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MERCURY ZINC ANODE FOR SULPHATE SOLUTIONS.

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To all whom it may concern:

Be it known that I, CHRISTIAN JOHN WERNLUND, a citizen of the United States, and resident of Tottenville, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Mercury Zinc Anodes for Sulphate Solutions, of which the following is a specification.

This invention relates to improvement in zinc electroplating with acid bath and has for its object to provide improvements over the ordinary process employing an acid bath containing sulphate or chlorid of zinc with a zinc anode.

The objects of this invention are to stabilize the bath as to zinc and acid content, to enable a bath of higher acidity to be used than is ordinarily practicable, to maintain clean anodes which do not themselves become foul or foul the solution, and to supply small amounts of mercury to the bath and to the coating produced on the cathode for the purpose of improving the homogeneity and durability of the coating.

I am aware that it has been known in zinc plating with acid bath to amalgamate the anode, and make no claim thereto herein, as the amalgamating of an anode is only temporary and ineffectual to carry out the objects and obtain the results obtained in actual practice by this invention. I am also aware that an anode containing a small quantity of mercury has been employed in a cyanid zinc plating solution and make no claim thereto herein. I am also aware that small quantities of mercury salt have been proposed to be added to acid baths for the purpose of improving the deposit, but so far as I am aware, such use of mercury has been unsuccessful and instead of improving the deposit, has rendered it less durable because more grainy and porous, with the result of local action and oxidation on the iron beneath instead of retarding such action.

In operating zinc plating solutions with acid bath, it is desirable to maintain a decided acidity in the bath, and it is further desirable to stabilize the bath as to zinc and acid content. If an anode of commercial zinc is left in a plating bath, especially with high acidity, it tends to dissolve chemically therein or waste away causing losses of both metal and acid. If pure zinc anodes are used, the same phenomenon occurs but to a somewhat less extent. Amalgamation of the anode lowers the solubility in the bath somewhat but is unsatisfactory in that amalgamation does not give effects which are constant throughout the life of the anode.

According to this invention, I have discovered that if a small quantity of mercury is uniformly alloyed throughout a high grade zinc anode, the bath is stabilized, the acidity can be increased, the anode will remain clean and not foul the solution, and that a coating containing a small amount of mercury will be deposited which will be dense, adherent, of bright lustre and far more protective of the iron beneath than zinc coatings heretofore obtained from acid baths.

In practice, I preferably alloy a zinc anode in carrying out this invention with from ¼ of 1% to 1% or more of mercury. Such anodes dissolve chemically more slowly than anodes of pure or of commercial unalloyed zinc and act uniformly throughout their life, which is not true either of an amalgamated or an unamalgamated anode. Such an anode protects the bath from rapid increase in zinc content which usually occurs when the bath is idle. The slower solution of zinc necessarily results in smaller depletion of free acid in the bath, thus minimizing waste of zinc and renewal of acid. This enables the operator to maintain the desired high acidity which increases the conductivity and the throwing power of the bath.

The slimes which form on ordinary zinc anodes, as in acid sulphate solution not only increase the resistance at the anode but drop off and become suspended in the bath, not only fouling the bath but attaching to the cathode and roughening the deposit, while the anode of this invention, the solution and the cathode all remain clean.

As the alloy anode dissolves uniformly, the mercury goes with the zinc into solution and deposits upon the cathode, imparting increased throwing power. At the cathode it decreases evolution of hydrogen, especially at elevated temperature and high current density.

The deposits obtained are characterized

by a uniform and small percentage of mercury with a finer grain structure of increased hardness, density and resistance to erosion. The coating obtained by this invention is less soluble chemically and less subject to corrosion as by weather influences, than unalloyed zinc coatings.

A preferred bath for carrying out the invention is made up as follows:

Water	1	gal.	1	L.
Zinc sulphate	2	lbs.	240	grams.
Magnesium sulphate	2	oz.	15	grams.
Sulphuric acid	⅓	oz.	2½	grams.

I do not limit my invention to the use of this bath since any other commercial acid zinc plating bath formula may be used with these anodes with beneficial results.

While the desired proportions of mercury in the anode and in the deposit may be varied to suit individual conditions, I prefer an anode containing approximately ¼ of 1% of mercury which, when used in a bath, run at a uniform rate, gives a coating containing substantially the same proportion of mercury.

What I claim is:

1. The combination with an acid zinc electroplating bath, of an alloy anode containing zinc and a small percentage of mercury whereby to stabalize the bath.

2. The combination with an acid zinc electroplating bath, of an anode containing zinc alloyed with between about ¼% and 1% of mercury whereby to stabalize the bath.

3. A slowly soluble anode for an acid zinc solution comprising zinc alloyed with about ¼% of mercury.

4. The method of zinc electroplating in acid solutions which consists in making the article to be plated the cathode, and providing an alloy anode containing zinc and mercury.

5, The method of zinc electroplating in acid sulfate solutions which consists in making the article to be plated the cathode, and providing an anode containing approximately ¼% of mercury and the balance zinc.

6. An alloy anode for an acid plating bath, composed of zinc and a small percentage of mercury.

7. An alloy anode for an acid sulfate plating bath, composed of zinc and approximately ¼% of mercury.

Signed at Perth Amboy, in the county of Middlesex and State of New Jersey, this 26th day of December, A. D. 1923.

CHRISTIAN JOHN WERNLUND.