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DRY BATTERY AND METHOD OF MAKING THE SAME

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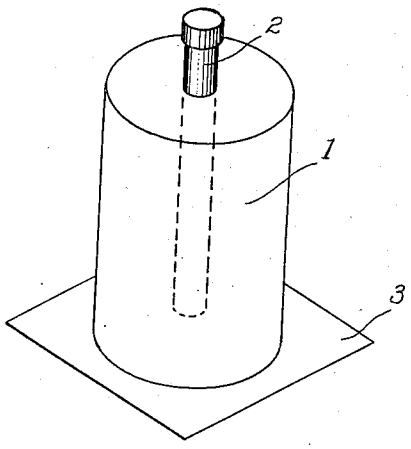

Fig. 1.

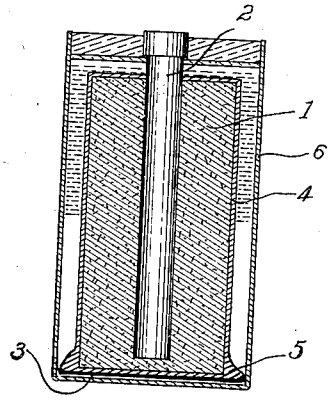

Fig. 2.

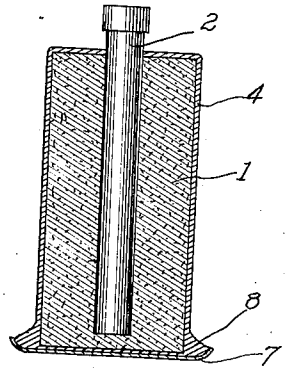

Fig. 3.

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DRY BATTERY AND METHOD OF MAKING THE SAME

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This invention relates to dry cells and particularly to dry cells of the bag or bobbin type.

The invention has for a principal object the provision of improved means for centering the cathode or bobbin electrode with respect to the zinc-cup anode.

It is a further object to eliminate the wrapping customarily used on bobbins to prevent their disintegration during handling and to provide an improved armoring coating for the bobbin and a method of forming the same.

It is a still further object of the invention to improve the shelf life and operating efficiency of dry cells by controlling the composition of the armoring coating for the bobbin and the composition of the electrolyte paste.

Other objects are disclosed in the detailed description which follows.

In the manufacture of dry cells of the bag or bobbin type it is customary to provide the bobbin, which comprises a mixture of carbonaceous material and depolarizer molded around a carbon electrode, with a protective wrapping of gauze, cheese cloth or the like held in place by thread or other binding means. This type of cell gives satisfactory results, but the manufacturing costs are high owing to the expense of the wrapping material and the hand labor required in applying it to the bobbin. It has also been proposed to dispense with the wrapping entirely, or to form a protective coating upon the bobbin by dipping it into paste or similar material which on being subjected to drying will form a bibulous adherent coating. Such coated bobbins show good results when used in dry cells but the methods heretofore employed in forming the coating have not been entirely satisfactory. When the bobbin is dipped in paste it is a very inconvenient unit to handle since it is sticky and tends to adhere to any surface with which it may come in contact while the coating is setting. As the freshly molded and dipped bobbin is very fragile it is also easily damaged.

In placing the bobbin in the zinc cup which constitutes the anode of the completed cell it is important that the bobbin should be spaced equidistantly from the side walls of the cup. Heretofore this has been accomplished by the use of centering cups or disks made of relatively stiff thick paper or by the use of spacing strips of cardboard or the like.

According to the present invention, concurrently with the formation of the bibulous protective coating on the bobbin, a ring of paste is formed about the base of the bobbin. This ring serves to space and center the bobbin with respect to the zinc cup. The means and method employed in forming this ring of paste facilitate the manipulation of the wet dipped bobbin and permit of its being placed upon a horizontal surface for the purpose of drying the coating without danger that the bobbin will adhere thereto.

