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Kelkheim, 03.12.96

T U 2 - Dr. Ro/en

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**Alkaline rechargeable battery and method for its
manufacture**

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Description:

The invention relates to an alkaline rechargeable battery having electrodes in the form of tablets in a lower part in the form of a cup and an upper part in the form of a lid which fits into said lower part, which lower part and upper part are connected to one another by swaging or crimping with the interposition of a sealing ring. The invention also relates to a method for manufacturing the rechargeable batteries described above.

German Patent 1596306 discloses a rechargeable battery in which the electrodes are held by two insulating rings which engage over one another. The proposed connection of the insulating rings by means of a screw connection or bayonet fitting, the proposed electrical leads and the number of parts used do not allow economic, automated production.

The invention is based on the object of specifying a rechargeable battery with an assembly aid for the electrodes, and a simple method for manufacturing such rechargeable batteries.

According to the invention, the object is achieved by an alkaline rechargeable battery in which the electrodes, in the form of tablets, and the separator arranged between them are inserted into an electrically non-conductive mounting cage, which is open on one side. The solution according to the invention allows the positive electrode and negative electrode to be assembled without any risk of shunt paths, production being simplified by the use of an integral mounting cage.

The mounting cage used in the rechargeable battery according to the invention is advantageously designed in the manner described in claims 2 - 4. The retaining

- arms are used during insertion of the separator as lateral centering aids, by which means the separator is centered without any offset or distortion. The thickness of the retaining arms also ensures a defined lateral expansion space between the electrode set and the rechargeable battery casing, which is formed from the lower part, in the form of a cup, and the upper part, in the form of a lid.
- 10 The rechargeable battery according to the invention is manufactured by the electrode tablets being inserted into an integral mounting cage, which is open on one side, with the interposition of a separator. This electrode set is placed in the lower part, in the form of a cup, and is impregnated with electrolyte, and the upper part, in the form of a lid, is fitted with the interposition of an electrically insulating sealing ring and is sealed by swaging or crimping the edge of the container over the edge of the lid, a contact spring on the side of the mounting cage bounded by the ring making the electrical contact. The integral mounting cage simplifies production in that the electrodes and the separator are combined to form an electrode set, which can be stored in magazines and allows automated production.

The method for manufacturing the rechargeable battery according to the invention is explained in more detail in claims 6 - 8. The proposed procedure ensures that the electrode set can be subjected to decarbonization and/or electrolyte impregnation outside the rechargeable battery vessel, in the form of a cup, with a defined electrode geometry. Furthermore, this ensures distortion-free, uniform wetting of the separator and the addition of electrolyte into the rechargeable battery casing, in the form of a cup, can be restricted or completely avoided.



A number of embodiments of the invention will be explained in more detail with reference to Figures 1 and 2.

5 Figure 1 shows a cross section through an electrode set which is held together by the mounting cage 1 and comprises the negative electrode 4, the separator 6 and the positive electrode 5. The negative electrode 4 in this case rests against the ring 2 of the mounting cage
10 1, and the separator 6 as well as the positive electrode 5 are held accurately in position above it by the retaining arms 3 and the projections 7 located on them. The mounting cage 1 is made from an insulating plastic, such as PE, PP, PVC, PTFE or a similar
15 material, by injection molding. The electrodes can be packaged in nickel wire mesh or can be embedded in nickel foam. For volume equalization and in order to make contact, a contact spring, which is used as an electrical lead, is fitted on the side of the mounting
20 cage 1 bounded by the ring 2.

Figure 2 shows the side view of the mounting cage 1. The ring-like connection 8 of the retaining arms 3 increases the robustness of the mounting cage 1 and, by
25 being arranged in the region of the separator 6, improves the protection against shunt paths. The thickness of the retaining arms 3 ensures the gas exchange area required for the gas produced in the event of overcharging reactions.

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Patent Claims

1. An alkaline rechargeable battery having electrodes in the form of tablets in a lower part in the form of a cup and an upper part in the form of a lid which fits into said lower part, which lower part and upper part are connected to one another by swaging or crimping with the interposition of a sealing ring, wherein the electrodes (4, 5), in the form of tablets, and the separator (6) arranged between them are inserted into an electrically non-conductive mounting cage (1), which is open on one side.
2. The alkaline rechargeable battery as claimed in claim 1, wherein the mounting cage (1) comprises a ring (2) from whose outer edge retaining arms (3) extend over the thickness of the electrode set formed from the two electrode tablets (4, 5) and the separator (6), and these retaining arms (3) have projections (7) on the side pointing inward at their other end.
3. The alkaline rechargeable battery as claimed in claim 1 or 2, wherein the retaining arms (3) of the mounting cage (1) are connected to one another in an annular shape by a circumferential joint (8).
4. The alkaline rechargeable battery as claimed in one or more of claims 1 to 3, wherein the mounting cage (1) has the shape of a truncated cone, the ring (2) forming the termination on the smaller circular surface of the truncated cone.
5. A method for manufacturing an alkaline rechargeable battery as claimed in one or more of claims 1 to 4, wherein the electrode tablets (4, 5) are inserted into an integral mounting cage



