Aug. 12, 1952 P. G. BONIN 2,606,942

DRY BATTERY

Filed July 17, 1947

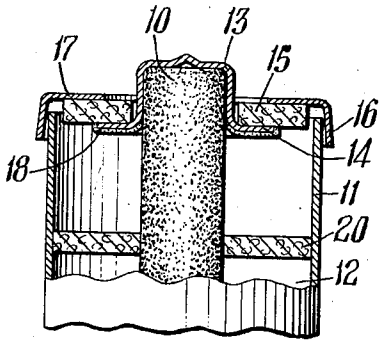


Fig. 1.

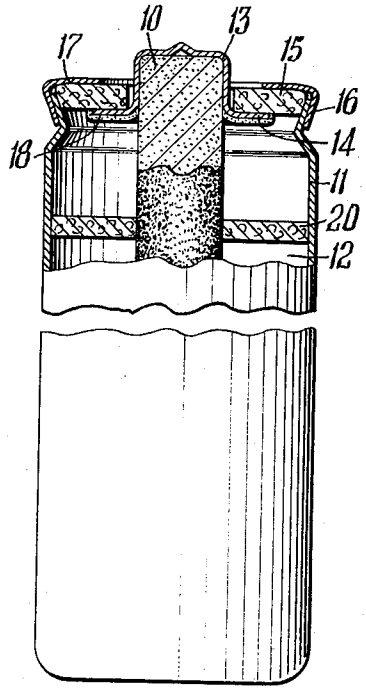


Fig. 2.

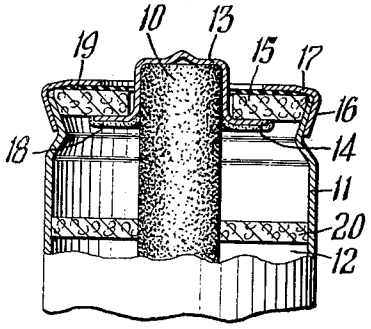


Fig. 3.

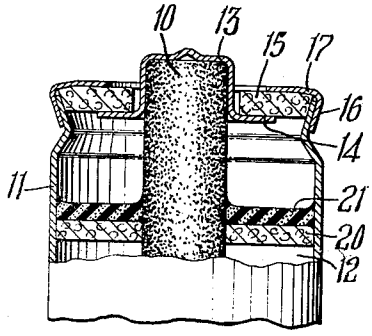


Fig. 4.

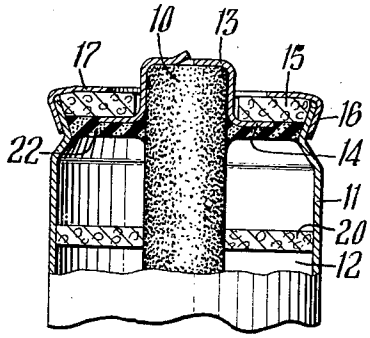


Fig. 5.

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Patented Aug. 12, 1952

2,606,942

UNITED STATES PATENT OFFICE

2,606,942

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Application July 17, 1947, Serial No. 761,488

11 Claims. (Cl. 136—133)

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This invention relates to a cover or closure for dry cells. More particularly, it relates to a closure for small cells such as are used for vest-pocket or pen-type flashlights and other purposes, designated by the United States Bureau of Standards as AA size. An object is to provide a closure having improved resistance to distortion and to leakage of electrolyte and reaction products.

Heretofore, a resinous seal of asphalt or the like has been used to close small dry cells, rather than the stronger metal cover often used on larger dry cells. The types of metal covers conventionally applied to larger cells have usually been attached by pinching the zinc cup during the spinning operation between two surfaces on the metal cover, commonly known as the top ridge of the metal cover. This method of fastening a cover is not suitable to the small AA cell because of the considerable depth of the ridge of cover required to obtain the proper pinch of cover to zinc cup, thus requiring considerable shortening of the zinc cup in order to maintain satisfactory clearance between the top of the cover and the tip of the brass cap. This, of course, is objectionable because shortening the can makes for a reduction of air space in the cell if the same amount of cell ingredients are used. In consequence, this size of cell has always been closed by pouring a seal such as rosin or some plastic material. The seal is not as strong as the seal formed by metal covers since internal pressure in the cell may loosen the adhesion of the plastic to the zinc at lower pressures than are required to rupture a closure having a metal cover.

