# United States Patent [19]

**Jammet**

[11] **3,859,137**

[45] **Jan. 7, 1975**


[54] **CYLINDRICAL ELECTROCHEMICAL CELLS**


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[22] Filed: **Nov. 8, 1973**

[21] Appl. No.: **414,085**

**Related U.S. Application Data**

[63] Continuation of Ser. No. 237,486, March 23, 1972.

[30] **Foreign Application Priority Data**

Mar. 26, 1971 France ..... 71.237486

[52] **U.S. Cl.** ..... **136/107,** 136/175

[51] **Int. Cl.** ..... **H01m 21/00**

[58] **Field of Search** ..... 136/107, 102, 106, 175, 136/176



[56] **References Cited**

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[57] **ABSTRACT**

Cylindrical cells each comprising a metal container for cell contents and sheathed by plastic material, which sheath is covered at least on the cylindrical part of the container by a metallic armoring jacket are disclosed. This jacket is formed from a rolled metallic sheet, whose adjoining edges do not overlap. The jacket at its lower end at least is tightened about the plastic sheath by means of a compressive metallic ring having substantially an L cross-section. In a modified form a second similar ring may be applied at the upper end of the jacket. Jackets of simple structure, requiring no complex material for mounting in place on the plastic sheathed container with no important variations in the dimensions of cells provided with such armoring jackets over cells not having them result.