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5 (1), open on one side, with the interposition of a
separator (6), this electrode set is placed in the
electrode container and is impregnated with
electrolyte and the lid is sealed by swaging or
10 crimping the edge of the container over the edge
of the lid with the interposition of an
electrically insulating sealing ring, a contact
spring being fitted on the side of the mounting
cage (1) bounded by the ring (2) and making the
electrical contact.

6. The method as claimed in claim 5, wherein the
electrode set formed from the electrode tablets
15 (4, 5) arranged in the mounting cage (1) is
subjected to decarbonization and/or electrolyte
impregnation.

7. The method as claimed in claim 5 or 6, wherein the
electrode tablets (4, 5) and the separator (6) are
20 inserted in the mounting cage (1) in the sequence
negative electrode (4), separator (6), positive
electrode (5).

8. The method as claimed in claim 7, wherein a
25 contact spring is fitted on the negative electrode
(4).



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Abstract

**Alkaline rechargeable battery and method for its
manufacture**

The invention relates to an alkaline rechargeable battery having electrodes in the form of tablets in a lower part in the form of a cup and an upper part in the form of a lid which fits into said lower part, which lower part and upper part are connected to one another by swaging or crimping with the interposition of a sealing ring. The electrodes, in the form of tablets, and the separator arranged between them are inserted in an electrically non-conductive mounting cage, which is open on one side.

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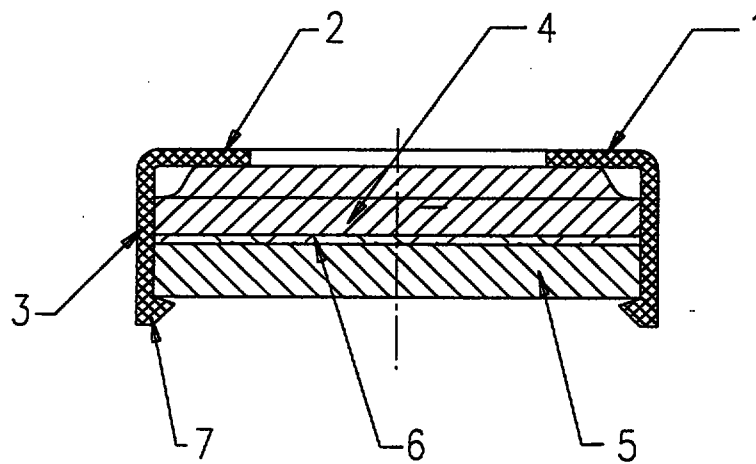


Fig.1

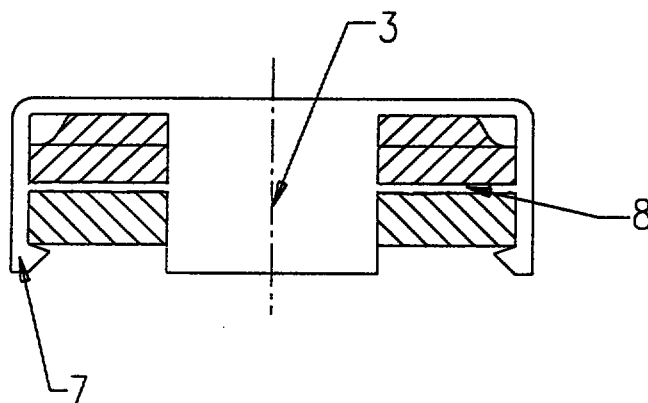


Fig.2

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Alkaline rechargeable battery and method for its manufacture

Description:

The invention relates to an alkaline rechargeable battery having electrodes in the form of tablets in a lower part in the form of a cup and an upper part in the form of a lid which fits into said lower part, which lower part and upper part are connected to one another by swaging or crimping with the interposition of a sealing ring. The invention also relates to a method for manufacturing the rechargeable batteries described above.

German Patent 1596306 discloses a rechargeable battery in which the electrodes are held by two insulating rings which engage over one another. The proposed connection of the insulating rings by means of a screw connection or bayonet fitting, the proposed electrical leads and the number of parts used do not allow economic, automated production.

