

**Prismatic rechargeable battery, and method for  
producing it**

The invention relates to a prismatic rechargeable  
5 battery having a housing which has a plurality of cell  
vessels which are separated from one another by  
electrically insulating intermediate walls, and having  
plate stacks which are formed from stacked electrode  
plates, with one plate stack being held in each of the  
10 cell vessels.

The invention also relates to a method for production  
of a prismatic rechargeable battery such as this.

15 Prismatic rechargeable batteries are well known and  
comprise a plurality of encapsulated battery cells  
which are arranged alongside one another in a common  
housing, are each formed from stacked electrode plates,  
and are filled with electrolyte.

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EP 1 087 449 A1 discloses a typical conventional  
prismatic rechargeable battery. The battery cells,  
which have a large number of stacked electrode plates,  
are inserted from above into associated vessels in a  
25 housing, with the cover open. The cell vessels are in  
this case formed by electrically insulating  
intermediate walls. Output conductor plates are  
provided on the opposite sides of the battery cells,  
which are adjacent to the intermediate walls, and are  
30 each welded to the positive and negative electrode  
plates. The output conductor plates are guided upwards  
in a dead space in the housing in the area of the  
cover, where they are welded to the adjacent output  
conductor plate, in order to produce an electrical  
35 connection.

In order to shorten the current-carrying paths,  
WO 03/015194 A1 proposes that contact connections on

the front face be welded in cutouts in the housing to the respective battery cells which are adjacent to output conductor plates arranged on the opposite sides of an intermediate wall.

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One object of the invention is to provide an improved prismatic rechargeable battery which has as low an internal resistance as possible and has a higher packing density, because the dead space is reduced.

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According to the invention, the object is achieved by the prismatic rechargeable battery of this generic type in that contact connector plates extend along each of the intermediate walls, are electrically conductively connected to one another through the intermediate wall on contact connector plates which are opposite on the intermediate wall, and the contacts of the plate stacks are electrically conductively connected to the associated contact connector plates.

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The additional contact connector plates make it possible to first of all produce an electrical field-contact between adjacent contact connector plates through the respective intermediate wall. In consequence, no dead space is required in the cover in order to make contact. Furthermore, this creates an approximately direct connection between the contact connector plates with as low an internal resistance as possible.

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Once the plate stacks have been introduced into the cell vessels, the contacts on the plate stacks can then be electrically conductively connected to the contact connector plates, for example by welding, soldering or brazing.

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In order to further reduce the internal resistance, it is advantageous if the contact connector plates are

electrically connected a plurality of times over their length to an associated contact connector plate which is arranged on the opposite side of the intermediate wall. A particularly low internal resistance can be achieved if the electrical connection of associated contact connector plates is produced by a clinch-joining process, by cold-surface-pressing of the associated contact connector plates.

10 The contacts on the plate stacks are preferably in the form of output conductor plates, with the side edges of the positive electrode plates in a plate stack being welded to a first output conductor plate, and the side edges of the negative electrode plates in the plate stack being welded to a second output conductor plate at the opposite end of the plate stack. The output conductor plates are then preferably welded to the associated contact connector plates over the entire length.

20 It is particularly advantageous for the contacts in the plate stacks to be welded to the associated contact connector plates, and, furthermore, to be soldered to the outer edges of the welded joint. This makes it possible to achieve a mechanically high-strength joint, which is electrically highly conductive, can carry high currents and has a very low internal resistance.

Simple design and production of the prismatic rechargeable battery are achieved by inserting the plate stacks into the cell vessels on the front face of the housing, rather than from above in the conventional manner. The side edges of the output conductor plates and contact connector plates are then exposed, and can easily be welded to one another, and if required soldered, in an accessible manner. The front cover of the housing is then placed on the side edges to the intermediate walls and side edges of the housing and is

welded to them, forming a seal, for example by means of known laser welding methods.