**11 Claims, 3 Drawing Figures**

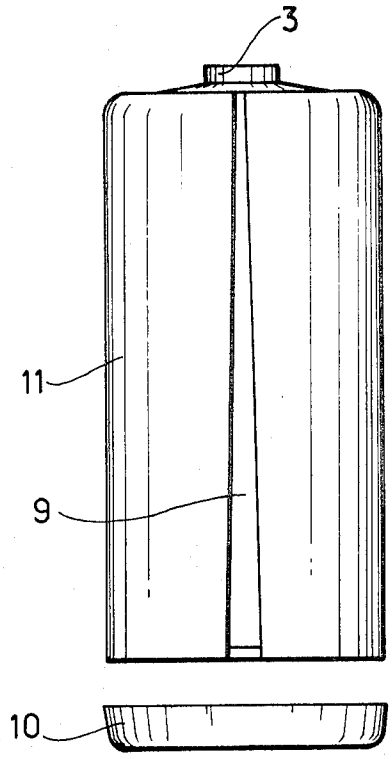


FIG. 1

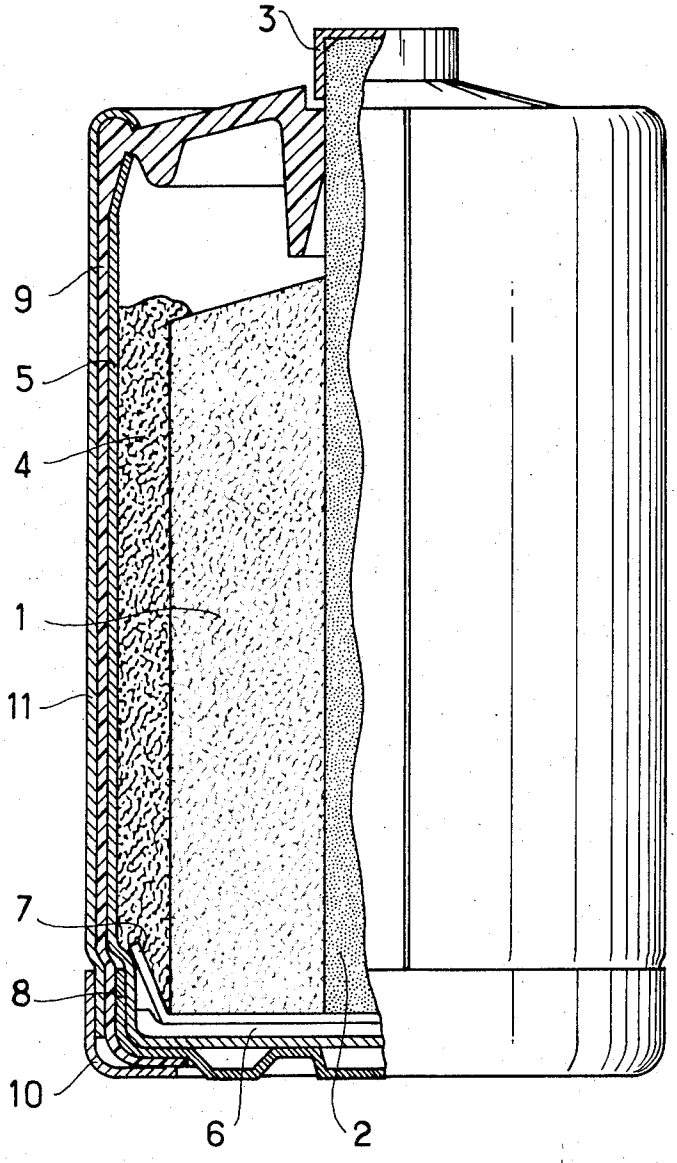


FIG. 2

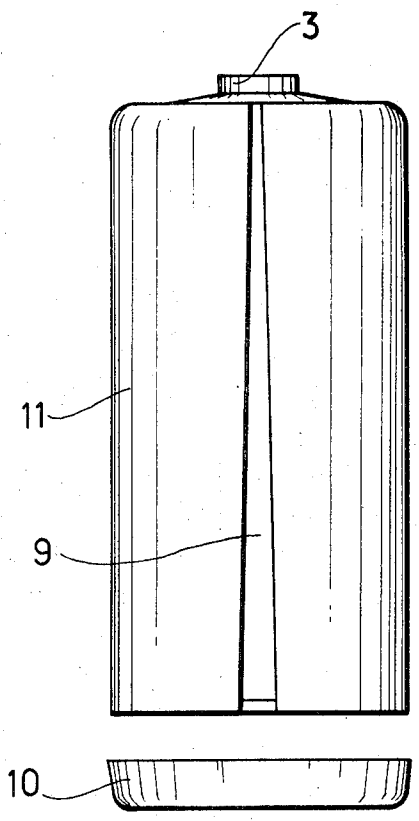
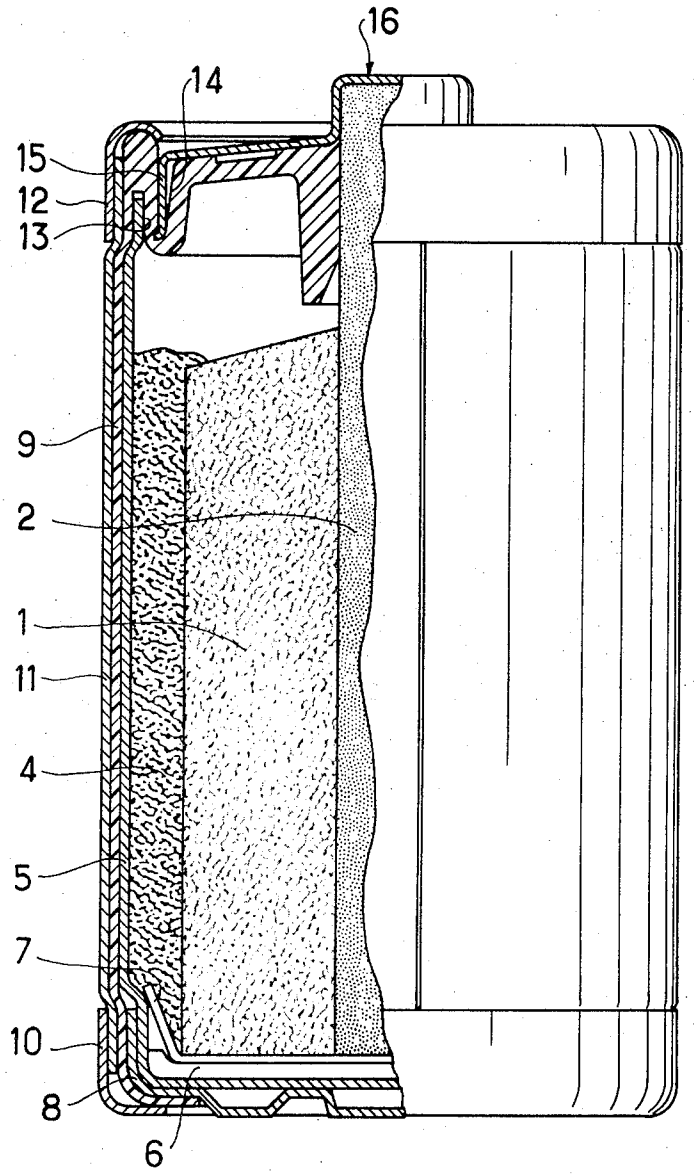


