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Rechargeable button cell and method for its manufacture

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Description

The invention relates to a rechargeable button cell, which contains negative and positive electrodes in the form of tablets separated by a separator and an alkaline electrolyte in a casing which is formed from a lower part in the form of a cup and an upper part in the form of a lid which fits therein, the casing parts being sealed in a gas-tight manner by swaging or crimping with the interposition of a sealing ring.

The invention furthermore relates to a method for manufacturing cells of the type mentioned above.

Rechargeable button cells and their physical design are known from the document "Rechargeable Batteries in Japan" edited by Y. Miyatake and A. Kozawa, JEC Press Inc., 1977, p. 388 - 391. In this case, these cells are assembled in such a manner that the positive electrode, which is pressed in the form of a tablet, is inserted into the cell container, alkaline electrolyte is added in a controlled manner, the separator, the negative electrode in the form of a tablet and the lid with the contact spring and sealing ring are positioned above the electrolyte, and the cell is sealed in a gas-tight manner by swaging or crimping the edge of the container over the edge of the lid. During the assembly process described above, it is absolutely essential for the electrodes to be positioned centrally and not to move into an eccentric, offset position as a result of mechanical influences, for example caused by vibration from the feed process on the assembly line. In this case, there is a risk of the separator being moved laterally and, in consequence, of the electrodes being short-circuited, and this can lead to total failure of the electrochemical cell. In addition, if the electrodes are in an eccentric position, there is a risk of it no longer being possible to join the seal and the cell lid centrally which, in the case of



- 3 -

automatic assembly with high production rates, leads to damage to the seal and/or to the negative electrode. The latter has a disadvantageous influence on both the sealing properties and the electrical characteristics of the electrochemical cell. This is evident, for example, in an increase in the internal resistance of the cell.

The invention is based on the object of specifying a rechargeable button cell and a method for its manufacture which allow the electrodes and the separator to be positioned in the button cell centrally, and such that they are protected against short circuits, during automatic manufacture at high production rates.

According to the invention, the object is achieved in that, in the case of button cells of the type described above, the sealing ring has on the edge pointing into the button cell at least 3 retaining tabs which hold and center the electrode tablet located in the casing upper part. The invention is furthermore refined as described in claims 2 - 4.

The method according to the invention for manufacturing a button cell is carried out in such a manner that electrolyte, an electrode tablet and the separator are introduced into the casing lower part in the form of a cup, that the casing upper part, in the form of a lid, is fitted with the sealing ring, the other electrode tablet and, possibly, with a contact spring, and that the casing upper part is folded onto the casing lower part and the casing of the button cell is sealed in a gas-tight manner by swaging or crimping. The button cell according to the invention and the method for its manufacture have the advantage that one of the electrodes is clamped in the casing upper part, in the form of a lid, by the cell seal such that it is protected again vibration. The retaining tabs located



on the inside of the sealing ring ensure that the electrode is seated centrally. The separate prior assembly of the positive and negative electrodes, on the one hand in the casing lower part in the form of a cup and on the other hand in the casing upper part in the form of a lid, allow highly-automated production. The clamping and centering of one electrode in the casing upper part furthermore has the advantage that automatic assembly, with short-circuit protection, can be carried out at a high production rate without damage to the sealing ring or to the negative electrode. Furthermore, clamping one electrode in the casing upper part in the form of a lid allows simple prior fitting of a contact spring, since this is held in the casing upper part by the electrode tablet located above it, without any additional welded joint.

The invention is explained in the following text using Figures 1 - 3 by way of example.

Figure 1 shows a sectional illustration of the individual parts of a rechargeable button cell according to the invention.

Figure 2 shows the inside of the casing upper part, in the pre-assembled state.

Figure 3 shows the refinement Versions A to E of the retaining tabs illustrated with the aid of the section through the casing upper part in the pre-assembled state.

