

May 10, 1927.

1,627,900

E. H. HEWITSON

PROCESS OF COATING ALUMINUM SURFACES

Filed Aug. 23, 1926

FIG. 1.

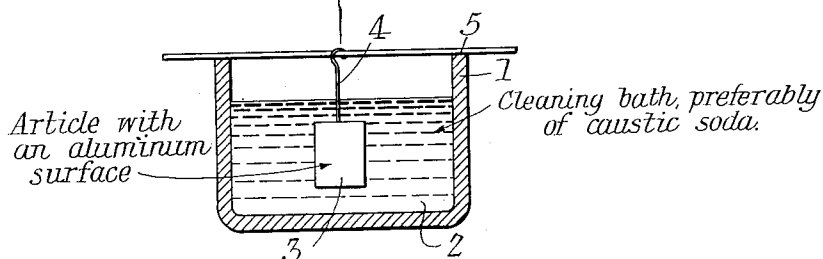


FIG. 2.

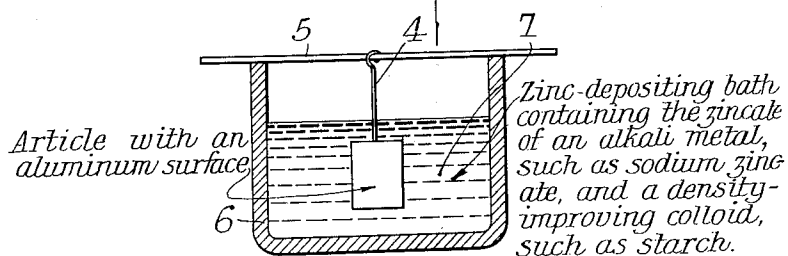
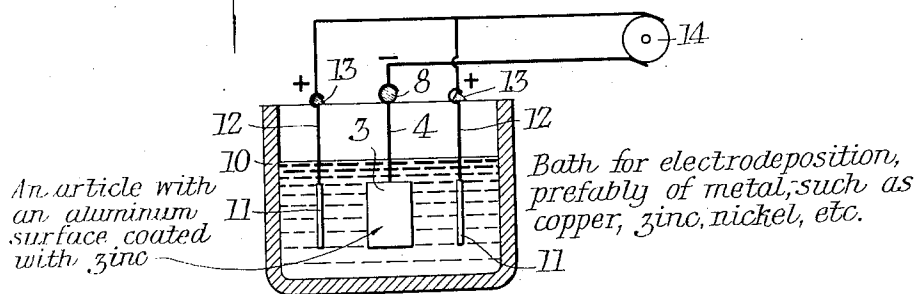


FIG. 3.



INVENTOR.

Edward H. Hewitson,

BY *P. L. Stinchfield*
ATTORNEY.

Patented May 10, 1927.

1,627,900

UNITED STATES PATENT OFFICE.

EDWARD HALLSTED HEWITSON, OF ROCHESTER, NEW YORK, ASSIGNOR TO EASTMAN KODAK COMPANY, OF ROCHESTER, NEW YORK, A CORPORATION OF NEW YORK.

PROCESS OF COATING ALUMINUM SURFACES.

Application filed August 23, 1926. Serial No. 130,828.

This invention relates to processes of coating aluminum surfaces. One object of the invention is to provide a process in which a dense, adherent coating, such as an electrolytic coating, will be firmly united to an aluminum surface in spite of the tendency of the latter to form a thin resistant film of oxide. Another object of the invention is to provide a preliminary treating step in which a dense, adherent, and usefully thick coating of zinc is first deposited upon an aluminum surface. A still further object of the invention is to provide a process in which an aluminum surface is coated with a chemically deposited covering of zinc, and the latter is then covered with a second coating, such as an electrodeposited coating of metal. Yet another object of the invention is to provide a bath in which an aluminum surface will very rapidly be covered with a dense adherent coating of zinc by chemical deposition. A further object is to provide such a bath with sufficient alkalinity to attack any aluminum oxide present on the aluminum surface when the latter is brought into contact with the bath. Other objects will hereinafter appear.