FIG. 3



# CYLINDRICAL ELECTROCHEMICAL CELLS

## RELATED APPLICATIONS

This is a continuation, of application Ser. No. 237,486 filed Mar. 23, 1972.

## BRIEF SUMMARY OF INVENTION

The invention relates to cylindrical dry cells and more particularly those comprising a metallic container which serves as the external electrode, the internal electrode being a conducting rod, for example, of carbon, the container and its cell content being contained within a thin coating sheath of plastic material, whose lower end is folded around onto the bottom of said container, the said sheath being covered, at least on its cylindrical portion, by a metallic armoring jacket.

In cases where the metallic container is of the consumable type, it is provided advantageously at its lower end with a metallic cup that covers the bottom of the container and preferably is fastened in place by compressing deformation of the side wall of the cup.

The metallic jacket, which constitutes what will be called the armor of the cell, serves to prevent the swelling of the cell container, particularly at the time of a very quick discharge of the cell because of the gases that are then produced.

It is actually known, more particularly from French Pat. No. 1,593,630 filed Nov. 13, 1968 (No corresponding U.S. application) of providing such armoring jackets by use of metallic tubes.

These tubes can have such an internal diameter than the cell ensemble including its metal container and other components must be forcibly introduced into the tube or better the tube may have a diameter slightly larger than that of the cell ensemble and after introduction, the tube diameter may be reduced in diameter by appropriate compression to tightly engage the ensemble.

Such armoring jackets in the form of tubes are inconvenient because of relatively precise dimensions. Their use, moreover, is not very economical.

A solution has been suggested which is to provide these armoring jackets by use of rolled metallic sheets whose edges are joined by hooking and cramping the interlocked hooked edges. However, this procedure requires use of a complex tool and complex procedure.

In addition, because of the methods of hooking used and especially because of the superposition of the hooked edges of the rolled sheet forming the jacket, the mounting of such a jacket effects an increase in the diameter of the cell which can be calculated as being about 5 to 6 times the thickness of said sheet.

It is essential that the cells present normalized or standardized dimensions, especially relative to their final diameters. The presence of such jackets thus forces the manufacturer, in order to comply with required tolerances, to diminish the diameter of the cell ensemble composed of the other components. This, in practice, results in a decrease in cell capacity.

Therefore, the use of jackets can cause a loss of 7 to 9% of volume of the depolarizing mass inside cylindrical cells of type R-20 and of 10 to 12% inside cells of Type R-14.

Furthermore, assuming that these cells, deprived of their armoring jackets, will not satisfy the conventional standards concerning their dimensions, this will force the manufacturer to maintain for each such cell two scales of production, one applying to armored cells, the other to unarmored cells.



This invention has for an object and feature especially a remedy to these inconveniences.