The rechargeable button cells according to the invention are manufactured, according to Figure 1, in such a manner that, in the first of two separate initial assembly lines, electrolyte 5, the positive electrode 7 and the separator 6 are introduced into the casing lower part 8 in the form of a cup. In a second line, the contact spring 2 as well as the negative



- 5 -

electrode 3 are inserted into the casing upper part 1, in the form of a lid, and are held and centered by fitting the sealing ring 4. The pre-assembled casing upper part is then folded onto the pre-assembled casing lower part, and the two parts are sealed in a gas-tight manner by swaging or crimping the edge of the container of the casing lower part 8 over the edge of the lid of the casing upper part 1. Figure 2 shows that the negative electrode tablet 3 is held centrally in the casing upper part 1 by the retaining tabs 9 on the sealing ring 4, gas exchange channels 11 remaining free. These gas exchange channels 11 are required to allow the gas produced in overcharging reactions to be converted on the rear of the negative electrode 3, which is designed as a gas dissipation electrode. Figure 3 shows the Versions A - E for the refinement of the retaining tabs 9 in conjunction with corresponding designs of the negative electrode tablet 3. In Versions A - C, the electrode tablet 3 is held by retaining tabs 9 by means of a push fit, the retaining tabs 9 extending to an increasing extent along the side surface of the electrode tablet 3.

In Version D, the edge of the electrode tablet 3 pointing towards the separator is chamfered. The retaining tabs 9 then have a matching chamfer according to the invention and hold the electrode tablet 9 in the casing upper part 1 by partially covering it.

In Version E, an annular step is formed in the electrode tablet 3, into which the retaining tabs 9 extend.

The sealing ring 4 is preferably held on the casing upper part 1 by a thickened region 10 which is in the form of a bead running around the inside of the sealing ring 4. In this case, when the sealing ring 4 is pushed onto the casing upper part 1, the casing upper part 1, whose lid edge is preferably folded back, latches in

- 6 -

behind the thickened region 10 (which is in the form of a bead) of the sealing ring 4 to provide a clip connection.

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Patent Claims

1. A rechargeable button cell, which contains negative and positive electrodes (3, 7) in the form of tablets separated by a separator (6) and an alkaline electrolyte (5) in a casing lower part (8) in the form of a cup, and a casing upper part (1) which is in the form of a lid and fits therein, the casing parts (1, 8) being connected to one another in a gas-tight manner by swaging or crimping with the interposition of a sealing ring (4), wherein the sealing ring (4) has on the edge pointing into the button cell at least 3 retaining tabs (9) which hold and center the electrode tablet (3) located in the casing upper part (1).
2. The rechargeable button cell as claimed in claim 1, wherein the retaining tabs (9) extend along the narrow side of the electrode tablet (3) or partially over their side pointing toward the separator (6).
3. The rechargeable button cell as claimed in claim 1 or 2, wherein the sealing ring (4) is held on the casing upper part (1) by a push fit or a thickened region (10) in the form of a bead.
4. The rechargeable button cell as claimed in one or more of claims 1 to 3, wherein the sealing ring (4) holds an electrode tablet (3) and, possibly, a contact spring (2) in the casing upper part (1).
5. A method for manufacturing a rechargeable button cell as claimed in one or more of claims 1 to 4, wherein electrolyte (5), an electrode tablet (7) and the separator (6) are introduced into the casing lower part (8) in the form of a cup, wherein the casing upper part (1), in the form of a lid, is fitted with the sealing ring (4), the

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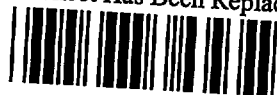
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other electrode tablet (3) and, possibly, with a contact spring (2), and wherein the casing upper part (1) is folded onto the casing lower part (8) and the casing is sealed in a gas-tight manner by swaging or crimping.

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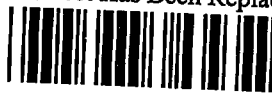
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Rechargeable button cell and method for its manufacture

5 The invention relates to a rechargeable button cell,
which contains negative and positive electrodes in the
form of tablets separated by a separator and an
alkaline electrolyte in a casing which is formed from a
lower part in the form of a cup and an upper part in
10 the form of a lid which fits therein, the casing parts
being sealed in a gas-tight manner by swaging or
crimping with the interposition of a sealing ring. The
button cells according to the invention have a sealing
ring (4) which has on the edge pointing into the button
15 cell at least 3 retaining tabs (9) which hold and
center the electrode tablet (3) located in the casing
upper part (1). The method according to the invention
for manufacturing the button cell is distinguished by
separate prior assembly of the casing lower part with
20 the positive electrode and the casing upper part with
the negative electrode.

