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(54) GALVANIC ROUND DRY CELL FILM SEAL

(71) We, UNION CARBIDE CORPORATION, of 270, Park Avenue, New York, State of New York, 10017, United States of America, a Corporation organized under the laws of the State of New York, United States of America, (assignee of ELLSWORTH GEORGE MUNCK), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to galvanic round dry cells of either the primary or secondary type. More particularly, the invention relates to the provision in a galvanic round dry cell of a protective film seal which serves as a guarantee to the customer that the cell is fresh and unused at the time of purchase.

Galvanic round dry cells are often sold to the customer, individually such as from a dispenser or an open bin conveniently located in the vendor's place of business. When the dry cells are sold individually, the customer usually has no way of determining whether the cells are fresh and unused or whether they may have been discharged prior to purchase.

It has recently been proposed by manufacturers of dry cells to employ a protective seal fastened in place over one terminal of the cell in an attempt to guarantee to the customer that the cell is fresh and unused at the time of purchase. One type of protective seal that has been proposed, for example, consists of a thin, narrow strip or web of a readily frangible electrically insulating material such as paper or cardboard, fastened in place over the top of the central positive terminal which protrudes a short distance beyond the top end of the cell. Before the cell can be placed in use, the protective strip or web must be broken and removed in order to ex-

pose the positive terminal.

While frangible protective seals of this type have been used with some success, they have nevertheless failed to serve as an effective guarantee to the consumer that he is buying a fresh and unused dry cell. This is so primarily because the thin, narrow, frangible strip or web has been adapted to cover only the top surfaces of the central positive terminal, leaving those portions of the surfaces around its side edges exposed to contact with some electrically conductive object which could cause the cell to be discharged. Furthermore, this type of protective seal is in no way indicative of the actual freshness of the cell since the cell tends to lose moisture upon storage and gradually diminishes in capacity with time.

The invention contemplates the provision in a galvanic round dry cell of a novel and improved readily removeable, protective seal which guarantees to the customer that the cell is fresh and unused in a more effective manner than those seals of the prior art.

More specifically, the invention contemplates a galvanic round dry cell including at least one terminal on one end thereof and having a flexible, electrically insulating protective film seal over said terminal and adhered around the outer extremities of the cell.

The term "film" as used herein means in the broadest sense a membrane-like cover which may be composed of any sheet material of substantially uniform thickness. Preferably, the protective film seal of the invention is composed of a stretchable film and most advantageously is made from a stretchable organic film such as a polyethylene film, for example.

The invention will be described herein with particular reference to the placement of the protective film seal over the top of the central positive terminal of a con-

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ventional galvanic round dry cell. Such a dry cell incorporates a top closure from which the central positive terminal protrudes a short distance for making terminal contact when the cell is placed in use. The top closure usually consists of a metallic top cover plate which closes the upper end of the cell and which has its outer edges locked in engagement with the upper edges of a tubular jacket surrounding the cell proper. This locked engagement may be achieved by crimping the upper edges of the tubular jacket over the edges of the metallic top cover plate forming a peripheral rim around the outer extremities of the dry cell.

In the practice of the invention, the protective film seal which is preferably made of stretchable organic film is placed over the top of the central positive terminal completely covering the top closure and is stretched tautly and adhered around the peripheral rim formed by the crimped over upper edges of the tubular jacket. The film seal may be adhered to the upper edges of the tubular jacket by heat sealing it thereto, i.e. fusion bonded, or the film may be adhered through the use of a cling agent or an adhesive cement. The adhesive cement is preferably used and may be applied directly to the underneath side of the film as a coating or around the peripheral rim formed by the crimped over upper edges of the tubular jacket. Preferred adhesive cements for use in the invention include commercially available vinyl base adhesive compositions, for example.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an elevational view partly in section of a conventional galvanic round dry cell embodying the invention;

Figure 2 is an enlarged fragmentary sectional view of a portion of the dry cell shown in Figure 1, illustrating the protective film seal and its manner of assembly in greater detail;