In the drawings, Fig. I is a perspective view of a partially completed bobbin;

Fig. II shows the bobbin of Fig. I, after the paste coating has drained down and formed a centering ring about the base of the bobbin, in assembled relation with the other elements of a dry cell; Fig. III shows a bobbin which is associated with a modified form of the means for retaining the fluid paste about the base of the bobbin until it has set.

According to a preferred embodiment of my invention, a bobbin 1 is first formed by molding moist battery mix comprising manganese dioxide, carbon or graphite, and preferably electrolyte salts, around a carbon rod 2. The molded bobbin is then dipped into a paste composed of water, corn starch, wheat flour or corn meal, and electrolyte salts. The dipped bobbin is then set on a small square or disk of thin paper 3, for example tissue paper, and allowed to dry until the paste coating 4 has become firmly set but not long enough to

show desiccation. Fig. I shows a freshly dipped bobbin which has just been placed upon the square of paper 3 but before the surplus paste has had sufficient time to run down the sides of bobbin and collect upon the paper square 3. The thin paper sticks to the bobbin but does not become sticky on the under side, so that the bobbin may be set on a horizontal surface without adhering. A portion of the fluid paste which is carried by the bobbin when it is removed from the dipping bath runs down the side of the bobbin and collects in a ring 5 at the base. This paste ring solidifies on drying and forms an efficient spacing and centering means for the bobbin when it is introduced into the zinc cup 6. The thin paper disk does not itself act as a centering or spacing member but on the contrary only acts to retain the paste which collects about the base of the bobbin so that it can solidify in the form of a ring integrally joined to the bobbin. The thin disk should preferably also be made of a porous paper which is readily permeable to electrolyte and will therefore interpose very little resistance to the flow of current between the bobbin or cathode and the bottom of the zinc cup anode, thus insuring the utilization of the zinc which is contained in the bottom of the zinc-cup anode and thereby increasing the effective service life or capacity of the cell as compared with similar cells in which insulating or high resistance spacing and centering means are used.

In some cases it may be desirable to place the dipped bobbins into shallow, thin paper cups instead of upon plain flat disks or squares. Such cups serve to hold the paste and retain it about the base of the bobbin until it has hardened sufficiently to act as a spacing member. Fig. III shows such a cup 7 into which a freshly dipped bobbin has been placed. Surplus paste runs down the sides of the bobbin and collects in the cup to form the ring 8.

The paste armoring or hardened coating, when care is taken to form it of the proper hardness and toughness without undue drying, serves a useful function in preventing penetration of paste or electrolyte into the bobbin.

With unprotected bobbins heretofore used such penetration is an occasional occurrence which may cause a loss in capacity of as high as 30–40% on certain types of service. I have found that the best results are obtained when the paste coating is allowed to dry only long enough to set firmly but not long enough to show desiccation. Ordinarily, drying for 30 minutes at 70–75° F. in an atmosphere of 50% humidity is satisfactory. If the bobbins are dried for a longer period, especially in dry air, the results are unsatisfactory due to the loss of moisture and the formation of high resistance layers at the bobbin surface. Too short a period is even more unsatisfactory, since the paste layer formed by dipping does not under these conditions protect the bobbin from electrolyte penetration while the cell is being assembled. A commercially preferable method of setting or toughening the paste coating consists in drying the dipped bobbins at approximately 175° F. for from 3 to 5 minutes. Still another method consists in dipping a hot bobbin into cold paste. It will be understood that these methods of setting or toughening the paste coating are not limited to use in conjunction with the means for centering the bobbin above described.