The subject matter of this invention is the provision of a cylindrical cell comprising a metallic container which serves as the external electrode, the internal electrode being a conducting rod, e.g. of carbon, the ensemble including the container being contained within a thin sheath of plastic material, said sheath being covered at least in its cylindrical part by a metallic armoring jacket, characterized by the fact that said jacket is made of a rolled sheet, with closely adjacent edges that do not overlap, the lower part of said jacket, at least, being tightened onto the plastic sheath by means of a metallic ring with L shaped cross-section. This results in bringing the edges of the sheet into close or abutting relationship.

According to a characteristic of this invention, said L shaped ring after mounting is compressed so that its external diameter is substantially equal to the internal diameter of the part of the jacket which it surmounts, and of substantially the same diameter as final diameter of the jacket adjacent the ring.

The upper end of the jacket can be folded down onto the top of the plastic sheath.

According to the invention, in another embodiment, the upper part of the jacket may be tightened against the plastic sheath by means of a second similar metallic ring located at the upper end of said jacket.

This second metallic ring after mounting can be compressed, its external diameter then being substantially equal to the external diameter of the part of the jacket adjacent the end which it surmounts.

The jackets in accord with the present invention, are manufactured simply and economically, and do not require the use of a complex machinery or procedure.

Since the use in a cell of the jacket according to the invention at most requires an increase of diameter of only twice the thickness of the sheet constituting the jacket, this thickness having, for example, the value of 0.2 millimeters, it is possible for each type or standard size of cell to require only one scale of manufacturing dimensions because the dimensions of the cell whether armored or not armored can satisfy the required normalized or standard conditions.

The presence of a jacket according to the invention for the same reason does not require the depolarizing mass to undergo a material loss of volume, in comparison to the maximum volume capable of being inserted into the cell container any such loss being less than 50% of the values mentioned above for cells of the R-20 or R-14 type using jackets with hooked interlocked edges.

Also, it must be noted that the use of a jacket according to this invention provides an economy of sheet metal of about 10% in comparison to that required for the jacket with hooked interlocked edges.

Other characteristics of the invention will come out from the detailed description which follows in conjunction with the accompanying drawings in which:

FIG. **1** is a cross-sectional view of one embodiment of a cell embodying the invention;

FIG. **2** depicts schematically one mode of preparing a cell depicted in FIG. **1**, and

FIG. **3** is a cross-sectional view of another embodiment of a dry cell embodying the invention.

Referring to FIGS. 1 and 3, reference numeral 1 designates an agglomerated compressed depolarizer, for example, based on manganese dioxide. Reference numeral 2 designates a conducting rod, for example, of carbon, serving the role of positive electrode for the cell. Reference numeral 4 designates an electrolyte, preferably of gelatinized type and reference numeral 5 designates a container of zinc.

An insulating cardboard washer 6 and a Kraft paper cup 7 at the bottom of container 5 assure the centering of the just-described agglomerated material inside the container 5. A protective sealing cup 8 is provided at the bottom of cup 5 which is compressed around the periphery of container 5 adjacent its bottom.

For a better understanding of the invention, the effect of the compressing deformation of parts has been voluntarily exaggerated in the drawings.

Reference numeral 9 designates a thin sheath of plastic material which has been applied to the zinc container after it is filled with cell components above described.

The lower end portion of the sheath 9 is advantageously indented and its edge bent around and about the bottom of a sealing cup 8.

The reference numeral 11 designates a tubular metallic jacket which, according to the invention, consists of a rolled, metallic sheet whose facing end edges do not overlap.

This jacket 11 has a straight edge portion at its lower end which is kept tightly compressed against the lower portion of the cell near the bottom by means of a metallic ring 10 with L-shaped cross-section.

Advantageously this ring 10 is mounted over the jacket 11 and set in place by compressing deformation. After this operation, the external diameter of ring 10 is equal substantially to the external diameter of the portion of the jacket 11 directly adjacent to it.

Sealing tightness thus is effected at the lower portion of the cell. This sealing is excellent because the lower extremity of the plastic container 9 is tightly compressed between the cup 8 at the bottom of the container 5 and the vertical leg of L-cross-sectioned metallic ring 10 with interposition also of the extremity of armoring jacket 11.

