

UNITED STATES PATENT OFFICE

2,548,419

METHOD FOR PRODUCTION OF LUSTROUS ZINC

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No Drawing. Application August 23, 1945,
Serial No. 612,304

6 Claims. (Cl. 148—6.21)

1

This invention relates to a process for brightening and sealing zinc surfaces.

It is well known that zinc surfaces tend to turn white or grayish-white with age, a property sometimes referred to as "white corrosion," which is apparently due to the formation of oxides and carbonates. Several processes have been devised for increasing the resistance of zinc surfaces to "white corrosion." One of these involves dipping the article made of zinc or containing a zinc coating in a chromic acid bath. The resultant product, however, discolors and therefore leaves much to be desired.

Another method of treating zinc surfaces is the so-called "bright dip" wherein the zinc article or an article containing a zinc coating is dipped in a bath of chromic acid anhydride, sodium sulfate and nitric acid. This process has the disadvantage that the articles are hard to rinse and the bath has no substantial passivating effect on the zinc.

Improved brightness in articles containing an electroplated coating of zinc has been obtained by adding various types of addition agents to the electroplating bath. This process is also used in conjunction with a "bright dip" of the type previously described.

One of the objects of the present invention is to provide a new and improved method of protecting zinc against "white corrosion."

Another object of the invention is to provide a new and improved method of treating zinc articles, or articles containing a surface coating of zinc, to produce a lustrous zinc surface possessing unusual brightness and excellent resistance against corrosion.

Other objects will appear hereinafter.

In accomplishing these objects in accordance with the invention it has been found that new and improved results in protecting zinc against corrosion and in enhancing the brightness of zinc can be obtained by subjecting the zinc successively to treatment with:

(1) A bath containing chromic acid of the type which forms a yellow-brown iridescent stain on the zinc, and

(2) An alkaline reducing solution of a hydrosulfite.

The invention will be illustrated but is not limited by the following example:

Example

Zinc is plated onto sheet steel in a conventional fashion from a conventional bath without adding

2

any brightening agents. A typical conventional zinc plating bath has the following composition:

95-100 grams sodium cyanide
45-55 grams zinc metal (added as the chemically equivalent proportion of zinc oxide)
100-120 grams sodium hydroxide and enough water to make 1 liter of solution

2 grams per liter of zinc dust are stirred into the electrolyte, and the entire mixture is filtered in order to remove traces of heavy metals.

The plated article is then rinsed and dried, or without drying is immersed in a bath having the following composition at room temperature (75° F.):

Chromic acid (CrO_3)—34 to 46 ounces per gallon of bath
Ammonium persulfate ($(\text{NH}_4)_2\text{S}_2\text{O}_8$)—3.4 to 4.6 ounces per gallon of bath
Licorice powder—0.1% to 0.5% by weight of water, and
Sufficient water to make a gallon of solution.

The zinc-plated article is immersed in this bath from 1 to 15 seconds and is then thoroughly rinsed and removed from the bath. It will be coated with a yellow-brown iridescent stain, which apparently consists of chromic hydroxide ($\text{Cr}(\text{OH})_3$) and various chromium chromates.

After the article has been removed from the first bath, above described, and thoroughly rinsed it is placed in a second bath at room temperature, the second bath having the following composition:

Sodium hydroxide—1 to 1.5 ounce per gallon of bath
Sodium hydrosulfite ($\text{Na}_2\text{S}_2\text{O}_4$)—1 to 1.5 ounce per gallon, and
Sufficient water to make a gallon of bath.

The article is allowed to remain in this bath for 1 to 15 seconds. This second bath removes the yellow-brown iridescent stains and produces a lustrous surface coating with a color resembling that of tin.

A zinc-plated article containing a surface coating of .0003 inch thickness of zinc prepared as above described by conventional electroplating operation without addition agents followed by the foregoing treatment will hold its color without the formation of any "white corrosion" products when subjected to 100-hour salt spray.

The proportions and conditions given in the foregoing example are optimum and may be varied somewhat without departing from the invention. The variation in proportions should

preferably not exceed 15% from the maximum or the minimum of the proportions given.