It has heretofore been recognized that if, in making up the depolarizer mix, electrolyte containing a high concentration of zinc chloride is incorporated therewith, the keeping quality of the cell and its efficiency for certain types of service, e. g. radio and flashlight service, are improved. However, as a practical matter it has been difficult to introduce the desired amount of zinc chloride into the mix under factory conditions because of the irritating effect of the zinc chloride on the hands of those engaged in handling the mix. It is not immediately practicable with ordinary compositions to introduce these high quantities of zinc chloride in the bulk of the paste for various reasons, including the rapidity with which the paste would tend to thicken. According to the present invention the advantages of high zinc chloride concentration in the cell are obtained by using a dipping paste having an abnormally high zinc chloride content and reducing the zinc chloride content of the mix to such limits as to permit of its being handled without trouble, or eliminating zinc chloride from the solution used in wetting the mix. I prefer that the zinc chloride content of the dipping paste shall be as high as is compatible with manufacture of paste of the desired viscosity. However, the zinc chloride content is dependent to some extent on the composition of the mix electrolyte. Thus if water only is used in wetting the mix, 35 parts of zinc chloride per 100 parts by weight of water in paste electrolyte may be used; with mix wet with zinc chloride solution a lower concentration, e. g. 28 parts of zinc chloride, is indicated. Improvement of the order of 10 to 15 per cent in radio service of miniature cells may readily be effected by such precedure. Concentrations ranging from 20 to 35 parts of zinc chloride per 100 parts of water have successfully been used.

According to the preferred embodiment of my invention the dipping paste contains no mercuric chloride. However, it is preferable to correspondingly increase the mercuric chloride content of the paste layer used to fill the space between the bobbin and the zinc-cup anode in the assembled cell so that the cell will contain the amount of mercury ordi-

narily used. The paste armoring for the bobbin tends to reduce the diffusion of mercury from the paste layer into the bobbin, and for that reason to maintain more mercury in effective relation to the zinc anode for amalgamation therewith without increasing the quantity of mercury in the cell. The increased mercury concentration of the paste layer also improves the keeping qualities of the cell and therefore prolongs its shelf life. It is also possible to use paste with normal mercury content in forming the paste layer between the bobbin and the zinc anode without material reduction in the keeping qualities and shelf life of the cell, although the mercury content of the cell thereby has been reduced and manufacturing costs have been correspondingly reduced.

By following the practice outlined above it is possible to effect the entire or partial elimination of the cooking operation heretofore considered indispensable for the production of cells of good quality, because of the electrolyte penetration previously discussed with uncooked paste. Cooking may be omitted entirely without danger that the cells will spoil while being stored prior to use, or, to hasten the setting of the paste, a cooking temperature ordinarily too low to be effective may be utilized. In either case danger of over-cooking is obviated.

I claim:

1. Process of encasing the depolarizing mix of a bobbin and forming a means thereon for centering the bobbin in an anode cup, comprising completely coating the sides and bottom of the molded unwrapped depolarizing mix with an excess of fluid paste; placing the bobbin on a support whereby the excess paste is collected in the form of a ring about the base of the bobbin and adhering thereto, and subjecting the coated bobbin to a regulated drying action to toughen the paste coating.

2. Process of encasing the molded depolarizing mix of a bobbin and forming a means thereon for centering the bobbin in an anode cup, comprising immersing the unwrapped depolarizing mix in a cereal paste; collecting an excess of paste on the surface of the mix; placing the bobbin on a porous bibulous material upon which the excess paste is collected in the form of a ring about the base of the bobbin and adhering thereto, and then subjecting the coated bobbin to a regulated drying action to toughen the coating.

3. A dry cell comprising an anode cup; an unwrapped bobbin therein of smaller diameter than said cup; a coating permeable to electrolyte on said bobbin; a ring of the same composition as said coating integral therewith and formed about the base of said bobbin; said ring extending to the walls of said cup.

4. A dry cell comprising an anode cup; an unwrapped bobbin therein spaced from said cup; a coating permeable to electrolyte encasing the sides and bottom of said bobbin; a paper cup fitting within said anode cup; a ring of the same composition as said coating integral with said coating and molded into said paper cup about the base of said bobbin; said ring extending from the base of said bobbin to the inner walls of said anode cup.

In testimony whereof, I affix my signature.

GEORGE W. HEISE.