner surface of the cap plate **31** via an insulating member. As an example, the insulating member may be formed of a thermal-fusion member **34**.

[0066] In the terminal plate **33**, the protruded terminal **332** is protruded from a center of the flange part **331** to the outside through a through hole **341** of the thermal-fusion member **34** and a terminal hole **311** of the cap plate **31**, and an inner surface of the terminal plate **33** (e.g., an inner surface of the protruded terminal **332**) is electrically connected to the second electrode tab **52**. The second electrode tab **52** may be connected to the inner surface of the flange part **331** or the inner surface of the protruded terminal **332**, or both.

[0067] The protruded terminal **332** is protruded more with a second height difference $\Delta H2$ than an outer surface of the cap plate **31** to form an outer surface of the rechargeable battery **2**. That is, the outer surface of the protruded terminal **332** is more protruded than the outer surface of the cap plate **31** with reference to a bottom of the case **20**, and the outer surface of the protruded terminal **332** and the outer surface of the cap plate **31** have the second height difference $\Delta H2$.

[0068] Herein, first, second, and third insulating members **62**, **622**, and **623** are described. The first insulating member **62** is disposed on an upper side of the second electrode tab **52** and is attached to

the inner surface of the cap plate **31** to further extend to the inner surface of the flange part **331**. The first insulating member **62** may form an electrically insulating structure between the cap plate **31** and the second electrode tab **52**, between the cap plate **31** and the electrode assembly **10**, and between the flange part **331** and the electrode assembly **10**.

[0069] As an example, the first insulating member **62** may be formed of an insulating washer having a step **621** corresponding to the exterior diameter of the thermal-fusion member **34**. Therefore, the protruded terminal **332** is protruded from the center of the flange part **331** to the outside, is protruded toward the outside through the through hole **341** of the thermal-fusion member **34** and the terminal hole **311** of the cap plate **31**, and is electrically connected to the second electrode tab **52** at the inner surface of the terminal plate **33**.

[0070] The second insulating member **622** is attached to a lower side of the second electrode tab **52**. As an example, the second insulating member **622** may be formed of an insulating tape attached to a surface of the second electrode tab **52**, a part of the protruded terminal **332**, and a part of the first insulating member **62**. The second insulating member **622** may form an electrically insulating structure between the second electrode tab **52** and the second end **102** of the electrode assembly **10**.

[0071] The third insulating member **623** is attached to the second end **102** of the electrode assembly **10** at a side of the second electrode tab **52**. As an example, the third insulating member **623** may be attached to a center of the second end **102** of the electrode assembly **10** and may be formed of an insulating disk that is larger than the inner surface of the flange part **331** so as to be overlapped by a distance (e.g., a predetermined distance) L**2** around the step **621** of the first insulating member **62**.

[0072] The first and second insulating members **62** and **622** electrically insulate both sides of the second electrode tab **52** from the cap plate **31** and the electrode assembly **10**. In addition, the third insulating member **623** may further electrically insulate the second electrode tab **52** and the electrode assembly **10** in the opened portion of the second end **102** of the electrode assembly **10** despite the use of the first and second insulating members **62** and **622**.

[0073] Referring to FIG. **4**, in the rechargeable battery **2** according to an embodiment, in a state in which the opening **21** of the case **20** is closed and sealed with the cap assembly **30**, the height H is set as the distance between a bottom outer plane of the case **20** and the protruded terminal **332**, and the battery diameter D is set as the exterior circumference of the case **20**. In an embodiment, the ratio of the height H to the battery diameter D is 1 or less ($H/D \leq 1$). Therefore, the rechargeable battery according to an embodiment may have a thin coin or button shape as in a coin cell or a button cell.

[0074] While the present invention has been described in connection with what are presently considered to be some practical embodiments, it is to be understood that the invention is not limited to the disclosed embodiments. On the contrary, it is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

Claims

1. A button cell comprising: an electrode assembly comprising a first electrode tab and a second electrode tab; a case comprising an opening and receiving the electrode assembly to be connected to the first electrode tab; a cap assembly comprising a cap plate coupled to the case and covering the opening, and a terminal plate coupled to the cap plate and connected to the second electrode tab; a first insulating member between the second electrode tab and the cap plate along a height direction, the first insulating member being adjacent the second electrode tab along the height direction; a second insulating member attached to a lower surface of the second electrode tab and extending between the lower surface and the electrode assembly, the lower surface facing toward the electrode assembly; and a third insulating member arranged below the lower surface of the second electrode tab and the second insulating member so as to extend between the second

electrode tab and the electrode assembly, the second insulating member arranged between the third insulating member and the second electrode tab along the height direction, wherein, in a plan view along the height direction, each of the cap plate and the first insulating member overlaps the second insulating member.

2. The button cell of claim 1, wherein the electrode assembly comprises a first electrode, a second electrode, and a separator therebetween, the first electrode is connected to the first electrode tab, and the second electrode is connected to the second electrode tab.

3. The button cell of claim 2, further comprising an insulating member between the cap plate and the terminal plate to electrically insulate the cap plate and the terminal plate from each other.

4. The button cell of claim 2, wherein the terminal plate comprises: a flange part located outside the cap plate and electrically insulated from and attached to an outer surface of the cap plate; and a tab connection part protruded from a center of the flange part to be protruded toward the electrode assembly through a terminal hole of the cap plate and a through hole of the first insulating member, and electrically connected to the second electrode tab at an inner surface of the tab connection part.

5. The button cell of claim 4, wherein the first insulating member comprises an insulating washer attached to an inner surface of the cap plate and having the through hole.

6. The button cell of claim 5, wherein the second insulating member comprises an insulating tape attached to the lower surface of the second electrode tab, a part of the tab connection part, and a part of the first insulating member.

7. The button cell of claim 5, wherein the third insulating member comprises an insulating disk attached to a center of an end of the electrode assembly and being larger than the inner surface of the tab connection part to be overlapped around the through hole of the first insulating member.

8. The button cell of claim 2, wherein the terminal plate comprises: a flange part between the cap plate and the electrode assembly and located at an inner side of a step of the first insulating member to be electrically insulated from and attached to an inner surface of the cap plate; and a protruded terminal protruded from a center of the flange part to penetrate a terminal hole of the cap plate and electrically connected to the second electrode tab at an inner surface of the terminal plate.

9. The button cell of claim 8, wherein the first insulating member comprises an insulating washer attached to the inner surface of the cap plate and comprising the step, and the flange part is arranged at the step.

10. The button cell of claim 9, wherein the second insulating member comprises an insulating tape attached to the lower surface of the second electrode tab, a part of the protruded terminal, and a part of the first insulating member.

11. The button cell of claim 9, wherein the third insulating member comprises an insulating disk attached to a center of an end of the electrode assembly and being larger than an inner surface of the flange part to be overlapped around the step of the first insulating member.

12. The button cell of claim 1, wherein a height of the button cell along the height direction is less than a diameter of the button cell in a diameter direction intersecting the height direction.