Figure 3 is a top plan view of the dry cell shown in Figure 1;

Figure 4 is a sectional view of the top portion only of a dry cell illustrating a modification of the invention;

Figure 5 is a top plan view of the dry cell shown in Figure 4;

Figure 6 is an elevational view partly in section of a dry cell illustrating another modification of the invention;

Figure 7 is an enlarged fragmentary sectional view of a portion of the dry cell shown in Figure 6, illustrating the protective film seal and its manner of assembly in greater detail;

Figure 8 is an elevational view partly in section of a dry cell illustrating still another

modification of the invention; and

Figure 9 is a top plan view of the dry cell shown in Figure 8.

Referring now to the drawing and more particularly to Figures 1-3, there is shown a primary Leclanché type galvanic round dry cell embodying the invention. As shown, the dry cell comprises a metallic cup container 10, i.e. zinc cup anode, having therein a cathode mix 12 suitably of manganese dioxide and carbon, separated from the interior walls of the metallic cup container 10 by a paste separator 14 containing a liquid electrolyte and a central carbon cathode rod 16 embedded within the cathode mix 12 and protruding a short distance beyond the open end of the metallic cup container 10.

Surrounding the metallic cup container 10 is a tubular jacket 18 which may suitably be composed of one or more spirally wound layers or plies of a fibrous material such as kraft paper, for example. The tubular jacket 18 may be suitably provided with an outer label 20 (Figure 2) which is wrapped around the tube before assembly of the cell. The label 20 may be composed of any one of a number of materials such as cellulose or cellulose acetate, for example, and may carry printed matter thereon including the trademark of the manufacturer.

The top closure for the dry cell comprises an annular shaped, metallic top cover plate 22 whose inner edges rest on an insulating washer 24 suitably of cardboard or paper, which is supported on top of the lower peripheral edges of a flanged metal central positive terminal cap 26 fitted tightly over the protruding upper end of the carbon cathode rod 16. As more particularly shown in Figure 2, the tubular jacket 18 has its upper edges crimped over and locked in engagement with the outer edges of the metallic top cover plate 22 forming a peripheral rim 28 around the outer extremities of the dry cell.

The dry cell may also incorporate an inner seal for preventing migration of the corrosive liquid electrolyte into the vicinity of the top closure assembly. This inner seal may consist of a top collar 30 suitably of paper or cardboard, fitted around the upper end of the carbon cathode rod 16 and supporting a soft seal 32 suitably of asphalt. The soft seal 32 adheres to the interior wall of the metallic cup container 10 and the carbon cathode rod 16 and thus effectively seals off the upper open end of the metallic cup container 10.

In accordance with the invention, a protective seal is provided for the dry cell which comprises a thin, flexible, electrically insulating, circular shaped stretchable organic film 34 which is placed over the top of the central positive terminal cap 26. The film

seal 34 completely covers the metallic top cover plate 22 and is stretched tautly around and adhered to the outer extremities of the cell, i.e., the peripheral rim 28 formed by the locked engagement between the tubular jacket 18 and the top cover plate 22. Preferably, the film seal 34 is of such size that when stretched tautly 360 degrees over the whole top closure assembly, the film will extend completely around the rim 28 and down a short distance over the side walls of the tubular jacket 18. This permits the film to be fastened tightly around its outer periphery so that there is less chance for the film to inadvertently be removed or stripped off prior to the time of purchase.

As more particularly shown in Fig. 2, the protective film seal 34 is actually adhered to that portion of the label 20 which is provided around the crimped over upper edges of the tubular jacket 18. The film seal 34 may be adhered to the label 20 through means of a cling agent coated on the underneath side of the film or through the use of an adhesive cement. In the embodiment of the dry cell shown in Figure 2, the film seal is adhered to the label 20 by an adhesive cement as generally indicated by the reference numeral 36. The adhesive cement may be applied directly to the underneath side of the film or it may be applied around the rim 28 and the upper side walls of the tubular jacket 18. In the case where the label 20 is made from a cellulosic film, for example, a commercially available adhesive cement composed of a cross-linking vinyl rubber solvent type composition has been successfully used.

