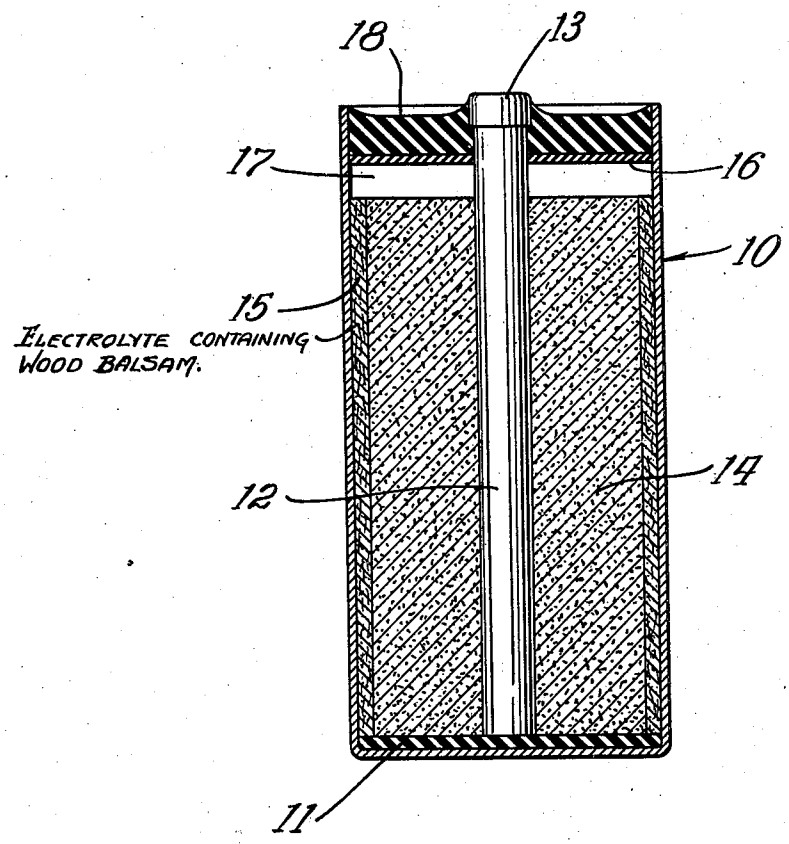
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DRY CELL

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DRY CELL

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This invention relates to dry cells, and particularly to improvements in the construction whereby deterioration of such cells during periods of storage and inactivity is reduced.

It is the object of the invention to provide an improved dry cell which has favorable "shelf life" and intermittent drain properties.

Briefly, the improvement is obtained by associating a wood balsam with the zinc anode of the cell in such way as to be effective at the surface thereof which is exposed to the electrolyte. In accordance with the invention, it has been discovered that the wood balsams, as a class of materials, possess the property of inhibiting the corrosion of the zinc anode, which, due to local action or other causes, occurs during periods of inactivity.

The invention will be described in connection with the common cylindrical type of dry cell. It is not limited to this type of cell, however, and may be used with any dry cell in which a zinc anode is employed in such manner as to have a surface thereof exposed to an electrolyte. The dry cell which is illustrated in the drawing comprises an open-top cylindrical zinc can 10 which is the negative electrode. Upon the bottom of the can is disposed a layer of electrical insulating material 11, which may be a heat-fusible pitch or wax composition, a resin, or a treated fibrous material such as paper board or pulp board, which is resistant to the electrolyte of the cell. A carbon rod positive electrode 12 is disposed substantially centrally of the zinc can 10 and has a metal cap 13 upon its upper end. The carbon rod is electrically insulated and positively separated from the bottom of the can 10 by the insulating layer 11. The carbon rod is surrounded by a moist, compacted mass of depolarizing material 14 which may be composed of powdered manganese dioxide ore, carbon or graphite, ammonium chloride, zinc chloride, and other well-known ingredients. Between the depolarizing body 14 and zinc can 10 is a substantially solid, electrolyte-containing layer 15 which may be composed of the usual electrolyte substances, such as water, starch, usually in gelatinized form, ammonium chloride, zinc chloride, etc. The electrolyte is in the form of an aqueous solution when initially inserted in the can 10. A top washer 16 is arranged in spaced relation above the depolarizing body 14 to form an expansion space 17, and a heat-fusible seal 18, of wax or pitch, rests upon washer 16 and forms a seal closure for the open top of the can 10.

It is not uncommon for dry cells to remain in storage, in the plant or on the dealer's shelf, for a considerable period between the time they are manufactured and the time they are placed in use by the consumer. After they are placed in use, they may be discharged rapidly, or they may be discharged slowly and only intermittently, with relatively long periods of inactivity intervening between periods of use. It is highly important, therefore, that a dry cell does not deteriorate and lose its capacity to deliver electric energy during such inactivity. Unless steps are taken to resist such deterioration, it takes place at an appreciable rate, and the dry cell industry has from the beginning striven to overcome this difficulty. This invention provides an improved means for accomplishing the purpose.

