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# UNITED STATES PATENT OFFICE.

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## METHOD AND ANODE FOR ELECTRODEPOSITION OF RUST-RESISTING COATINGS.

No Drawing. Original application filed January 5, 1924, Serial No. 684,506. Divided and this application filed July 6, 1925. Serial No. 41,866.

*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 Methods and Anodes for Electrodeposition of Rust-Resisting Coatings, of which the following is a specification.

This invention relates in general to the electroplating on iron and steel or other metal articles of alloys of zinc and cadmium, this application being a division of my application Serial No. 684,506, filed January 5, 1924.

Cadmium has many properties which render it advantageous over other metals and alloys as a protective coating for metals such as iron and steel. It is light in color and has a higher solution potential than iron, thus tending to protect the iron from corrosion. As its solution potential is higher than that of iron and lower than that of zinc, the same weight of protective coating of cadmium affords more protection to atmospheric corrosion than is afforded by straight zinc. Also more cadmium than zinc can be deposited per unit of current used. The oxide coating formed by atmospheric or other corrosion of cadmium is thinner and more adherent than that formed on zinc, consequently the tendency of cadmium to scale off and waste away is much less pronounced than that of zinc.

While I have found that pure cadmium coatings can be effectively deposited electrolytically, I have further found that alloy coatings comprising cadmium retain in large measure the advantageous features of pure cadmium coatings in durability and rapidity of deposit and can be much more cheaply and conveniently produced than previous coatings of pure cadmium. According to my invention, I produce alloyed coatings comprising over 2% of cadmium and another metal, such as cadmium and mercury or zinc, or zinc, cadmium and mercury, using either plain anodes with a suitable bath, or alloy anodes, or both. The coatings have the enhanced practical advantages characteristic of pure cadmium coatings in giving better protection than zinc with less thickness, good color of coating, and economy of current.

Such a coating may be formed by the use of a plating solution to which the proper addition of cadmium or cadmium and (zinc) compounds soluble in the bath have been made, or the metals can be furnished to the solution by the use of cadmium anodes and zinc anodes or alloy anodes.

Examples of the scope of this invention are as follows:

### *Example I.*

To plate wire screen with a zinc cadmium alloy, the material is cleaned by an alkaline electric cleaner or when rusty by alternate acid and alkaline pickling until a chemically clean metallic surface is secured. The wire may then be plated in the following solution:

| | | | |
|---|---|---|---|
| Water | 1 | L. | 1 gal. |
| Sodium cyanide | 45 | G. | 6 oz. |
| Sodium hydroxide | 30 | G. | 4 oz. |
| Zinc cyanide | 30 | G. | 4 oz. |
| Cadmium hydrate | 7.5 | G. | 1 oz. |

Other conditions maintained are as follows:

| | |
|---|---|
| Temperature | 25° C. (77° F.) |
| E. M. F | 3 to 6 volts. |
| Current | 25 amperes per sq. ft. |
| Anodes | Zinc. |

The bath must be replenished from time to time as the several ingredients become depleted. An average analysis of the resulting coating will be zinc 70–75%, cadmium 25–30%.

### *Example II.*

I have also found that the zinc and cadmium contents of the bath may be stabilized by using zinc cadmium alloy anodes to supply the desired quantities of these metals to the solution. A preferred composition of such an alloy anode is—

| | Per cent. |
|---|---|
| Zinc | 75 |
| Cadmium | 25 |

In plating, for example, wire screen, I proceed as in example I with the exception that in this case I substitute the zinc cadmium in place of the straight zinc anodes.

In all the above examples the plating has been done in a still bath. It is understood that if mechanical solutions are used such as in barrel plating the concentrations of solutions, currents required, etc., may be changed considerably to conform to the different operating conditions.

I do not claim specifically herein the novel products resulting from the processes and baths herein disclosed, as such products are claimed in another application, Serial No. 684,507, filed January 5, 1924, patented Dec. 9, 1924, No. 1,518,622.

What I claim is:

1. Method of electrodepositing a rust resistant deposit of cadmium and zinc which consists in electrodepositing these metals from a solution of their salts in an aqueous sodium cyanide-sodium hydroxide solution.

2. Method of electrodepositing a rust resistant deposit of cadmium and zinc which consists in electrodepositing these metals from a solution of their salts in an aqueous sodium cyanide-sodium hydroxide solution wherein the article receiving the deposit is the cathode and an alloy of cadmium and zinc is the anode.

3. In zinc electroplating from a cyanide bath the step which consists in depositing zinc in the presence of cadmium to produce a coating of zinc alloyed with cadmium.

4. In zinc electroplating from a cyanide bath, the step which consists in depositing zinc in the presence of cadmium to produce a coating of zinc alloyed with a minor percentage of cadmium.

5. In zinc electroplating from a cyanide bath, the step which consists in depositing zinc in the presence of cadmium to produce a coating of zinc alloyed with more than 2% of cadmium.

6. In plating ferrous articles with zinc from cyanide baths, the improvement which consists in depositing cadmium in conjunction with the zinc.

7. In zinc electroplating from a cyanide bath, the step which consists in depositing zinc in the presence of a cadmium salt to produce a coating of zinc alloyed with cadmium.

8. In zinc electroplating from a cyanide bath, the step which consists in depositing zinc in the presence of a salt of cadmium to produce a coating of zinc alloyed with a minor percentage of cadmium.

9. Method of electrodepositing an alloy coating comprising zinc and cadmium which consists in making the article to be plated the cathode and providing an anode comprising zinc and cadmium.

10. Method of electrodepositing an alloy coating comprising zinc and cadmium which consists in making the article to be plated the cathode and providing an anode containing zinc and cadmium, the cadmium content being at least 2%.

11. The method of electrodepositing an alloy coating comprising zinc and cadmium which consists in making the article to be plated the cathode and providing an anode whose major constituent is zinc and whose minor constituent is cadmium.

12. The method of electrodepositing an alloy coating comprising zinc and cadmium which consists in making the article to be plated the cathode and providing an anode whose major constituent is zinc and whose minor constituent is at least 2% of cadmium.

13. An anode for electroplating comprising zinc and cadmium in amounts effective for the purpose set forth.

14. An anode for electroplating comprising zinc and cadmium in which the cadmium content shall be above 2% and the zinc content above 10%.

Signed at Perth Amboy, in the county of Middlesex and State of New Jersey, this 29th day of June A. D. 1925.

CHRISTIAN JOHN WERNLUND.