In the accompanying drawing,—

Fig. 1 is a diagrammatic vertical section on a reduced scale of one form of apparatus in which the preliminary cleaning may be carried out.

Fig. 2 is a similar view of one form of apparatus in which the chemical deposition of the zinc on the aluminum may be carried out.

Fig. 3 is a similar view of one form of apparatus in which a further coating on the zinc may be carried out.

The coating of our aluminum surface has always been difficult because of the presence on said surface of a tenacious oxide film which, in spite of its great thinness, is highly resistant to the adherence of a coating over it. For example, the electro deposition on aluminum of zinc, copper, nickel, etc., from the customary plating baths has produced irregular and easily removable deposits, because of the interference of this oxide coating. Even when the aluminum surface is given a preliminary cleaning immediately before the electrodeposition, the oxide forms on the aluminum with such rapidity that it interferes with the subsequent plating work.

I have found that this trouble can be

avoided by chemically depositing a thin layer of zinc upon the surface of the aluminum and then placing upon this a thicker coating, say by electrodeposition. It is essential that the bath for chemically depositing the zinc be one which has a tendency to attack the oxide film on the aluminum, and is also capable of making a smooth, dense, adherent deposit instead of one that is weak or pulverulent. I have found that such a bath can be prepared by forming a solution of the zincate of an alkali metal and mixing into such solution a protective colloid which has the property of improving the density of the deposited zinc. Such a bath is alkaline, so that it tends to attack any oxide coating on the aluminum surface. While various protective colloids can be used, I find that those which have a tendency to swell in water are, in general, preferable.

My novel bath may be used directly in treating the aluminum surfaces, but I prefer to give such surfaces a preliminary treatment with caustic alkali in order to remove any grease or dirt that may be present, as well as to attack and loosen the oxide film on the aluminum. This relieves by zinc-depositing bath from the burden of removing such dirt and grease, and thus prevents it from becoming fouled by them.

I shall now describe several forms of my invention by way of illustration, but it will be understood that the invention is not restricted to the details thus given, except as indicated in the appended claims. The aluminum surface is first dipped in a 5% aqueous solution of caustic soda (sodium hydroxide). There is an evolution of gas from the surface of the metal, and it is a convenient time to stop this preliminary cleaning when this evolution of gas is uniform over the surface. The cleaned aluminum article of surface is then dipped, preferably at once, into the zinc-depositing ("zinc flashing") bath. This is composed of 1,000 parts by weight of water, 50 parts of zinc chloride, 150 parts of sodium hydroxide, and 40 parts of sodium silicate solution. The zinc chloride and sodium hydroxide interact to form sodium zincate and the bath is distinctly alkaline. The sodium silicate solution may be one of the commercial varieties containing, for instance, sodium silicate corresponding to approximately 33% by weight of silica in the solu-

tion and 14% by weight of sodium oxide in the solution, the remaining percentage being water.

It is a feature of my process that the chemical deposition of the metallic zinc in a dense adherent layer takes place with great rapidity in this bath. At room temperature an excellent coating of zinc may be obtained in about twenty to thirty seconds, for instance.

As soon as the zinc coating is completed, the surface is washed, preferably in cold water. It may then be dried and later electro-plated, or it may be introduced immediately after washing into any of the usual baths for electro-plating on zinc. As these are well known to those skilled in the art, their composition need not be given here. Moreover, the electrodeposition may be of rubber or other organic coating material, in accordance with the process disclosed in U. S. Patent No. 1,589,324, Beal and Eberlin, June 15, 1926. Since the electrodeposited coating adheres firmly to the zinc, and since the latter is in a suitably dense and adherent condition with respect to the aluminum surface, (the adherence and density not being impaired by an intermediate oxide layer) said surface is thus provided with an adherent laminated coating having all of the necessary qualities. The outer coating is generally thicker than the first zinc layer.