The protective film seal 34 may be a clear or opaque film and may contain printed matter thereon. Usually this printed matter will be in the form of notice or instruction to the consumer to remove the seal before using the dry cell.

Figures 4 and 5 show a modification wherein such notice or instruction is printed on an underlay member in the form of a thin, fairly wide, electrically insulating collar 38 fitted around the central positive terminal cap 26 and resting on the metallic top cover plate 22. The collar 38 is removed and disposed of when the dry cell is put in use and is constructed of an inexpensive material such as paper or cardboard. The protective film seal 40 overlies the collar 38 and in this instance is a clear film material.

The dry cell construction shown in Figures 4 and 5 is basically the same as that just described except of the provision of an outer metal tubular jacket 42. The metal jacket 42 is isolated from contact with the metallic cup container 10 by an electrically insulating sleeve 44 suitably

composed of a fibrous material such as kraft paper, for example. Both the metal jacket 42 and the sleeve 44 are crimped over at their upper peripheral edges and locked in engagement with the metallic top cover plate 22 forming the peripheral rim 46 around the outer extremities of the dry cell.

The protective film seal 40 is applied in the same manner as described before using an adhesive cement. Generally, a cling agent coated on the underneath side of the film seal 40 will not provide a tenacious enough bond between the film and the metal jacket 42. A particularly good adhesive for this purpose is a vinyl base cement of any one of a number of commercially available compositions.

It may be desirable in some instances to provide a protective film seal which is mechanically locked or fastened in place around the outer extremities of the dry cell. This sort of construction is advantageous in that it protects against the possibility of the film becoming inadvertently loosened and partially or wholly removed during shipment or storage of the dry cell.

Such a construction is used in the modification shown in Figures 6 and 7. In this modification, the dry cell is basically of the same construction using an outer metal tubular jacket 48 but in which only the upper peripheral edges of the electrically insulating sleeve 50 are crimped over and locked in engagement with the metallic top cover plate 22. The protective film seal 52 is adhered around the peripheral rim 54 formed by the crimped-over edges of the sleeve 50 either through the use of a cling agent or an adhesive cement. The upper edges of the metal jacket 48 are then crimped over the top of the outer edges of the film seal 52 locking it in place as indicated at 56.

Before using the dry cell of this modified construction, it is necessary to first fracture the film seal and then tear it off from the top closure assembly. This may conveniently be done by first puncturing the film with the user's fingernail or some sharp pointed object and then by using the fingers tearing the film from about the crimped-over edges of the metal jacket 48.

Figures 8 and 9 show a further modification of the same basic dry cell construction wherein a concave disc shaped underlay member 57 is positioned over the top of the central positive terminal 58 which is formed integrally with a one-piece metal top cover plate 60. The underlay member 57 may contain printed matter thereon in the form of notice or instruction to the consumer to remove the seal before using the dry cell and suitably is made of paper or cardboard. The upper peripheral edges of

the electrically insulating sleeve 50 are crimped over and locked in engagement with the outer edges of the top cover plate 60. These outer edges of the top cover plate 60 are isolated from the upper open end of the metallic cup container 10 by an electrically insulating top washer 62 fitted around the upper end of the carbon cathode rod 16. The protective film seal 64 is made of a clear film and is fastened or locked around its outer edges by the crimped-over upper edges of the metal jacket 48 in the same manner as described before.

A number of thin, flexible, electrically insulating films may be used for the protective film seal of the invention including both organic films and fibrous sheet materials. The film is preferably stretchable so that a film seal can be formed which is smooth, taut and generally pleasing in appearance. Suitable stretchable organic films include polyethylene film and the film consisting of the copolymer of polyvinyl chloride and polyvinylidene chloride. The fibrous sheet materials which may be used for the film seal include stretchable papers and cloth, for example. The film seal may also be made from a combination of films such as a laminate of an organic film and fibrous sheet material. The thickness of the film is not too critical so long as the film has sufficient strength to resist being easily ruptured. A one mil thickness polyethylene film has been successfully used.