In the first bath, the licorice powder is employed as a wetting agent to increase rinsability. Any other wetting agent which is stable in the presence of chromic acid may be employed. Another example of a wetting agent is quillaja extract. As will be understood, licorice powder is powdered licorice root. The persulfate constituent of the first bath may also be varied somewhat and other persulfates, including potassium persulfate and sodium persulfate may be used.

In the second bath it is preferable to employ sodium hydrosulfite as the hydrosulfite reducing agent because it is the cheapest and most readily available of the various hydrosulfites. Other hydrosulfite compounds which may be mentioned are zinc hydrosulfite and sodium formaldehyde sulfoxylate. The alkali employed in this bath is preferably sodium hydroxide because a relatively small amount of it produces a strong alkalinity, but it will be understood that other alkalis can be employed, such as soda ash and potassium hydroxide.

So far as is known the present invention produces results that have never been obtained heretofore in the protection of zinc against "white corrosion" and in the production of lustrous zinc surfaces. One of the principal advantages of the invention is its use in the electroplating or electrodeposition of zinc to eliminate the present practice of producing bright plates by means of addition agents added to the electroplating bath. A second advantage of the invention resides in the unusual resistance to corrosion of zinc-surfaced articles produced in accordance with the invention.

The expression "zinc-surfaced article" is employed herein to cover any article having an exterior surface of zinc regardless of whether the article is made entirely of zinc or whether it merely contains a zinc coating. The expression "zinc-plated article" is employed herein to describe a zinc coated article in which the zinc coating has been applied by an electroplating process.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A method of producing lustrous zinc surfaces and of protecting zinc surfaces against corrosion, which comprises treating a zinc-surfaced article with a chromic acid solution capable of forming a stain thereon and then with an alkaline reducing solution of a hydrosulfite.

2. In a method of producing lustrous zinc surfaces and of protecting zinc surfaces against corrosion, the step which comprises treating a zinc-surfaced article with an alkaline aqueous reducing solution of a hydrosulfite after said article has previously been treated with chromic acid to form thereon a yellow-brown iridescent coating.

3. The process of producing a lustrous zinc-surfaced article resistant to corrosion, which

comprises immersing the article in a bath comprising essentially 34 to 46 ounces per gallon of chromic acid, 3.4 to 4.6 ounces per gallon of ammonium persulfate and a stable wetting agent in amounts effective to increase rinsability, rinsing the article and then immersing it in an alkaline aqueous hydrosulfite bath.

4. The process of producing a lustrous zinc-surfaced article resistant to corrosion, which comprises immersing the article in a bath comprising essentially 34 to 46 ounces per gallon of chromic acid, 3.4 to 4.6 ounces per gallon of ammonium persulfate and a stable wetting agent in amounts effective to increase rinsability, rinsing the article and then immersing it in a bath comprising essentially 1 to 1.5 ounce per gallon of sodium hydroxide and 1 to 1.5 ounce per gallon of sodium hydrosulfite, the remainder being water.

5. The process of producing a lustrous zinc-surfaced article resistant to corrosion, which comprises immersing a zinc-surfaced article in a bath comprising essentially 34 to 46 ounces per gallon of chromic acid, 3.4 to 4.6 ounces per gallon of ammonium persulfate, a stable wetting agent in amounts effective to increase rinsability, the remainder of the bath being water, at substantially room temperature for a period of 1 to 15 seconds, removing the article from the bath and rinsing it, and then immersing the article in an aqueous bath comprising essentially 1 to 1.5 ounce per gallon of sodium hydroxide and 1 to 1.5 ounce per gallon of sodium hydrosulfite at substantially room temperature for a period of 1 to 15 seconds.

6. A method of producing zinc-plated articles which comprises plating zinc from a conventional zinc electroplating bath containing no addition agents of the type adapted to brighten the zinc plate, rinsing the plated article and immersing it in a chromic acid bath of the type producing a yellow-brown iridescent stain on the zinc plate, removing the article from the chromic acid bath and rinsing it, and then immersing it in an alkaline aqueous hydrosulfite bath until said stains are removed and a lustrous metal coating is produced.

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