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23 FEB 1978

- 1 -RECHARGEABLE BUTTON CELL AND METHOD FOR ITS MANUFACTURE

The invention relates to a rechargeable button cell, which contains negative and positive electrodes in the form of tablets separated by a separator and an alkaline electrolyte in a casing which is formed from a lower part in the form of a cup and an upper part in the form of a lid which fits therein, the casing parts being sealed in a gas-tight manner by swaging or crimping with the interposition of a sealing ring.

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automatic assembly with high production rates, leads to damage to the seal and/or to the negative electrode. The latter has a disadvantageous influence on both the sealing properties and the electrical characteristics of the electrochemical cell. This is evident, for example, in an increase in the internal resistance of the cell.

The invention is based on the object of specifying a rechargeable button cell and a method for its manufacture which allow the electrodes and the separator to be positioned in the button cell centrally, and such that they are protected against short circuits, during automatic manufacture at high production rates.

According to the invention, the object is achieved in that, in the case of button cells of the type described above, the sealing ring has on the edge pointing into the button cell at least 3 retaining tabs which hold and center the electrode tablet located in the casing upper part. The invention is furthermore refined as described in claims 2 - 4.

The method according to the invention for manufacturing a button cell is carried out in such a manner that electrolyte, an electrode tablet and the separator are introduced into the casing lower part in the form of a cup, that the casing upper part, in the form of a lid, is fitted with the sealing ring, the other electrode tablet and, possibly, with a contact spring, and that the casing upper part is folded onto the casing lower part and the casing of the button cell is sealed in a gas-tight manner by swaging or crimping. The button cell according to the invention and the method for its manufacture have the advantage that one of the electrodes is clamped in the casing upper part, in the form of a lid, by the cell seal such that it is protected against vibration. The retaining tabs located

23 FEB 1998

- 3 -

on the inside of the sealing ring ensure that the electrode is seated centrally. The separate prior assembly of the positive and negative electrodes, on the one hand in the casing lower part in the form of a cup and on the other hand in the casing upper part in the form of a lid, allow highly-automated production. The clamping and centering of one electrode in the casing upper part furthermore has the advantage that automatic assembly, with short-circuit protection, can be carried out at a high production rate without damage to the sealing ring or to the negative electrode. Furthermore, clamping one electrode in the casing upper part in the form of a lid allows simple prior fitting of a contact spring, since this is held in the casing upper part by the electrode tablet located above it, without any additional welded joint.

The invention is explained in the following text using Figures 1 - 3 by way of example.

Figure 1 shows a sectional illustration of the individual parts of a rechargeable button cell according to the invention.

Figure 2 shows the inside of the casing upper part, in the pre-assembled state.

Figure 3 shows the refinement Versions A to E of the retaining tabs illustrated with the aid of the section through the casing upper part in the pre-assembled state.

The rechargeable button cells according to the invention are manufactured, according to Figure 1, in such a manner that, in the first of two separate initial assembly lines, electrolyte 5, the positive electrode 7 and the separator 6 are introduced into the casing lower part 8 in the form of a cup. In a second line, the contact spring 2 as well as the negative

22 FEB 1978

electrode 3 are inserted into the casing upper part 1, in the form of a lid, and are held and centered by fitting the sealing ring 4. The pre-assembled casing upper part is then folded onto the pre-assembled casing lower part, and the two parts are sealed in a gas-tight manner by swaging or crimping the edge of the container of the casing lower part 8 over the edge of the lid of the casing upper part 1. Figure 2 shows that the negative electrode tablet 3 is held centrally in the casing upper part 1 by the retaining tabs 9 on the sealing ring 4, gas exchange channels 11 remaining free. These gas exchange channels 11 are required to allow the gas produced in overcharging reactions to be converted on the rear of the negative electrode 3, which is designed as a gas dissipation electrode. Figure 3 shows the Versions A - E for the refinement of the retaining tabs 9 in conjunction with corresponding designs of the negative electrode tablet 3. In Versions A - C, the electrode tablet 3 is held by retaining tabs 9 by means of a push fit, the retaining tabs 9 extending to an increasing extent along the side surface of the electrode tablet 3.

In Version D, the edge of the electrode tablet 3 pointing towards the separator is chamfered. The retaining tabs 9 then have a matching chamfer according to the invention and hold the electrode tablet 9 in the casing upper part 1 by partially covering it.