The protective film seal of the invention is most advantageously made from an organic film having fairly low oxygen and water vapor transmission properties. Such a film offers the additional advantage in that the film serves as a barrier against the ingress of oxygen from the atmosphere which can result in undesirable oxidation of the zinc cup anode and also against loss of moisture from inside the cell.

Still another advantage of using an organic film resides in the fact that the protective film seal is liquid impermeable and capable of retaining any liquid exudate or spew which may leak through the top closure of the cell. This is particularly important in those cases where the cell may be damaged or subjected to abnormally high temperatures during shipment or storage when leakage is more apt to occur. The liquid exudate or spew is highly corrosive and can corrode and damage other cells placed within the shipping carton or display device.

Various cling agents for adhering the protective film seal may be used in the practice of the invention. The cling agent is usually pressure sensitive but may be of the heat activating type. Suitable pressure sensitive cling agents are the mono- and di- glycerides of fat-forming fatty acids.

The cling agent may be incorporated directly within the film during its manufacture or may be coated on one side of the film material. As already indicated, the cling agent is not recommended for use in those instances where the dry cell incorporates a metal jacket.

The adhesive cement used in the practice of the invention should be capable of tenaciously bonding the protective film seal around the outer extremities of the dry cell. At the same time, the adhesive cement should be compatible with the particular film material used and should permit the film seal to be easily peeled or stripped off by the user when the dry cell is actually placed in use. A vinyl base adhesive cement is particularly good adhesive for this purpose and is uniformly applicable for use in those cases where the film is to be adhered either to the label, fibrous electrically insulating sleeve or to the metal jacket. Several types of vinyl base adhesives are commercially available and generally consist of a vinyl copolymer base dissolved in a suitable solvent such as ketone, for example. These adhesives are heat activated requiring temperatures of up to about 200°F. (93°C.) for low pressure sealing. Instead of using heat to activate the adhesive, a suitable solvent may be used such as methyl isobutyl ketone, methyl ethyl ketone and acetone.

The adhesive cement may be roll coated or sprayed over the entire surface of one side of the film, thus adhering the film also to the central positive terminal cap or it may be roll coated over the outer peripheral edges of the film. The adhesive cement may also be applied directly to the peripheral rim formed by the crimped-over edges of the tubular jacket after the dry cell has been finished. With some organic films such as polyethylene film, it is necessary in order to achieve the proper bond with the film that the film be electrostatic-field treated before the adhesive cement is applied. The adhesive cement should be allowed sufficient time to dry after application and before the protective film seal is positioned in place over the top closure of the cell.

The protective film seal may be applied after the dry cell has been completely assembled during manufacture in the following manner. The film material is fed from a large roll in the form of a continuous strip and is coated on its underneath side with the cling agent if not incorporated within the film or with the adhesive cement as described before and is then positioned over the top end of the dry cell. The film is then stretched tautly (radially in 360 degrees) and held stationary while the dry cell is forced through the film

with the end result of the film being adhered to the outer extremities of the cell. In the alternative, the dry cell may be held stationary and the film forced down over the top of the cell. Any excess film is torn away as the dry cell passes through the film. If a printed collar or underlay member is used, it should be placed in position prior to application of the film seal. After the film seal has been applied, the adhesive cement if used should be heated to an elevated temperature, i.e. about 200°F. (93°C.) in the case of the vinyl base adhesives, in order to activate the cement. This may suitably be done by means of a heated metal collar having a silicone rubber insert which fits around the outer periphery of the dry cell.