A further object of the invention is to provide an improved method for the production of a prismatic rechargeable battery.

According to the invention, the object is achieved by the steps of:

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- production of an electrical connection between contact connector plates which are in each case arranged on the opposite sides of an intermediate wall, through the intermediate wall;
- 15 - arrangement of plate stacks in the cell vessels which are formed by the intermediate walls;
- welding of the electrical contacts of the plate stacks to the contact connector plates; and
- closure of the housing in such a manner that the  
20 cell vessels and the housing are sealed.

The invention will be explained in more detail in the following text with reference to the attached drawings, in which:

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Figure 1 shows a perspective illustration of a prismatic rechargeable battery according to the invention;

30 Figure 2 shows a perspective illustration of a plate stack with stacked electrode plates and output conductor plates;

Figure 3 shows a perspective illustration of the opened housing of the prismatic rechargeable battery shown in Figure 1, without a front panel;

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Figure 4 shows a perspective illustration of the prismatic rechargeable battery shown in Figure 1, with a plate stack having been inserted into the cell vessels, but without a front panel;

Figure 5 shows a perspective illustration of a second embodiment of a prismatic rechargeable battery according to the invention;

Figure 6 shows a perspective exploded view of the housing of the prismatic rechargeable battery shown in Figure 5;

Figure 7 shows a perspective illustration of a plate stack with a second embodiment of output conductor plates;

Figure 8 shows a perspective illustration of the output conductor plate shown in Figure 7;

Figure 9 shows a perspective illustration of a contact connector plate; and

Figure 10 shows a section view of a detail of the prismatic rechargeable battery shown in Figure 6 in the area of the intermediate walls and of the connections between adjacent plate stacks.

Figure 1 shows a perspective view of a prismatic rechargeable battery 1. A degassing channel 2 is placed on the upper face of the housing. Furthermore, connecting contacts 3a, 3b for the positive and negative pole connection of the prismatic rechargeable battery 1 are fitted to the mutually opposite narrow faces of the housing.

The housing of the rechargeable battery 1 is closed by a front cover 4, which is placed on the housing and is welded to it, forming a seal.

5 Figure 2 shows a perspective view of a plate stack 5. This clearly shows that a large number of positive and negative electrode plates 6, which are stacked alternately one on top of the other, form the plate stack 5. The connecting lugs of the positive electrode  
10 plates 6 are passed to the outside on one side of the plate stack 5, where they are electrically conductively connected and mechanically joined to an output conductor plate 7a with the aid of known laser welding processes. The connections of the negative electrode  
15 plates 6 are connected in a corresponding manner to an output conductor plate 7b on the opposite side of the plate stack 5.

Plate stacks 5 (battery cells) such as these which are  
20 known per se are introduced into cell vessels 8 which are formed in the housing 9 by intermediate walls 10 which extend from the bottom to the cover of the housing 9. Contact connector plates 11 are provided on both upper faces of the intermediate walls 10 and  
25 extend over the entire length of the intermediate walls 10. The contact connector plates 11 which are located opposite on one intermediate wall 10 make contact with one another through the intermediate wall 10. This is preferably done with the aid of clinch joining  
30 processes, by the contact connector plates 11 being cold-joined without any additional material, in the area of the hole in the intermediate walls 10. The connecting contacts 3a, 3b are connected in a corresponding manner to the outer contact connector  
35 plates 11 on the inner walls of the narrow faces of the housing 9.

- 7 -

As can be seen from Figure 4, the plate stacks 5 are inserted into the cell vessels 8 in the housing 9. In this case, there is no longer any need for any dead space in the upper and lower area of the housing 9, since contact is made between the plate stacks 5 via the output conductor plates 7 and contact connector plates 11 on the longitudinal face of the plate stacks 5, and not in the area of the cover of the housing 9.

