

June 16, 1953

O. K. REINHARDT ET AL

2,642,470

DRY CELL

Filed June 7, 1951

FIG. 1

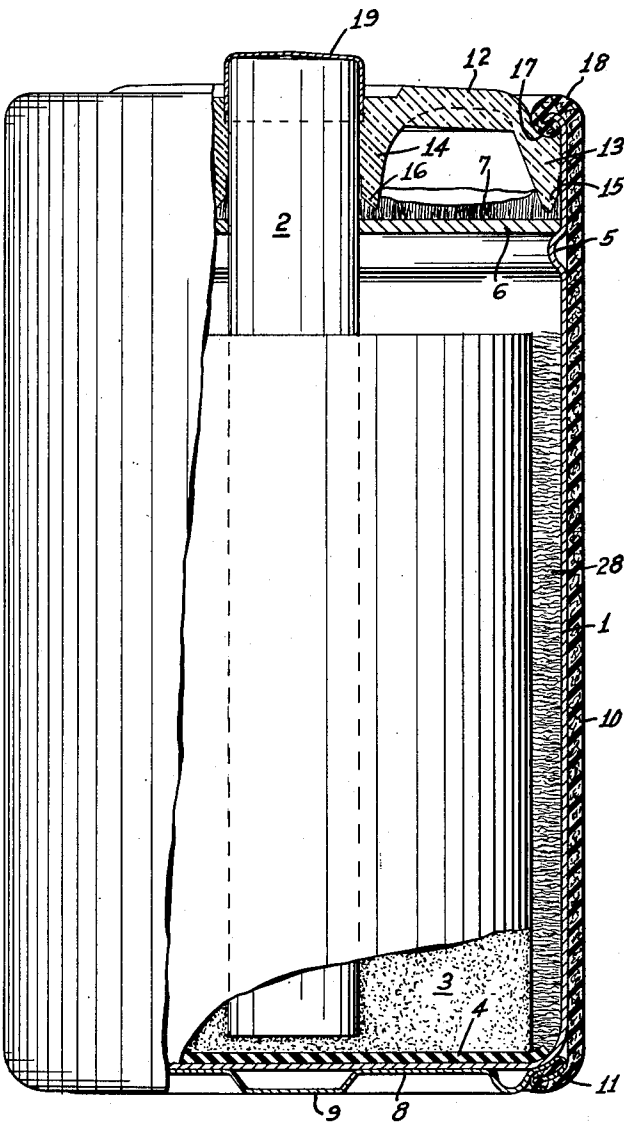


FIG. 2

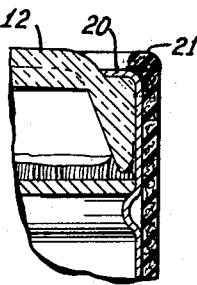
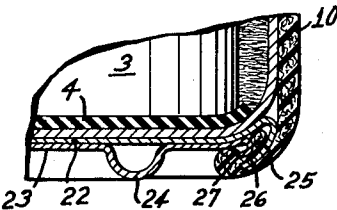


FIG. 3



INVENTORS
O. K. Reinhardt
J. V. Welsh

BY

Gunn, Edwards, Minton, Barrows and Fox, Inc.
ATTORNEYS

UNITED STATES PATENT OFFICE

2,642,470

DRY CELL

Otto Karl Reinhardt, West Haven, and Jay Y. Welsh, Hamden, Conn., assignors to Olin Industries, Inc., New Haven, Conn., a corporation of Delaware

Application June 7, 1951, Serial No. 230,391

3 Claims. (Cl. 136—133)

1

2

This invention relates to dry cells and more particularly to a leak-resistant cell construction which may be used in flashlight batteries.

Many types of leak-resistant flashlight cells have been proposed during recent years. Some of these proposals have been adopted with more or less success but a completely satisfactory leak-resistant cell has not yet been produced.

In the present invention we provide a leak-resistant cell in which the surrounding jacket consists of a metal bottom, side walls of insulating material of laminated construction and a closure of thermoplastic or thermosetting material. An important feature of the invention is the provision of collars or sleeves on the closure member which extend downwardly on the inside of the zinc can and surrounding the carbon pencil into the soft sealing material placed above the core of the cell. The sealing material is thus forced upwardly between the lower edge of the outer collar and the inside walls of the zinc can and between the lower edge of the inner collar and the carbon pencil to provide a high degree of leak-resistance.