The invention is based on the object of specifying a rechargeable battery with an assembly aid for the electrodes, and a simple method for manufacturing such rechargeable batteries.

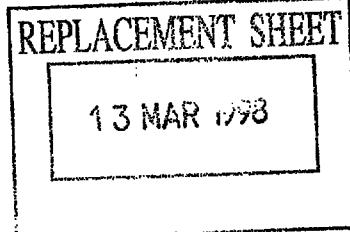
According to the invention, the object is achieved by an alkaline rechargeable battery in which the electrodes, in the form of tablets, and the separator arranged between them are inserted into an electrically non-conductive mounting cage, which is open on one side. The solution according to the invention allows the positive electrode and negative electrode to be assembled without any risk of shunt paths, production being simplified by the use of an integral mounting cage.

The mounting cage used in the rechargeable battery according to the invention is advantageously designed in the manner described in claims 2 - 4. The retaining

arms are used during insertion of the separator as lateral centering aids, by which means the separator is centered without any offset or distortion. The thickness of the retaining arms also ensures a defined lateral expansion space between the electrode set and the rechargeable battery casing, which is formed from the lower part, in the form of a cup, and the upper part, in the form of a lid.

10 The rechargeable battery according to the invention is manufactured by the electrode tablets being inserted into an integral mounting cage, which is open on one side, with the interposition of a separator. This electrode set is placed in the lower part, in the form of a cup, and is impregnated with electrolyte, and the upper part, in the form of a lid, is fitted with the interposition of an electrically insulating sealing ring and is sealed by swaging or crimping the edge of the container over the edge of the lid, a contact spring on the side of the mounting cage bounded by the ring making the electrical contact. The integral mounting cage simplifies production in that the electrodes and the separator are combined to form an electrode set, which can be stored in magazines and allows automated production.

The method for manufacturing the rechargeable battery according to the invention is explained in more detail in claims 6 - 8. The proposed procedure ensures that the electrode set can be subjected to decarbonization and/or electrolyte impregnation outside the rechargeable battery vessel, in the form of a cup, with a defined electrode geometry. Furthermore, this ensures distortion-free, uniform wetting of the separator and the addition of electrolyte into the rechargeable battery casing, in the form of a cup, can be restricted or completely avoided.



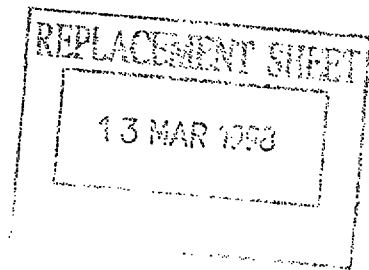
A number of embodiments of the invention will be explained in more detail with reference to Figures 1 and 2.

5 Figure 1 shows a cross section through an electrode set which is held together by the mounting cage 1 and comprises the negative electrode 4, the separator 6 and the positive electrode 5. The negative electrode 4 in this case rests against the ring 2 of the mounting cage
10 1, and the separator 6 as well as the positive electrode 5 are held accurately in position above it by the retaining arms 3 and the projections 7 located on them. The mounting cage 1 is made from an insulating plastic, such as PE, PP, PVC, PTFE or a similar
15 material, by injection molding. The electrodes can be packaged in nickel wire mesh or can be embedded in nickel foam. For volume equalization and in order to make contact, a contact spring, which is used as an electrical lead, is fitted on the side of the mounting
20 cage 1 bounded by the ring 2.

Figure 2 shows the side view of the mounting cage 1. The ring-like connection 8 of the retaining arms 3 increases the robustness of the mounting cage 1 and, by
25 being arranged in the region of the separator 6, improves the protection against shunt paths. The thickness of the retaining arms 3 ensures the gas exchange area required for the gas produced in the event of overcharging reactions.



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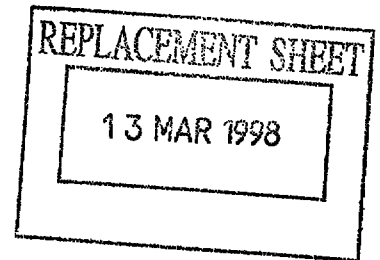