For this purpose, the output conductor plates 7 and contact connector plates 11, which are located directly alongside one another, are welded and/or soldered to one another, preferably over the entire length of the exposed edges of the output conductor plates 7 and contact connector plates 11, with the housing 9 open and without the front cover 4. It is particularly advantageous for a soldered joint to be applied to the outer edge of the weld bead or the output conductor plate 7 and contact connector plate 11.

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Figure 5 shows a perspective view of a second embodiment of a prismatic rechargeable battery 1. This clearly shows that the connecting contacts 3 are cold-surface-pressed by means of a clinch joining process to the associated internal contact connector plate at two points over the height of the rechargeable battery 1. Furthermore, the degassing valve 12 for the degassing channel is provided centered in the degassing channel 2 rather than on the side, as in the first embodiment shown in Figure 1.

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Figure 6 shows an exploded view of the prismatic rechargeable battery 1 shown in Figure 5. This clearly shows that the degassing channel 2 is placed on the upper face of the housing 9, in which degassing holes 13 are incorporated for each cell vessel 8.

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- 8 -

This also clearly shows that two holes 15 are in each case provided on the outer narrow faces 14 of the housing and on the intermediate walls 10, through which adjacent contact connector plates 11 are connected to one another, and contact connector plates 11 are electrically conductively permanently connected to one another, by means of the contact connections 3, on the narrow faces 14. A clinch joining process is preferably used for this purpose. Other methods, such as screwing, riveting, welding, soldering, etc. are, however, also possible.

If required, sealing elements are provided, such as O-rings or a coating in order to seal the holes 15, once contact has been made with the contact connector plates 11.

The use of a plurality of connection points within the physical height of the contact connector plates 11 further reduces the internal resistance.

Figure 6 shows a perspective view of a plate stack 5 with one preferred embodiment of output conductor plates 7. These are connected to the contact lugs of associated electrode plates 6 at a plurality of points in the lateral direction, by means of a laser welding process.

As can clearly be seen from Figure 7 and the perspective detailed view of the output conductor plates 7 in Figure 8, the improved embodiment of the output conductor plate 7 has slightly angled connecting sections 16 cut into it. These connecting sections 16 are located in the area of the housing opening, with the front cover 4 removed, in a plate stack 5 which has been inserted into the cell vessel 8. By way of example, three connecting sections 16 are provided over the length of the output conductor plate 7.

Figure 9 shows one preferred embodiment of a contact connector plate 11 which likewise has an angled outer edge 17, which is adjacent to the connecting sections 16 of the associated output conductor plate 7 when the rechargeable battery 1 is in the assembled state.

As can also be seen, cylindrical contact sections 18 with a circumferential recess are preformed in the area of the holes 15 in the intermediate walls 10. The insertion of pressing tools into the cylindrical contact sections 18 and the application of a high pressure force make it possible to produce a permanent cold-form joint between the contact sections 18 of adjacent contact connector plates 11 through the hole 15 in the intermediate wall 10 between them. A joint such as this has a very low internal resistance.

Figure 10 shows a section view through a detail of the prismatic rechargeable battery 1, as is sketched in Figures 5 to 9. This shows a detail of the housing in the area of an intermediate wall 10, onto which a front cover 4 is fitted in order to close the housing 9. The front cover 4 which closes the front face of the housing 9 is located at the top in the illustration.

As can also be seen, the connecting sections 16 of the output conductor plate 7a, 7b of the plate stacks 5 which have been inserted into the cell vessels 8 are aligned with the adjacent front cover 4 and are angled from the respective plate stack 5 in the direction of the adjacent cell wall 10.

As can also be seen, the contact connector plates 11 which are arranged on both sides of the intermediate wall 10 are electrically connected to one another by means of the contact sections 18 through the intermediate wall 10. The outer edge 17 of the contact

- 10 -

connector plates 11, which is adjacent to the front cover 4, extends away from the intermediate wall 10 to the adjacent output conductor plate 7. The angled outer edge 17 of a contact connector plate 11 is welded to  
5 the adjacent angled connecting section 16 of the associated output conductor plate 7. A soldered joint is preferably also formed between the contact connector plate 11 and the associated output conductor plate 7 on the outer edges of the welded joint.

