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CORROSION RESISTANT METAL

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5 Claims. (Cl. 148—6)

This invention relates to a treatment for imparting a visible corrosion resistant coating to zinc, cadmium and their alloys. The invention is useful in connection with surfaces coated with these metals, their alloys, as well as castings of the same and galvanized metal.

The primary object of the invention is to produce an improved corrosion resistant coating having an attractive bronze appearance.

Another object of the invention is to provide an aqueous acidic solution mixture to which the metal may be subjected, as by immersion, and the desired coating produced economically with respect to amounts of chemicals required and in a commercially feasible time cycle.

A further object of the invention is to provide a solution containing components which are critical to produce the coating, namely chromic acid or soluble salts thereof, formic acid or soluble salts thereof, nitric acid or its soluble salts and sulfuric acid or a soluble sulfate.

In carrying out the invention, a suitable solution mixture as indicated below is prepared, and the metal or alloy to be coated is dipped therein or subjected to the solution in any appropriate manner to form the coating.

Example

$\text{Na}_2\text{Cr}_2\text{O}_7$	grams per liter...	50
HCOOH	cubic centimeters per liter...	30
$\text{Zn}(\text{NO}_3)_2$	grams per liter...	20
H_2SO_4	cubic centimeters per liter...	5

Initially, the solution has a pH of about 1.0 to 1.1 and may be satisfactorily used through a pH of about 3.4. A coating is formed at all temperatures between about 33° F. and 212° F., but we prefer to operate at about 80° to 90° F. In five seconds, a light bronze slightly iridescent coating is produced, while in twenty seconds a darker bronze coating is formed.

The dichromate is used in the range between substantially 30 g./l. and 70 g./l., the formic acid is used in the range between about 30 cc./l. and 60 cc./l.; the zinc nitrate is used in amount of from about 10 g./l. to 30 g./l., and the sulfuric acid is used in amount of from about 4 to 10 cc./l.

The foregoing conditions have been found to be preferable for producing an improved visible corrosion resistant coating of a pronounced and attractive bronze color. Instead of a dichromate which is preferred, chromic acid or soluble salts of chromic acid, notably sodium and potassium chromate, may be used. A suitable soluble salt of formic acid may be employed such as sodium, potassium or ammonium formate in lieu of

formic acid, but the latter is preferred. While sulfuric acid is preferred, soluble sulfates such as copper sulfate, ferric sulfate or zinc sulfate may be used. Cobalt nitrate or nitric acid may be utilized instead of the preferred zinc nitrate. Where such alternative constituents are employed, they are used in amounts to produce a solution having substantially the same characteristics, properties and preferred content of chemicals as the preferred dip above set forth.

The formic acid or salt thereof together with the dichromate reacts with the metal surface to form a coating. The nitric acid or nitrate renders the visible coating produced by the reaction of the dichromate and formic acid homogeneous and uniform in appearance. The function of the sulfuric acid or sulfate in the foregoing composition is primarily to modify the color of the coating to give an attractive and bronze effect.

We claim:

1. A method of producing an adherent corrosion resistant coating on zinc and cadmium, comprising subjecting the same to an aqueous acidic solution essentially consisting of a water soluble chromium compound selected from the group consisting of chromic acid and its salts and an organic compound which is easily oxidized by chromic acid and selected from the group consisting of formic acid and soluble formates, a compound selected from the group consisting of nitric acid and soluble salts thereof, and a compound selected from the group consisting of sulfuric acid and soluble salts thereof, until a visible coating is formed, the amount of the organic compound being sufficient to cause the chromium compound in conjunction with the organic compound to produce a visible corrosion resistant chromium containing coating on the base metal, the compound selected from the group consisting of sulfuric acid and soluble salts thereof being in amount sufficient to produce a bronze color.

2. The process in accordance with claim 1 wherein the aqueous acidic solution essentially consists of $\text{Na}_2\text{Cr}_2\text{O}_7$, HCOOH , $\text{Zn}(\text{NO}_3)_2$ and H_2SO_4 until a visible corrosion resistant coating having a bronze color is formed.

3. The process in accordance with claim 1 wherein the solution has an acidity of about pH 1.0 to about pH 3.4 and a temperature of from about 33° F. to about 212° F.

4. An aqueous acidic solution for imparting a bronze colored corrosion resistant coating to zinc and cadmium and alloys thereof, said solution essentially consisting of a water soluble chromium compound selected from the group consisting of

chromic acid and its salts and an organic compound which is easily oxidized by chromic acid and selected from the group consisting of formic acid and soluble formates, a compound selected from the group consisting of nitric acid and soluble salts thereof, and a compound selected from the group consisting of sulfuric acid and soluble salts thereof, the amount of the organic compound being sufficient to cause the chromium compound in conjunction with the organic com- 10

pound to produce a visible corrosion resistant chromium containing coating on the base metal, the compound selected from the group consisting of sulfuric acid and soluble salts thereof being in amount sufficient to produce a bronze color.

5 5. An aqueous acidic solution in accordance with claim 4 which consists essentially of $\text{Na}_2\text{Cr}_2\text{O}_7$, HCOOH , $\text{Zn}(\text{NO}_3)_2$ and H_2SO_4 .

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