In place of the zinc-depositing bath mentioned above, I may employ one in which 1,000 parts by weight of water are mixed with 50 parts of zinc chloride, 150 parts of caustic soda and 20 parts of sodium tannate or starch. Each of the latter substances is a very effective colloid for improving the deposit. While I have indicated useful proportions in the above formulæ, it will be understood that these proportions can be varied considerably without impairing the utility of the baths. In place of caustic soda a hydroxide of any of the other alkali metals, such as potassium hydroxide or lithium hydroxide can be substituted; or mixtures of any of the alkali metal hydroxides can be used. Instead of zinc chloride any other zinc compound capable of reacting with an alkali metal hydroxide to form an alkali metal zincate can be employed. The operations may be conducted at room temperature, although the zincate baths can be somewhat warmed up to hasten the action. This is quite unnecessary, however, because of the great rapidity with which the zinc is chemically deposited at room temperature. In the above examples the preliminary treating bath of caustic soda may be replaced by any other hydroxide bath having equivalent alkalinity. Or as indicated above, this preliminary cleaning bath can be omitted, and the aluminum surfaces can be directly introduced into the alkali metal zincate bath with

good results, until the bath becomes fouled by dirt or grease.

Where only a thin coating of zinc on the aluminum is desired, the surface with the "flashing" of zinc upon it can be dried and used by itself in that condition. I prefer, however, to deposit a further coating upon the zinc, as described above.

In the drawing in Fig. 1, I have diagrammatically indicated a vessel 1, containing the described cleaning bath 2 in which is immersed the article having the aluminum surface 3, such article being conveniently suspended by hook 4 from removable supporting rod 5.

In Fig. 2, the article with the aluminum surface 3, is suspended by hook 4 from rod 5, in vessel 6 containing the described zinc-depositing bath 7.

In Fig. 3, the article with the zinc coated aluminum surface 3, is suspended by electrically conducting hook 4 from cathode bus-bar 8 in the electrolytic coating bath 9, in vessel 10. The anodes 11 are suspended by conducting hooks 12 from anode bus-bars 13. The bus-bars are connected to a suitable source of low voltage direct current, such as dynamo 14.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In the process of coating an aluminum surface, the step of treating said surface with a solution of a zincate of an alkali metal until said surface is coated with zinc, said solution containing a protective colloid which increases the density of said zinc.

2. In the process of coating an aluminum surface, the steps of treating said surface with a solution of a zincate of an alkali metal until said surface is coated with zinc, said solution containing a protective colloid which increases the density of said zinc, and thereafter depositing a further coating on said zinc.

3. In the process of coating an aluminum surface, the steps of cleaning said surface with a solution of a caustic alkali, and then treating said surface with a solution of a zincate of an alkali metal until said surface is coated with zinc, said solution containing a protective colloid which increases the density of said zinc.

4. In the process of coating an aluminum surface, the steps of cleaning said surface with a solution of a caustic alkali, and then treating said surface with a solution of a zincate of an alkali metal until said surface is coated with zinc, said solution containing a protective colloid which increases the density of said zinc, and thereafter depositing a further coating upon said zinc.

5. In the process of coating an aluminum surface, the steps of treating said surface with an aqueous alkaline solution of the

zincate of an alkali metal until said surface is coated with zinc, said solution containing a protective colloid of the type which swells in water and has the property of increasing the density of the deposited zinc, and thereafter depositing a further coating upon said zinc.

6. In the process of coating an aluminum surface, cleaning said surface with an aqueous solution of caustic soda, treating said surface with an aqueous alkaline solution of sodium zincate until a dense adherent coating of zinc is obtained upon said surface, said solution of sodium zincate containing a protective colloid which increases said density and adherence, and thereafter electrodepositing a further coating upon said zinc.

7. A bath for chemically depositing zinc

upon an aluminum surface, comprising an aqueous solution of the zincate of an alkali metal and a protective colloid which increases the density of the zinc deposited from said bath.

8. A bath for chemically depositing zinc upon an aluminum surface, comprising sodium zincate and a protective colloid of the type which swells in water and improves the density of the zinc deposit.

9. A bath for chemically depositing zinc upon an aluminum surface, comprising 1,000 parts by weight of water, 50 parts of zinc chloride, 150 parts of caustic soda, and 20 parts of starch.

Signed at Rochester, New York, this 17th day of August 1926.

EDWARD HALLSTED HEWITSON.