### **Patent Claims**

1. A prismatic rechargeable battery (1) having a housing (9) which has a plurality of cell vessels (8) which are separated from one another by electrically insulating intermediate walls (10), and having plate stacks (5) which are formed from stacked electrode plates (6), with one plate stack (5) being held in each of the cell vessels (8), characterized in that contact connector plates (11) extend along each of the intermediate walls (10), are electrically conductively connected to one another through an intermediate wall (10) on contact connector plates (11) which are opposite on the intermediate wall (10), and the contacts (7) on the plate stacks (5) are electrically conductively connected to the associated contact connector plates (11), and the front cover (4) of the housing is welded to side edges of the intermediate walls and side walls of the housing to form a seal.

2. The prismatic rechargeable battery (1) as claimed in claim 1, characterized in that the contact connector plates (11) are electrically conductively connected a plurality of times over their length to an associated contact connector plate (11) which is arranged on the opposite side of the intermediate wall (10).

3. The prismatic rechargeable battery (1) as claimed in claim 1 or 2, characterized in that the electrical

connection between associated contact connector plates (11) is a cold-surface-pressed clinch joint.

4. The prismatic rechargeable battery (1) as claimed in one of the preceding claims, characterized in that the contacts (7) on the plate stacks (5) are welded to the associated contact connector plates (11), and are soldered joints on the outer edges of the welded joint.

5. The prismatic rechargeable battery (1) as claimed in one of the preceding claims, characterized in that the side edges of the positive electrode plates (6) in a plate stack (5) are welded to a first output conductor plate (7a), and the side edges of the negative electrode plates (6) in the plate stack (5) are welded to a second output conductor plate (7b) at the opposite end of the battery stack, and in that the output conductor plates (7a, 7b) are welded to associated contact connector plates (11).

6. The prismatic rechargeable battery (1) as claimed in one of the preceding claims, characterized in that a front cover (4) of the housing (9) is placed on the side edges of the intermediate walls (10) and side walls of the housing (9) and is welded to them, forming a seal.

7. A method for production of a prismatic rechargeable battery (1) as claimed in one of the

preceding claims, characterized by the steps of:

- production of an electrical connection between contact connector plates (11) which are in each case arranged on the opposite sides of an intermediate wall (10), through the intermediate wall (10) ;
- arrangement of plate stacks (5) in the cell vessels (8) which are formed by the intermediate walls (10);
- welding of the electrical contacts of the plate stacks (5) to the contact connector plates (11); and
- closure of the housing (9) in such a manner that the cell vessels (8) and the housing (9) are sealed.

8. The method as claimed in claim 7, characterized in that, in order to close the housing (9), a front panel (4) is placed on the side edges of the intermediate walls (10) which are integrally formed with the housing (9) and on the outer walls of the housing (9), and is connected to the side edges, forming a seal.

9. The method as claimed in claims 7 or 8, **characterized by**  
clinch-joining of the contact connector plates (11) by means of cold surface pressing for the electrical connection through the respective intermediate wall

(10), with the intermediate wall (10) being perforated at the connecting points.

10. The method as claimed in one of claims 7 to 9, **characterized by**

welding of output conductor plates (7) in the plate stacks (5) to associated contact connector plates (11), with the positive electrode plates (6) in a plate stack (5) being welded on a first side edge to a first output conductor plate (7a), and the negative electrode plates (6) in the plate stack (5) being welded on the opposite side of the side edge to a second output conductor plate (7b).

11. The method as claimed in one of claims 7 to 10, **characterized by**

production of soldered joints in the outer edges of the welded joint between the contacts (7) of the plate stack (5) and the associated contact connector plates (11).