According to this invention a strong closure is provided for a small cell without the necessity of spinning the metal cover radially within the zinc, the metal spinning operation being confined to the outside of the zinc cup. This is made possible by providing a hard insulating washer to serve as an abutment to limit the degree to which the cover and zinc are spun inwardly, such washer serving also to close the top of the cell radially within the metal cover, to insulate the cover from the central electrode and cap and to form a surface on which the inside of the zinc can is tightly pinched by the metal cover, thus providing a pinching action on the zinc cup. Specifically, this washer is preferably mounted upon a supporting flange formed on the cap for the central electrode; the cover is placed over the washer and the outer edge portion of the cover and zinc are spun into position fitting tightly against the periphery of the washer, thus pinching the zinc cup. The washer is preferably coated with a moisture impervious film and the cap flange may be coated with a corrosion-resistant film. Any internal pressure is vented between the supporting flange and washer or between the cover and washer. The bond between these parts may be enhanced

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by an adhesive to decrease the moisture transfer capacity of the seal. The central carbon of a small cell is sometimes very dense and not well adapted to vent gas.

Referring to the drawing:

Fig. 1 shows the cover of this invention before it has been spun in place;

Fig. 2 shows the cover after it has been spun in position;

Fig. 3 illustrates a modification of the device of Fig. 1 in which a soft washer is placed contiguous the hard washer to reduce moisture loss;

Fig. 4 shows this invention with a construction in which moisture tightness is obtained largely by a subseal located below the hard washer;

Fig. 5 illustrates this invention provided with an inner seal contiguous the hard washer.

This invention applied to the small AA or penlight size dry cell is shown in Fig. 1 in which the inner electrode 10 is provided with the usual brass cap 13 having a supporting flange 14. Between the inner electrode and the outer zinc cup or container 11 is a space 12 filled in the customary manner familiar to those skilled in the art of manufacturing dry cells. Supported on the flange 14 of the brass cap is a hard insulating washer 15. A desired material for this washer is hard fibre coated with a moisture-proof varnish or a phenolic condensation product, although any other material which has the required strength, insulation, and moisture-proof characteristics, could be used as material for the washer. As shown in Fig. 1 a small clearance space of about the relative size indicated is provided between the periphery of the washer 15 and the top edge of the zinc cup 11. A cover 17 of steel or other appropriate material painted on both sides prior to stamping is supported on top of the washer, this cover having been previously formed downward by punching and drawing operations so that the edge portion 16 is provided to receive the top edge of the zinc cup.

The cover assembly is pushed down into final position with respect to the top of the can and the edge portion 16 of the cover 17 is spun inwardly as shown in Fig. 2, thus pinching the top edge of the zinc cup tightly between the hard washer and outer edge 16 of the cover. The cover, being strong and stiff, cannot be expanded outwardly to allow the closure to be blown off of the cell and the zinc itself being tightly pinched between this cover and the hard insulating washer, cannot pull out of position or withdraw itself. Consequenlty, the cover remains in position, even though subjected to considerable internal pressures.

The cap 13 may or may not be provided with the usual venting hole in its center position, depending on whether it is or is not desirable to use the electrode as a venting medium. The brass

cap flange 14 is preferably provided on both sides with a corrosion-resistant film such, for example, as a cyclopentadiene resin. Venting occurs between the washer 15 and its contiguous supporting flange 14 or the contiguous cover 17. Instead of the film mentioned for the brass cap flange, any suitable moisture-proof adhesive may be used on both sides of the brass cap flange. This adhesive protects the brass from cell corrosion as well as forming a bond to the hard insulating washer which requires rupture for any of the cell reaction products to escape from the inside of the cell. Corrosion-resistant film 18 is shown in Figs. 1 to 3 of the drawing on only the under side of the cap flange, but it will be understood that this film may also be supplied to both sides of the cap flange. The washer 20 is of the type common in dry cells.

The construction illustrated in Fig. 3 of the drawing is merely that of Fig. 2 except for the addition of a thin, soft washer 19 between the hard washer 15 and the cover 17. This variation in construction is intended to decrease moisture loss. This soft washer may be either above or below the hard insulating washer, although the drawing shows it only in above position. Such soft washer is of chipboard or pulpboard about .015 or .020 inch thick.

Instead of the required moisture seal being provided between the washer 15 and either of its contiguous metal parts, in Fig. 4 is illustrated a construction like that in Fig. 2 but having a sealing material 21 of asphalt wax, synthetic resins, or other suitable material placed over the soft washer 20 and below the hard washer 15 as illustrated. The soft washer 20 provides a support for the subseal 21 of the plastic material referred to.