The side wall of the jacket consists preferably of soft plies of fibrous insulating material, such as paper. It may be applied to the exterior of the zinc can as a tube made by either a spiral or convolute winding process. The inner plies of this paper jacket are formed of absorbent paper which readily take up any electrolyte which may reach them, for example, through perforations in the metal anode which may occur when the cell has been in use for a period of time. The outer plies, however, are resistant to penetration by the electrolyte.

In the accompanying drawings we have shown several embodiments of the invention. In this showing:

Fig. 1 is an elevation, partly in section, of one form of the invention;

Fig. 2 is a sectional view of the upper edge of a cell showing a modified form of the invention; and

Fig. 3 is a similar view of the bottom of a cell showing a modified bottom construction.

Referring to the drawings the reference numeral 1 designates the anode element or electrode of a cell. As is conventional, it may be in the form of a cylindrical can of zinc, although other metals may be used. The other electrode consists of a carbon pencil 2 preferably disposed centrally of the can and surrounded by a depolarizing mixture. The depolarizing mixture 3 may consist of the conventional mixture of

manganese dioxide and a carbonaceous or graphitic mixture, such as graphite or other suitable form of carbon. Suitable electrolytes, in the form of a solution or paste, are added to the cell in the conventional manner. The depolarizing mixture is separated from the bottom of the can by an insulating washer 4. Adjacent the top of the can we provided an inwardly extending bead or groove 5 which supports a paper washer 6. A layer of sealing material 7 of a character that may be softened by heat, such as pitch or wax, is placed over the washer 6 as a closure.

The construction heretofore described is conventional and forms no part of the invention except in the combination claimed and hereinafter described. In the form of the invention shown in Fig. 1, we provide a metal disc 8 at the bottom of the cell. This disc may be formed of tin-plated steel or other metal and is preferably embossed at its center, as indicated at 9, to provide a more certain contact between cells in tandem when used in a flashlight casing. The cell is surrounded by a jacket 10 of fibrous insulating material. As stated, the inner layers of this jacket are preferably absorbent. If perforations develop in the side walls of the zinc can when the cell is in use, electrolyte discharged into the jacket is thus absorbed by these inner absorbent layers. The outer layers of the jacket, however, are resistant to penetration by the electrolyte, thus preventing any electrolyte that gets out of the can through such perforations from reaching the exterior of the complete construction where it may corrode metal parts in flashlight casings or in other places in which the cell is used. As shown, the lower edge of the jacket and the outer edge of the disc 8 are united to each other by an interlocking crimp 11. In assembling the jacket and the disc, the metal disc is first provided with a circumferential groove which is open at the bottom. This groove is inserted into the base of the jacket and the bottom end of the jacket when turned upwardly to extend into the groove. The assembly is then turned inwardly by the application of suitable pressure producing the interlocking crimp indicated at 11 in Fig. 1 of the drawings.

After the elements of a conventional cell have been assembled and while the layer 7 of sealing material is still in a fluid condition, the closure member may be inserted. The closure member consists of a disc 12 of suitable thermoplastic or thermosetting material of a proper size to be received in the top of the cell and having a central

3

opening of a proper size to receive the carbon pencil. At its periphery, the disc is provided with a depending collar or circular flange 13 which, as shown, is received in contact with the inner wall of the can when assembled. Likewise, surrounding the central opening through which the carbon pencil protrudes, the disc is provided with a dependent sleeve or circular flange 14. The lower edges of these sleeves or flanges may be shaped, as indicated at 15 and 16, to facilitate forcing the sealing material upwardly between the inner wall of the zinc can and the flange and between the carbon pencil and the flange, as shown in Fig. 1, when the disc 12 is placed in the top of the cell with the sealing material 7 in a soft or fluid condition. The cell with the closure disc is then inserted into the previously described assembly of the jacket 10 and bottom disc 8. As shown, the outer edge of the top of the disc 12 is shaped as indicated at 17 to cooperate with a crimp on the upper edge of the jacket and the can. The top edge of the jacket and the top edge of the can are then rolled, as indicated at 18 to provide a firm roll crimp which retains the closure in position during the storage period and during use of the cell. A metal contact cap 19 is then placed over the carbon pencil with which it forms a force fit.