Although the invention has been described herein with particular reference to the use of a protective film seal which is placed over the central positive terminal at the top end of the dry cell, it will be understood that the invention is not so limited but is broadly applicable to the use of a protective film seal which is adapted to completely cover one electrode at either the top or bottom end of the cell. Thus, the protective film seal may be applied equally as well over the bottom closure covering the negative terminal of the cell. Usually the negative terminal consists of a metallic bottom cover plate positioned in electrical contact with the bottom wall of the metallic cup and having its outer edges locked in an engagement with the lower peripheral edges of the tubular jacket.

It will be seen from the foregoing that the invention provides a novel readily removable protective film seal for a galvanic round dry cell which serves as an effective guarantee to the consumer that the cell is fresh and unused at the time of purchase. The film seal completely covers one terminal at one end of the cell and thus serves as a guard against the cell being discharged during shipment, storage or when on display. Before placing the dry cell in use, the protective film seal must be removed and consequently is destroyed so that it is a relatively easy matter for the consumer to detect by visual inspection whether the cell may have been discharged prior to purchase.

WHAT WE CLAIM IS:—

1. A galvanic round dry cell including at least one terminal of one end thereof, which has a flexible, electrically insulating protective film seal positioned over said terminal and adhered around the outer extremities of the cell.

2. A galvanic round dry cell as claimed in claim 1 in which the protective film seal is made from a stretchable organic film.

3. A galvanic round dry cell as claimed

in claim 2 in which the protective film seal is made from a stretchable organic film or polyethylene or a copolymer of polyvinyl chloride and polyvinylidene chloride.

4. A galvanic round dry cell as claimed in claim 1 in which the protective film seal is made from a stretchable fibrous sheet material.

5. A galvanic round dry cell as claimed in claim 4 in which the protective film seal is made from a stretchable fibrous paper or cloth sheet material.

6. A galvanic round dry cell as claimed in any of claims 1 to 5 in which the protective film seal is adhered around the outer extremities of the cell by means of a cling agent incorporated within the film.

7. A galvanic round dry cell as claimed in any one of claims 1 to 5 in which the protective film seal is adhered around the outer extremities of the cell by means of a cling agent coated on the underneath side of the film.

8. A galvanic round dry cell as claimed in any one of claims 1 to 5 in which the protective film seal is adhered around the outer extremities of the cell by means of an adhesive cement.

9. A galvanic round dry cell as claimed in any one of claims 1 to 5 in which said dry cell having a tubular jacket surrounding the cell proper and a top closure including a central positive terminal protruding therefrom, the top closure having its outer edges locked in engagement with the upper edges of said tubular jacket forming a peripheral rim, characterized by a thin, flexible, electrically insulating protective film seal being positioned over said central positive terminal and completely covering said top closure, said film seal being adhered in sealing relation around said peripheral rim formed by the locked engagement between said top closure and said tubular jacket.

10. A galvanic round dry cell as claimed in claim 9 in which the protective film seal is composed of a clear film material.

11. A galvanic round dry cell as claimed in either of claims 9 or 10 in which an annular shaped underlying member is provided containing printed matter thereon and is placed around said central positive terminal underlying said film seal.

12. A galvanic round dry cell as claimed in either of claims 9 or 10 in which a disc shaped underlay member is provided containing printed matter thereon and is placed over said central positive terminal underlying said film seal.

13. A galvanic round dry cell as claimed in any of claims 9 to 12 in which the tubular jacket is made of metal and the protective film seal is adhered around the peripheral rim formed by the locked

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with the end result of the film being adhered to the outer extremities of the cell. In the alternative, the dry cell may be held stationary and the film forced down over the top of the cell. Any excess film is torn away as the dry cell passes through the film. If a printed collar or underlay member is used, it should be placed in position prior to application of the film seal. After the film seal has been applied, the adhesive cement if used should be heated to an elevated temperature, i.e. about 200°F. (93°C.) in the case of the vinyl base adhesives, in order to activate the cement. This may suitably be done by means of a heated metal collar having a silicone rubber insert which fits around the outer periphery of the dry cell.