In accordance with this invention, it has been discovered that wood balsams have the property to a remarkable degree of inhibiting corrosion of the zinc electrode during inactivity of the cell, both before and after the cell is initially placed in use. They do not, however, interfere with the delivery of energy while the cell is in operation. It is a primary feature of the invention to incorporate a material of this character in the electrolyte layer 15 contiguous to the dry cell can 10. The wood balsams which are available upon the market may be used for the purpose. A large number of balsams have been used with success, among them being the following: balsam copaiba, Oregon fir balsam, gumbo limbo balsam, balsam Peru, balsam Mecca, Canada balsam, Cuban pine balsam, citrus gumosa balsam, resinoid sandalwood and resinoid patchouli. Other wood balsams may be used, and it is understood that the invention is not limited to those specifically mentioned.

The balsams are in the form of solids or liquids, and may be incorporated in the dry cell in several different ways. The simplest method is to deposit a small quantity of the material upon the top of the depolarizing body 14 or electrolyte paste 15. A portion of it becomes absorbed by the depolarizing body or electrolyte paste and spreads to the surface of the zinc can 10. It becomes distributed uniformly and protects the entire area of the zinc which is exposed to the electrolyte.

The balsam may also be incorporated in the form of a suspension or dispersion thereof in the electrolyte. It may be added to the electrolyte liquid with agitation before the electrolyte is inserted in the can 10. It is adsorbed by the starch present in the electrolyte, and this promotes its uniform distribution. To improve the thorough dispersion of the balsam, an emulsify-

ing agent, such as an organic amine may be added. Triethanolamine is an example. A small quantity of ammonia added to the liquid also serves the purpose.

Satisfactory results are also obtained by rinsing the interior surface of the zinc can with a dilute solution or emulsion of the balsam, or by dipping the can momentarily into such a solution or emulsion, before the other elements of the cell are inserted in the can.

In a well known type of dry cell, the electrolyte layer 15 is in the form of a lining of paper pulp sheet material which is inserted in the can 10 and is saturated with electrolyte. The balsam may be applied to the paper pulp sheet before it is inserted in the can, or it may be incorporated in the liquid electrolyte before the latter is inserted in the can.

The amount of balsam which should be used is not critical. A relatively small amount is all that is required. This depends upon the specific balsam used. In a dry cell adapted for heavy duty, such as meter readers' service, employing a zinc can 2¼ inches high and 1¼ inches in diameter, approximately 0.16 gram of Oregon fir balsam has been used in the electrolyte paste of each cell with satisfactory results. However, more than this may be used and, in general, more is used in cells intended for light, intermittent service than in those intended for heavy duty. So much balsam should not be used as will cause the internal resistance of the cell to be excessive.

The reason for the remarkable beneficial results produced by the use of a wood balsam is not fully understood. The balsams are partially soluble in water, and it may be that the beneficial results are produced by some chemically active agent which goes into solution in the liquid of the electrolyte. It may be that they are produced by the formation of a mechanical layer or film of the balsam upon the surface of the zinc. It is believed that the active agent, whatever it is, is physically present at the surface of the zinc and exerts its influence there. This presence may be due to migration from different localities within the cell, as where the balsam is incorporated in the electrolyte; or to actual application to the zinc surface, as where the can is rinsed with an emulsion or solution of the balsam. The distribution of the substance over the active surface of the zinc is thorough even when a small amount of the natural balsam is placed directly upon the top of the depolarizing body or electrolyte paste, because in such case the entire active surface of the zinc is protected effectively against deterioration and corrosion. Therefore, the invention contemplates the application of the balsam to the interior of the cell in any manner whereby it has an opportunity to become accessible to the zinc and is enabled to exert its beneficial effect.

I claim:

1. In a dry cell having a zinc anode and a non-alkaline chloride electrolyte adjacent said anode; a wood balsam contained in suspension in said electrolyte.

2. In a dry cell having a zinc anode and a non-alkaline chloride electrolyte adjacent said anode; a wood balsam contained in suspension in said electrolyte, said wood balsam being from the group consisting of balsam copaiba, Oregon fir balsam, gumbo limbo balsam, balsam Peru, balsam Mecca, Canada balsam, Cuban pine balsam, citrus gumosa balsam, resinoid sandalwood and resinoid patchouli.

3. In a dry cell having a zinc anode, and a non-alkaline chloride electrolyte adjacent said anode; a suspension of wood balsam at the surface of said anode exposed to said electrolyte.

4. In a dry cell having a zinc anode, and a non-alkaline chloride electrolyte adjacent said anode; a suspension of wood balsam at the surface of said anode exposed to said electrolyte, said wood balsam being from the group consisting of balsam copaiba, Oregon fir balsam, gumbo limbo balsam, balsam Peru, balsam Mecca, Canada balsam, Cuban pine balsam, citrus gumosa balsam, resinoid sandalwood and resinoid patchouli.

5. A non-alkaline chloride electrolyte for a dry cell containing a wood balsam in suspension therein.

6. The method for decreasing the corrosion during inactivity of the zinc electrode of a dry cell having a non-alkaline chloride electrolyte, which comprises applying a suspension of wood balsam to the surface of the zinc exposed to the electrolyte.

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