In the example of FIG. 1, the upper end of the conducting rod 2 is covered by a metallic cup 3.

The upper extremity of the armoring jacket 11 is folded over onto the top of the plastic sheath 9.

Advantageously, in this embodiment, the length of the upper edge of armoring jacket 11 is slightly larger than the length of its lower edge.

This is seen in FIG. 2 which depicts very schematically a cell similar to that of FIG. 1 before the application thereto of ring 10 with L shaped cross-section.

In this manner, after mounting said ring 10 and deforming it by compression, gaping of the facing edges of jacket 11 is avoided in the vicinity of the upper portion of the cell. These facing edges then can be either in abutting contact or only very slightly spaced apart, for example, a distance of the order of but 0.1 or 0.2 mm.

The embodiment of FIG. 3 differs mainly from that of FIG. 1 in that the upper end portion of the jacket 11 is not folded over onto the upper transverse portion of the plastic sheath 9 but instead it is tightened against the upper periphery of this sheath 9 by use of a metallic ring 12. This ring 12, like ring 10, is originally of L-shaped cross-section. After application of said ring 12 its horizontal leg is bent over and onto the upper transverse portion of sheath 9.

This ring after mounting about the upper peripheral portion of jacket 9 can be subjected to compressing, its external diameter after this operation being substantially equal to the external diameter of the upper peripheral portions of the jacket 11 adjacent to it.

Advantageously in this embodiment, some provision for reinforcement of the upper portion of the cell should be made so that the compression of ring 12 can be done correctly.

In the embodiment shown in FIG. 3, the upper portion of sheath 9 in the vicinity of its perimeter is thickened in its transverse portion and provided with two practically parallel grooves 13 and 14 thus defining a sort of S-formation and in which grooves respectively lie the upper extremity of container 5 and the cylindrical portion 15 of lid 16, the latter being provided to overlie the transverse portion of sheath 9 and be in electrical contact with the conductive rod 2.

The height of the upper extremity of container 5 engaged in the groove 13 is advantageously less than that of the cylindrical portion 15 of lid 16 that is engaged in the groove 14.

Optionally, the top of sheath 9 of FIG. 3 can be provided at its periphery with a small folding strip (not shown) serving to insulate in the most complete manner possible the ring 12 from the lid 16.

In the embodiment depicted in FIG. 3, wherein the upper extremity of jacket No. 11 is secured by use of a compressed metallic ring 12, it is not necessary to provide different lengths at the upper and lower edges of the sheet which constitutes said armoring jacket.

In both described embodiments, the manufacturing procedure comprises providing cylindrical metallic cell containers, filling the containers with requisite cell components, applying a thin plastic sheath to the filled containers, providing a rolled thin sheet of armoring material of substantially cylindrical shape but whose facing edges are spaced apart and do not overlap, mounting said rolled sheet about the plastic sheathed container, providing a metallic ring of substantially L-shaped cross-section, mounting said ring about the rolled sheet at its lower periphery, and then applying compressing deformation to said ring to reduce its internal diameter thereby tightening said rolled sheet against the plastic sheathed container and bringing said facing edges of said rolled sheet into close proximity, thus providing a completed cell having an armoring jacket serving to counteract swelling tendencies within the cell container during use of the cell.

In the second embodiment, an additional ring is similarly mounted about the periphery of the rolled sheet in its upper portion and compressively deformed subsequent to mounting to prevent gaping of the facing edges of the sheet forming the armoring jacket.

In both embodiments of the invention, despite application of rings 10 or 10 and 12, the cylindrical peripheries of the resulting armor jacketed cells present substantially unbroken straight longitudinal lengths.

Although specific embodiments of the invention have been described and shown, variations in procedure and structure within the scope of the appended claims are possible and are contemplated. There is no intention, therefore, of limitation to the disclosure hereinabove presented.