The construction described provides an internal hermetic seal at the junction of the closure flanges 13 and 14 with the sealing material. Neither the metal contact cap 19 nor the rim or upper edge of the anode can are relied upon to accomplish the seal. Any internal pressure created in the cell during use will tend to increase the tightness of the seal. Such pressure will force additional sealing material 7 into the space adjacent the lower edges of the flanges 13 and 14 where leakage would otherwise occur. In the alternative form of construction shown in Fig. 2 of the drawings, the peripheral portion 19 of the disc is substantially flat and the upper edge 20 of the can is first turned in over it. The upper edge 21 of the jacket may then be turned in as a roll crimp over the inturned rim 20 of the metal can.

Fig. 3 of the drawings illustrates an alternative bottom construction employing two metal discs. As shown, we provide an inner metal disc 22 and an outer metal disc 23, the latter being suitably embossed as indicated at 24 to insure connection between the electrodes of opposite polarity of two cells arranged in tandem. The bottom end of the jacket 10 is turned inwardly and upwardly, as indicated at 25, to position it between flanges 26 and 27 formed on the edges of the discs 22 and 23. Interlockings is then accomplished by turning the entire assembly inwardly by the application of suitable pressure.

The closure member 12 may be molded of any suitable plastic insulating composition. We may employ either thermoplastic or thermosetting materials. We may employ "Bakelite," phenol formaldehyde resins and others. The construction provides a very efficient leak-resistant cell having many advantages over those types of leak-resistant cells in which the outer casing or jacket is formed of metal. The jacket side walls are designed to retain any liquid which may exude from the anode cup, and the bottom and top closures are tightly sealed against the escape of any liquid. At the same time, any gas evolved in the cell interior can readily escape through pores provided for the purpose in the central carbon electrode.

4

In a copending application of applicant, Reinhardt, and Thomas C. Stapleton, Serial No. 230,392, filed June 7, 1951, a structure is claimed in which the jacket and upper closure member are formed integrally and in which a collar surrounds the central opening for the cathode of the cell, the lower end of the collar being embedded in the sealing material placed over the washer.

We claim:

1. A leak-resistant dry cell comprising a metal can forming an anode, a cathode and a depolarizing mix arranged in the can, the cathode projecting from the top of the can, a metal disc covering the bottom of the can, a jacket surrounding the can having its lower edge crimped to the disc, a washer arranged in the can above the depolarizing mix, a layer of material capable of being softened by heat on said washer, and a closure member comprising a disc having a central opening, the closure member having depending collars at the periphery and surrounding the central opening adapted to be embedded in the material on the washer, and means for retaining the disc in position.

2. A leak-resistant dry cell comprising a metal can forming an anode, a cathode and a depolarizing mix arranged in the can, the cathode projecting from the top of the can, a metal disc covering the bottom of the can, a jacket surrounding the can having its lower edge crimped to the disc, a washer arranged in the can above the depolarizing mix, a layer of material capable of being softened by heat on said washer, and a closure member comprising a disc having a central opening, the closure member having depending collars at the periphery and surrounding the central opening adapted to be embedded in the material on the washer, the upper edge of the jacket and the upper edge of the metal can being crimped over the closure disc.

3. A leak-resistant dry cell comprising a metal can forming an anode, a cathode and a depolarizing mix arranged in the can, the cathode projecting from the top of the can, a metal disc covering the bottom of the can, a jacket surrounding the can having its lower edge crimped to the disc, a washer arranged in the can above the depolarizing mix, a layer of material capable of being softened by heat on said washer, and a closure member comprising a disc having a central opening, the closure member having depending collars at the periphery and surrounding the central opening adapted to be embedded in the material on the washer, the upper edge of the jacket and the upper edge of the metal can being crimped over the closure disc, the lower edges of the collars being shaped to force the sealing material between the cathode and the inner collar and between the inner surface of the can and the outer collar.

OTTO KARL REINHARDT.
JAY Y. WELSH.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,169,702	Marsal	Aug. 15, 1939
2,399,089	Anthony	Apr. 23, 1946
2,402,784	Smithback	June 25, 1946
2,445,005	Schmelzer	July 13, 1948
2,450,813	Reinhardt et al.	Oct. 5, 1948