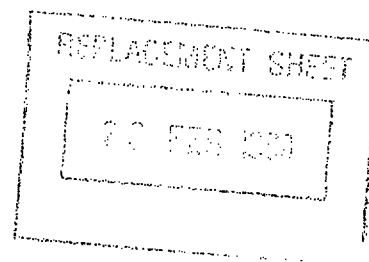
In Version E, an annular step is formed in the electrode tablet 3, into which the retaining tabs 9 extend.

The sealing ring 4 is preferably held on the casing upper part 1 by a thickened region 10 which is in the form of a bead running around the inside of the sealing ring 4. In this case, when the sealing ring 4 is pushed onto the casing upper part 1, the casing upper part 1, whose lid edge is preferably folded back, latches in

23 FEB 1998

- 5 -

behind the thickened region 10 (which is in the form of a bead) of the sealing ring 4 to provide a clip connection.



1. A rechargeable button cell, which contains negative and positive electrodes (3, 7) in the form of tablets separated by a separator (6) and an alkaline electrolyte (5) in a casing lower part (8) in the form of a cup, and a casing upper part (1) which is in the form of a lid and fits therein, the casing parts (1, 8) being connected to one another in a gas-tight manner by swaging or crimping with the interposition of a sealing ring (4), wherein the sealing ring (4) has on the edge pointing into the button cell at least 3 retaining tabs (9) which hold and center the electrode tablet (3) located in the casing upper part (1).
2. The rechargeable button cell as claimed in claim 1, wherein the retaining tabs (9) extend along the narrow side of the electrode tablet (3) or partially over their side pointing toward the separator (6).
3. The rechargeable button cell as claimed in claim 1 or 2, wherein the sealing ring (4) is held on the casing upper part (1) by a push fit or a thickened region (10) in the form of a bead.
4. The rechargeable button cell as claimed in one or more of claims 1 to 3, wherein the sealing ring (4) holds an electrode tablet (3) and, possibly, a contact spring (2) in the casing upper part (1).
5. A method for manufacturing a rechargeable button cell as claimed in one or more of claims 1 to 4, wherein electrolyte (5), an electrode tablet (7) and the separator (6) are introduced into the casing lower part (8) in the form of a cup, wherein the casing upper part (1), in the form of a lid, is fitted with the sealing ring (4), the



23 FEB 1998

other electrode tablet (3) and, possibly, with a contact spring (2), and wherein the casing upper part (1) is folded onto the casing lower part (8) and the casing is sealed in a gas-tight manner by swaging or crimping.



23 FEB 1998

RECHARGEABLE BUTTON CELL AND METHOD FOR ITS MANUFACTURE

Abstract

Rechargeable button cell and method for its manufacture

The invention relates to a rechargeable button cell, which contains negative and positive electrodes in the form of tablets separated by a separator and an alkaline electrolyte in a casing which is formed from a lower part in the form of a cup and an upper part in the form of a lid which fits therein, the casing parts being sealed in a gas-tight manner by swaging or crimping with the interposition of a sealing ring. The button cells according to the invention have a sealing ring (4) which has on the edge pointing into the button cell at least 3 retaining tabs (9) which hold and center the electrode tablet (3) located in the casing upper part (1). The method according to the invention for manufacturing the button cell is distinguished by separate prior assembly of the casing lower part with the positive electrode and the casing upper part with the negative electrode.