Although the invention has been described herein with particular reference to the use of a protective film seal which is placed over the central positive terminal at the top end of the dry cell, it will be understood that the invention is not so limited but is broadly applicable to the use of a protective film seal which is adapted to completely cover one electrode at either the top or bottom end of the cell. Thus, the protective film seal may be applied equally as well over the bottom closure covering the negative terminal of the cell. Usually the negative terminal consists of a metallic bottom cover plate positioned in electrical contact with the bottom wall of the metallic cup and having its outer edges locked in an engagement with the lower peripheral edges of the tubular jacket.

It will be seen from the foregoing that the invention provides a novel readily removable protective film seal for a galvanic round dry cell which serves as an effective guarantee to the consumer that the cell is fresh and unused at the time of purchase. The film seal completely covers one terminal at one end of the cell and thus serves as a guard against the cell being discharged during shipment, storage or when on display. Before placing the dry cell in use, the protective film seal must be removed and consequently is destroyed so that it is a relatively easy matter for the consumer to detect by visual inspection whether the cell may have been discharged prior to purchase.

WHAT WE CLAIM IS:—

1. A galvanic round dry cell including at least one terminal of one end thereof, which has a flexible, electrically insulating protective film seal positioned over said terminal and adhered around the outer extremities of the cell.

2. A galvanic round dry cell as claimed in claim 1 in which the protective film seal is made from a stretchable organic film.

3. A galvanic round dry cell as claimed

in claim 2 in which the protective film seal is made from a stretchable organic film or polyethylene or a copolymer of polyvinyl chloride and polyvinylidene chloride.

4. A galvanic round dry cell as claimed in claim 1 in which the protective film seal is made from a stretchable fibrous sheet material.

5. A galvanic round dry cell as claimed in claim 4 in which the protective film seal is made from a stretchable fibrous paper or cloth sheet material.

6. A galvanic round dry cell as claimed in any of claims 1 to 5 in which the protective film seal is adhered around the outer extremities of the cell by means of a cling agent incorporated within the film.

7. A galvanic round dry cell as claimed in any one of claims 1 to 5 in which the protective film seal is adhered around the outer extremities of the cell by means of a cling agent coated on the underneath side of the film.

8. A galvanic round dry cell as claimed in any one of claims 1 to 5 in which the protective film seal is adhered around the outer extremities of the cell by means of an adhesive cement.

9. A galvanic round dry cell as claimed in any one of claims 1 to 5 in which said dry cell having a tubular jacket surrounding the cell proper and a top closure including a central positive terminal protruding therefrom, the top closure having its outer edges locked in engagement with the upper edges of said tubular jacket forming a peripheral rim, characterized by a thin, flexible, electrically insulating protective film seal being positioned over said central positive terminal and completely covering said top closure, said film seal being adhered in sealing relation around said peripheral rim formed by the locked engagement between said top closure and said tubular jacket.

10. A galvanic round dry cell as claimed in claim 9 in which the protective film seal is composed of a clear film material.

11. A galvanic round dry cell as claimed in either of claims 9 or 10 in which an annular shaped underlying member is provided containing printed matter thereon and is placed around said central positive terminal underlying said film seal.

12. A galvanic round dry cell as claimed in either of claims 9 or 10 in which a disc shaped underlay member is provided containing printed matter thereon and is placed over said central positive terminal underlying said film seal.

13. A galvanic round dry cell as claimed in any of claims 9 to 12 in which the tubular jacket is made of metal and the protective film seal is adhered around the peripheral rim formed by the locked

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engagement between said top closure and said metal jacket.

14. A galvanic round dry cell as claimed in claim 13 in which the metal tubular jacket surrounds the cell proper but is separated therefrom by an electrically insulating sleeve member whose upper edges are locked in engagement with the outer edges of said top closure.

15. A galvanic round dry cell as claimed in either of claims 13 or 14 in which the

upper edges of said metal tubular jacket are crimped over the outer peripheral edges of film seal.

16. A galvanic round dry cell substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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