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METHOD OF TREATING DRY CELL CONTAINERS

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This invention relates to a new and improved method of treating dry cell containers, and more particularly to a method of treating the zinc can for dry cells to prevent deterioration of the can, both while awaiting use and during use.

A source of considerable loss of energy and efficiency of dry cells lies in the fact that, as generally constructed, there is a considerable deterioration of the cells both while simply being held in stock awaiting use and while being discharged at a light intermittent rate, such for example, as that to which a radio A or B battery is subjected. This deterioration consists largely in the corrosion of the zinc container of the cell, which container forms the negative electrode of the cell.

We are aware of the fact that it has been practice with some manufacturers to treat the zinc electrodes with mercury or certain mercury compounds, and that in some cases this mercury compound has been mixed with the gelatinizable electrolyte or with the depolarizing mixture and is allowed to deposit out on the zinc electrode after the cell has been assembled.

It is an object of the present invention to provide a new method whereby the surfaces of a dry cell container, which are subject to corrosion, may be protected more satisfactorily than heretofore, by a coating of mercury.

It is a further object to provide a method of this character in which the coating may be uniformly and certainly applied without the use of complicated machinery.

It is also an object to provide a method whereby the coating may be applied without the material loss of the mercury salts used in the process.

The employment of solutions for coating zinc cans with mercury by processes other than that of the present invention, is subject to many difficulties, due to the fact that the valuable nature of the solutions makes it necessary to use them over and over again and after each use, the concentration of the solution of the mercury salt, the zinc chloride content and acidity are altered. If the solution is to be restored to a known and workable condition, complicated analyses and methods of replenishing the mercury deposited on the zinc are necessary. In addition to this objection, the use of such solutions requires close control of the temperature of the amalgamating bath and the length of time during which the zinc is in contact with the mercury containing solution. It is therefore a further object of the present invention to provide a method in which the solution is used once and is then discarded without loss and furthermore, one which does not require the employment of skilled workmen nor any special degree of skill whatsoever. In accordance with the present process, the solution is merely placed in the containers to be coated and left for a period of time sufficient to complete the coating action, after which the remaining solution is discarded. The present process further permits accurate and predetermined results and absolute uniformity in the coating results of different operations.

Other and further objects will appear as the description proceeds.

The methods of adding the mercury compound to either the gelatinizable electrolyte or the depolarizing mixture do not protect the can above the initial heights of these parts of the cell. It is well known that the electrolyte expands sometimes while the cell is idle and always while it is being discharged. As the electrolyte expands it rises in the cell and comes in contact with the unamalgamated zinc if the mercury compound has merely been included in the electrolyte paste.

According to our improved method a mercury containing solution is poured into the can to fill the can to a point above that which will be reached by the mixture to be later placed in the can in assembling the cell. In this manner the zinc is protected where ever the electrolyte may contact with it during the life of the cell.

It should be understood that in the employment of solutions of mercury salts for coating articles such as zinc cans, that if the concentration is such that the coating ac-

tion may be accomplished in a relatively short period of time, that either damage of the cans results or the operation requires a high degree of skill and care, to produce the desired results and results in variance in the results of different operations and also the re-use of the solution with the requirement that complicated analyses and methods of replenishing the mercury be employed in order to restore the solution to a known and useable condition. As a matter of illustration, if a 6% solution of mercury chloride is used, a quantity of mercury is deposited on the zinc can in thirty seconds, rendering the can unfit for use as dry cell containers. The can would be so weakened, that it would be crushed like an eggshell and would not have sufficient strength to act as a supporting container nor withstand the force of the spring contacting connector, without puncture. On the other hand, if solutions of much lesser concentration, though of the same order of magnitude, namely, 1% solution is used, the time required to deposit a satisfactory coating of mercury may be increased to approximately three minutes. Although it is possible to amalgamate dry cell cans in this manner, by solutions of this concentration, the process is subject to the objections above referred to, namely, that sufficient mercury is left in the solution after the completion of the coating operation, to render it necessary to re-use the solution to prevent waste. Unless solutions of known concentration are employed, no satisfactory degree of control can be exercised and therefore, it becomes necessary to analyze the solution and resort to some means for restoring its concentration. This process is further subject to control by the operator as the coating process is still in operation when it becomes necessary to discontinue the treatment.

The applicants have discovered that the difficulties herein above enumerated may be eliminated if solutions of relatively weak concentration are employed, the concentration of which is calculated and selected as that which, when completely exhausted of its mercury content, will supply the exact coating which is desired for the dry cell cans. By use of the weak solution, the period of treatment is of course, prolonged, but an over-treatment results in no harm as the coating operation automatically comes to an end upon completion of the coating operation, that is to say; upon exposure for a sufficient length of time. The solutions which are now devoid of mercury, may be discarded without waste. By commencing with a solution of the same concentration, all operations will produce exactly the same results and consequently uniform products. Furthermore, the practice of the operation requires no unusual care or skill as the solution automaticaly runs to completion and completely exhausts itself at exactly the point where the cans have received the desired coating.

As a specific example, a satisfactory coating for a flashlight or radio cell, one and one-quarter (1¼) inches in diameter and two and one-quarter (2¼) inches in height, may be obtained by using ten milligrams of mercury bichloride in a quantity of solution adapted to fill such a can to the desired height. It has been found in practice that the mercury is practically completely removed from the solution in a few hours. The solution may, therefore, be discarded after being once used without any material loss of mercury salts.

A satisfactory coating may also be obtained by filling cans of the above-mentioned size, to the desired height, with a one per cent solution of mercury bichloride, and allowing it to remain therein for approximately three minutes. The cans are then emptied and are ready for use. The solution may be strengthened by adding about ten (10) milligrams of mercury bichloride for each cell treated, and the solution reused.

The solution may be merely a neutral solution of the mercury compound or the solution may be slightly acidified with a suitable acid, such for example, as muriatic acid.

This method of procedure has been fully tried out and cells treated in this manner have been found to have a very materially reduced deterioration while being discharged or while awaiting use on the shelf.

We claim:

1. The method of treating zinc dry cell containers which comprises placing in said containers a weak solution of bichloride of mercury, said solution for a radio or flashlight container one and one-quarter (1¼) inches in diameter and two and one-quarter (2¼) inches in height, containing approximately ten (10) milligrams of bichloride of mercury, and depositing the greater portion of the mercury content of the solution upon the inner walls of the cell container.

2. The method of treating zinc dry cell containers which comprises selecting a solution of a mercury salt of a concentration calculated to produce the desired finished coating upon complete exhaustion of the mercury, placing said solution in said containers and depositing upon the inner walls of said containers, substantially all of the mercury content of said solution.

Signed at Madison, Wis., this 20th day of April, 1928.

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