Figure 1

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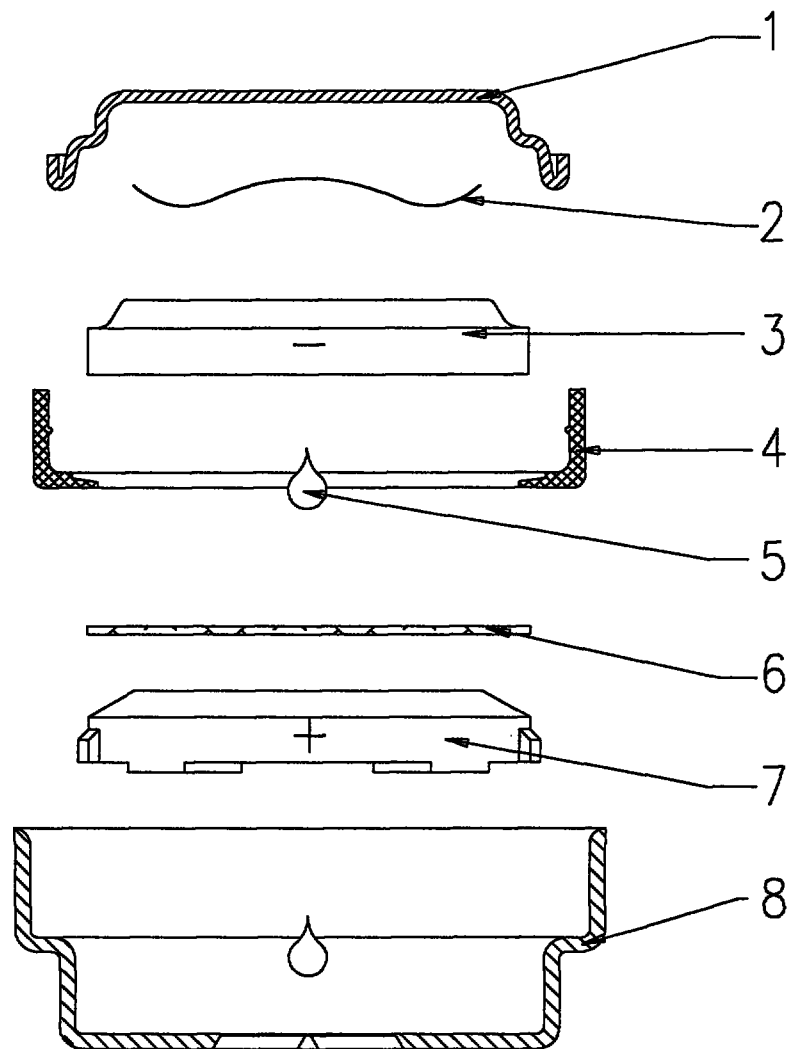


Fig .1

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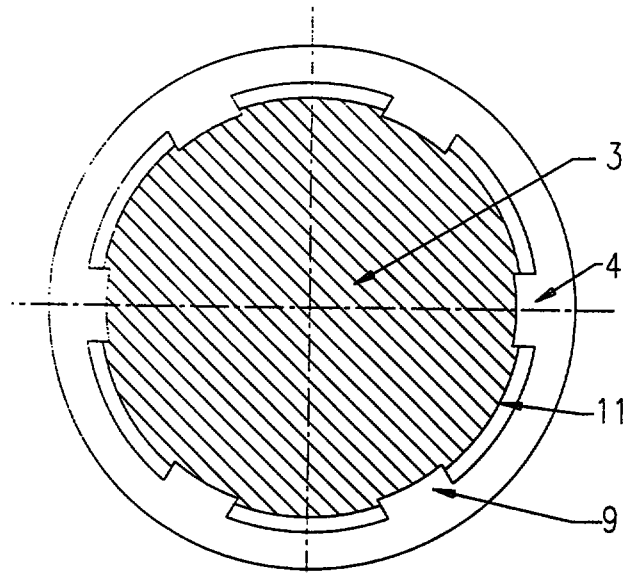


Fig. 2

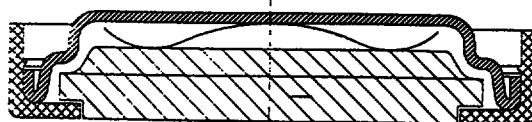
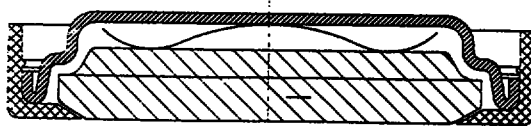
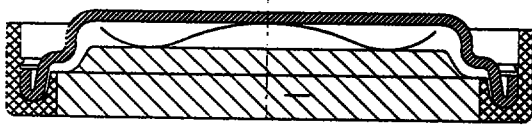
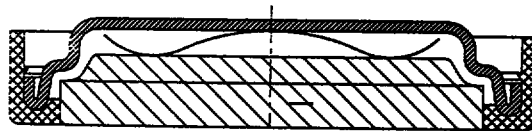
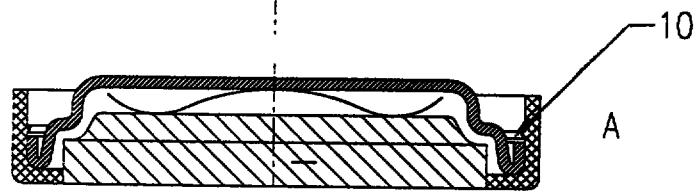


Fig. 3