In Fig. 5 the plastic material 22 of the same sort as that used in Fig. 4 is placed contiguous the hard washer and cap flange to seal the space between the inner and outer electrodes against escape of gas or electrolyte material, at the same time protecting the cap from corrosion. A vent is provided in the cap 13. The inner seal 22 may be applied by the process described in the patent to P. A. Marsal, 2,244,016, dated June 3, 1941.

Among the advantages of this invention may be mentioned that only the outer edge portion of the cover has been spun over the zinc instead of having the cover spun contiguous to both the inside and outside of the zinc, thus eliminating the upward projecting rim required when zinc is pinched between portions of the cover. The hard washer 15 constitutes an abutment or reinforcement to limit the degree of initial bending or spinning of the zinc and cover portions at the same time tightly clamping, in conjunction with the metal cover, the top of the zinc cup. Such action holds the cover in place even when the cell is subjected to severe tests. By the use of such a construction in place of compound or plastic sealed cells, closer control of moisture loss is maintained and leakage is reduced when cells are subjected to abuse. Venting may be between either or both the top and bottom sides of the washer 15 and contiguous metal parts in preference to venting through the dense carbon electrode, although if desired the usual vent orifice in the center of the brass cap over the carbon may be provided.

The described construction keeps the cover in position, even though excessive pressures are developed within the cell, because the cover is tightly anchored to the zinc cup. For a spun-on cover to be blown off by excessive pressures within the cells, the cover, pushing upward, must deform the zinc inward allowing the cover to slide over the zinc at the spun-in joint. In this particular construction, the zinc is prevented from deforming inward by the use of the hard insulating washer. The fact that the cell cover does not expand because of its strength and that the zinc cannot move inward because of the hard insulating washer, combined with the fact that the zinc cup is tightly pinched between this hard insulating washer and skirt of the cover, produces a strong rigid cover construction which cover remains in position even though it may be subjected to considerable internal pressures. The closure of this invention is not only strong and moisture-proof, but is simple and inexpensive and requires only the spinning operation outside the zinc instead of the more common practice in dry cells of spinning the cover against both the inside and outside faces of the zinc. The cover 17 is suitably about .009 or .010 inch thick and of can cover steel.

I claim:

1. A Le Clanché cell comprising a container of deformable material, a hard insulating washer contiguous the inside of the container at an end portion thereof, a central contact cap provided with a supporting flange for an inner portion of said hard washer, a cover of stiffer material than the container contiguous to at least a portion of the hard insulating washer, said cover having an outer flange bent downwardly against the container and holding the container end portion clamped against said washer.

2. In a dry cell having a central electrode, an outer cylindrical electrode surrounding the central electrode, electrolyte and depolarizing materials between said electrodes, a soft washer above said materials, and the combination therewith of the improvement for closing the space between said electrodes against the free escape of moisture, said improvement comprising a layer of hard insulating material at an end portion of said cell spaced above said soft washer and through which the central electrode projects, said layer of material extending radially outward to adjacent the cylindrical electrode, means for supporting said material in place, and a metal cover of stiffer material than the outer electrode having its outer portion flanged and bent over the edge portion of the cylindrical electrode, said layer of material serving as an abutment to limit inward bending of the lower end of the cover flange and against which the outer cylindrical electrode is held clamped between said cover flange and an adjacent edge of said layer of insulating material.

3. In a dry cell having a central electrode, an outer cylindrical electrode surrounding the central electrode, and the combination therewith of the improvement for closing the space between said electrodes against the free escape of moisture, said improvement comprising a washer of hard insulating material at an end portion of the cell through which the central electrode projects, said washer extending radially outward to the inner surface of the cylindrical electrode, means for supporting said washer in place, and a metal cover of stiffer material than said outer electrode having its outer portion flanged and spun over the edge portion of the cylindrical electrode, said washer serving as an abutment to limit inward spinning of the cover flange and against which the outer cylindrical electrode is held by said cover flange, said supporting means includ-

ing a flange metal cap and said washer being supported by the flange of said cap.

4. A cell having a central electrode, an outer cylindrical electrode, a cap over the central electrode, a hard insulating washer supported by said cap, a metal cover over said washer with its peripheral edge portion bent contiguous the outside of the zinc and holding the zinc against the periphery of said washer, said cap having a flange on which the insulating washer is supported, and another washer softer and thinner than the first mentioned washer and located between said first washer and at least one of said cap flange and said cover.