What is claimed is:

1. A cylindrical electrochemical cell comprising a metal container for contents of the cell, a sheath of plastic material surrounding said container, a metallic split armoring jacket comprising a rolled sheet of metal having unjoined facing axially extending edges surrounding said sheath at least in a cylindrical container region, and a metallic ring of substantially L cross-section mounted over said jacket at at least one end thereof and being of reduced overall internal diameter relative to initial diameter, so as to tighten said rolled sheet around said sheath and bring said facing end edges of said rolled sheet closely together without joining them, the overall external diameters of said mounted ring and the adjacent portions of said sheet not covered by said ring being substantially equal.

2. A cell according to claim 1, wherein said plastic sheath has a portion that spans the metal container at one end thereof and wherein said outer armoring jacket has one of its ends turned over said portion of said sheath.

3. A cell according to claim 1, wherein a second metallic ring of substantially L-shaped cross-section is mounted over said jacket at its other end and is also reduced in overall internal diameter to enhance tightening of said jacket around said plastic sheath.

4. A cell according to claim 3, wherein the external diameter of said second metallic ring is substantially equal to that of cylindrical portions of said jacket adjacent thereto.

5. A cell according to claim 3, including a carbon rod in the contents of said cell, a metallic cover member mounted on an end of said rod, said plastic sheath having a transverse portion underlying said metallic cover member and having a portion defining a substantial S in section, said metallic cover having a cylindrical portion engaging between parallel walls of the S section of said plastic sheath, and said metal container having its upper end portion engaged between another pair of parallel walls of the said S section.

6. A cell according to claim 5, wherein the upper end portion of the metal container engaged between said second pair of parallel walls of said S section has less height than the cylindrical portion of said cover engaged between said first named pair of parallel walls of said plastic sheath.

7. A cell according to claim 5, wherein the plastic sheath is shaped to insulate the second metallic ring from said metallic container, and said metallic cover member.

8. A cell according to claim 1, wherein said cell includes a carbon rod, and a metallic cap mounted on an end of said rod in intimate electric contact therewith.

9. A cylindrical electrochemical cell comprising a metal container for contents of the cell, said container serving as negative electrode therefor, a rod-like positive electrode, depolarizing material and electrolyte within said container, a sheath of plastic material surrounding said container, a split metallic armoring outer jacket and comprising a rolled metal sheet surrounding said sheath at least in the cylindrical container region thereof, said sheet having unjoined facing end edges defining an axially extending split extending substantially the full axial length of said rolled sheet, and a metallic ring of substantially L cross-section mounted over said jacket at at least one end thereof, said ring being reduced overall internal diameter relative to its original dimensions so that the said unjoined facing end edges of said rolled sheet that form the jacket are maintained close together and said split jacket tightly surrounds said sheath.

10. A method of manufacturing a cylindrical electrochemical cell to provide an armoring external jacket therefor comprising providing a cylindrical metallic cell container including requisite cell components and bearing an external sheath, providing a rolled split metal sheet of substantially cylindrical shape with axially extending spaced apart facing edges, mounting said rolled split sheet about the sheath on said container, providing a metallic ring of substantially L-shaped section, mounting said ring over the mounted rolled split sheet adjacent one end thereof and applying compressive deformation to said ring to reduce its original diameter and thereby tighten the rolled split sheet around the sheath and bring the said facing edges of said sheet closely together without joining them so as to provide the said armoring jacket.

11. A method according to claim 10, including provision of a second ring of substantially L-shaped section, mounting said second ring over said mounted sheet adjacent its opposite end and applying compressive diametrical reducing deformation to said second ring so as also to maintain facing edges of said sheet adjacent said opposite end closely together without being joined.

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# UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 3,859,137 Dated January 7, 1975

Inventor(s) Jean Jammet

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In item 30 of the preamble the foreign priority data 71 237 486 should read ---71 10 809---;

In column 6, line 19, ---in--- should be inserted after "reduced"

Signed and sealed this 4th day of March 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334