Patent Claims

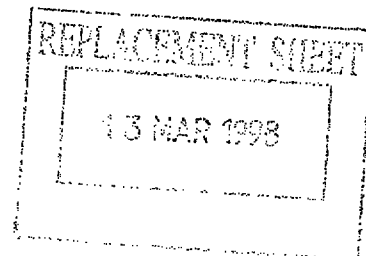
1. An alkaline rechargeable battery having electrodes in the form of tablets in a lower part in the form of a cup and an upper part in the form of a lid which fits into said lower part, which lower part and upper part are connected to one another by swaging or crimping with the interposition of a sealing ring, wherein the electrodes (4, 5), in the form of tablets, and the separator (6) arranged between them are inserted into an electrically non-conductive mounting cage (1), which is open on one side.
2. The alkaline rechargeable battery as claimed in claim 1, wherein the mounting cage (1) comprises a ring (2) from whose outer edge retaining arms (3) extend over the thickness of the electrode set formed from the two electrode tablets (4, 5) and the separator (6), and these retaining arms (3) have projections (7) on the side pointing inward at their other end.
3. The alkaline rechargeable battery as claimed in claim 1 or 2, wherein the retaining arms (3) of the mounting cage (1) are connected to one another in an annular shape by a circumferential joint (8).
4. The alkaline rechargeable battery as claimed in one or more of claims 1 to 3, wherein the mounting cage (1) has the shape of a truncated cone, the ring (2) forming the termination on the smaller circular surface of the truncated cone.
5. A method for manufacturing an alkaline rechargeable battery as claimed in one or more of claims 1 to 4, wherein the electrode tablets (4, 5) are inserted into an integral mounting cage



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- 5 (1), open on one side, with the interposition of a separator (6), this electrode set is placed in the electrode container and is impregnated with electrolyte and the lid is sealed by swaging or crimping the edge of the container over the edge of the lid with the interposition of an electrically insulating sealing ring, a contact spring being fitted on the side of the mounting cage (1) bounded by the ring (2) and making the electrical contact.
- 10
6. The method as claimed in claim 5, wherein the electrode set formed from the electrode tablets (4, 5) arranged in the mounting cage (1) is subjected to decarbonization and/or electrolyte impregnation.
- 15
7. The method as claimed in claim 5 or 6, wherein the electrode tablets (4, 5) and the separator (6) are inserted in the mounting cage (1) in the sequence negative electrode (4), separator (6), positive electrode (5).
- 20
8. The method as claimed in claim 7, wherein a contact spring is fitted on the negative electrode (4).
- 25



Abstract

Alkaline rechargeable battery and method for its manufacture

The invention relates to an alkaline rechargeable battery having electrodes in the form of tablets in a lower part in the form of a cup and an upper part in the form of a lid which fits into said lower part, which lower part and upper part are connected to one another by swaging or crimping with the interposition of a sealing ring. The electrodes, in the form of tablets, and the separator arranged between them are inserted in an electrically non-conductive mounting cage, which is open on one side.

Figure 1

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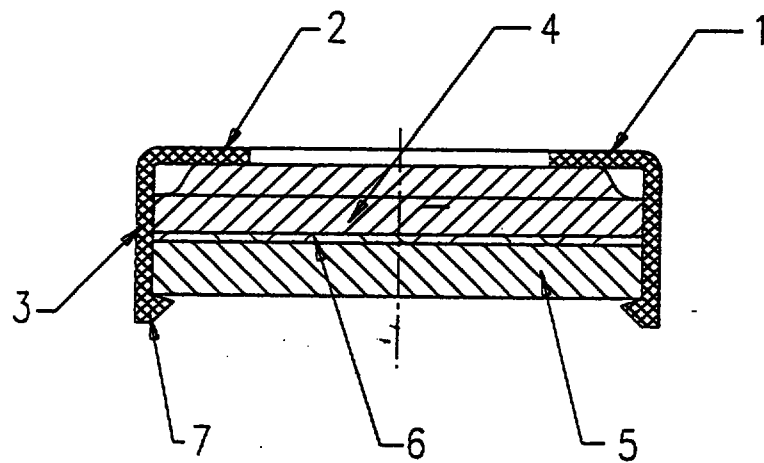


Fig.1

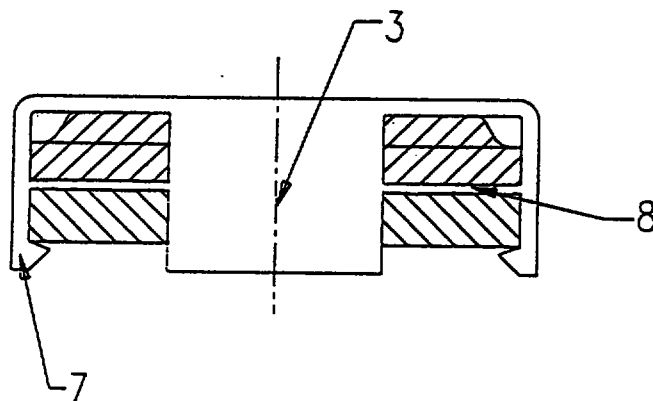


Fig.2