5. In a dry cell having a central electrode, an outer cylindrical electrode surrounding the central electrode, and the combination therewith of the improvement for closing the space between said electrodes against the free escape of moisture, said improvement comprising a washer of hard insulating material at an end portion of the cell and through which the central electrode projects, said washer extending radially outward adjacent to the cylindrical electrode, a metal cap flanged for supporting said washer in place, a metal cover of stiffer material than said outer electrode having its outer portion flanged and spun over the edge portion of the cylindrical electrode, said washer serving as an abutment to limit inward spinning of the cover flange, and sealing material supported below and spaced from said insulating washer and between said electrodes.

6. In a cell having a central electrode, an outer cylindrical electrode surrounding the central electrode, and the combination therewith of the improvement for closing the space between said electrodes against the free escape of moisture, said improvement comprising a layer of hard insulating material at an end portion of the cell and through which the central electrode projects, said material extending radially outward adjacent to the cylindrical electrode, means for supporting said material in place, and a metal cover of stiffer material than said outer electrode having its outer portion flanged and bent over the edge portion of the cylindrical electrode, said layer of insulating material serving as an abutment to limit inward bending of the cover flange and to clamp the upper edge of said outer electrode, said cell being vented between said material and at least one of said cap and cover.

7. A cell having an inner electrode, an outer cylindrical electrode, a layer of hard insulating material at an end portion of the cell and between said electrodes adjacent an edge of the outer electrode, a metal cover of stiffer material than said outer electrode overlying said material with at least some portion of the outer edge of said cover being bent to clamp an edge of the outer electrode between the hard material and bent portion of the cover in the plane of said hard insulating material.

8. A cell having an inner electrode, an outer cylindrical electrode, a layer of hard insulating material at an end portion of the cell and between said electrodes adjacent an edge of the outer electrode, a metal cover of stiffer material than said outer electrode, longitudinally beyond the adjacent edge of said outer electrode, contiguous said layer of material with at least some portions of the outer edge of said cover being bent to clamp an edge of the outer electrode between the layer of material and bent portions of the cover, said outer edge portion of the outer electrode being bent in whereby said layer of material is clamped within said cover and a bent in portion of the outer electrode as a support for such material in the plane thereof.

9. In a dry cell of the type having a central electrode, a moisture resistant cover of metal, and an outer cylindrical electrode of less stiff material than the metal cover, the combination therewith of the improvement enabling the cover and edge of the outer electrode in contact therewith to form a joint resistant to bulging of said outer electrode where it contacts with said cover without the necessity of clamping the outer electrode edge portion between two crimped face portions of the metal cover and the reduction in gas space in the top of said cell required by such a crimped joint between the cover and electrode, said improvement comprising a stiff insulating washer around said central electrode at the top end portion of the cell beneath said metal cover and against which an upper edge portion of said outer electrode is clamped by a down-turned flange of said cover, the plane of said cover being at the upper end of said cover flange.

10. A dry cell comprising a central electrode, depolarizing material and electrolyte material around said electrode, a container for said electrode and materials, a flanged cap over said electrode, a flanged cover stiffer than said container, spaced from said cap, and the improvement for enhancing gas tightness of such a cell by enabling it to be mechanically sealed at its upper outer edge portion by a spinning tool which is too large to be inserted in the space available between the upper edge of the container and the flanged cap, said improvement including a hard layer of insulating material at an upper end portion of the cell supported by the flange of said cap, underlying said cover, and extending radially outward to a position adjacent the upper edge of the container, said layer of hard insulating material being of stiffer and less readily deformed material than said container, the upper edge portion of said container being clamped by the flange of said cover against said hard layer of insulating material, whereby the cover need not be dished downwardly to form an upwardly extending inverted U-shaped rib in which the upper edge of the container is clamped.

11. A dry cell according to claim 10 in which said layer of insulating material is a resinous plastic.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,060,799	Drummond	Nov. 17, 1936
2,088,307	Ruhoff et al.	July 27, 1937
2,149,169	Gelardin	Feb. 28, 1939
2,169,702	Marsal	Aug. 15, 1939
2,179,816	Drummond	Nov. 14, 1939
2,332,456	McEachron et al.	Oct. 19, 1943
2,399,089	Anthony	Apr. 23, 1946

FOREIGN PATENTS

Number	Country	Date
71,747	Germany	Mar. 15, 1893

OTHER REFERENCES

Mills, W. C.: P. 544, Product Engineering, August 1945.