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TREATMENT OF ALUMINUM AND ITS ALLOYS PRIOR TO ELECTRO-PLATING WITH LEAD

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The present invention relates to lead plating of aluminum and aluminum base alloys, and particularly, to the electro-deposition of lead thereon. Direct electro-plating with lead of aluminum and its alloys cannot be carried out on metal which has merely been pickled by means of the usual baths, since the latter, being strongly acidic, attack the aluminum and, as a result, cause formation of blisters in the deposits, the adherence of which, moreover, is frequently defective. Further, the various chemical treatments—as coating with zinc, coating with iron—which are ordinarily used before electro-plating of most metals on aluminum and its alloys, are not suitable when lead plating light alloys because zinc and iron, being attacked by the usual lead plating baths, do not protect aluminum and its alloys against attack by the electrolyte, and this results in the formation of blisters in the lead deposits.

It has accordingly been sought to carry out the lead plating of aluminum on an underlying layer of nickel deposited by electrolysis; however, this process requires the use of large electrical machines for parts of large dimensions and the cost of production is high. It would be more simple and more economical to coat articles of aluminum or alloys thereof with an underlying layer of nickel by mere immersion in a bath of nickel chloride. This method has been used as a preliminary treatment prior to coating aluminum electrolytically with a metallic layer; however, an underlying layer of nickel obtained chemically is granular (pulverulent) and does not present a metallic appearance. If a layer of chromium or of nickel be deposited electrolytically on top of such an underlying layer, a good adherence is not obtained. It has accordingly been proposed to form an underlying layer of chemically deposited nickel, and to redissolve it thereafter, thereby making it possible to obtain a good adherent surface for the electrolytic deposition of the final coating.

In contrast thereto, the present invention makes it possible to obtain on aluminum and its alloys an electrolytic coating of lead on top of a granular layer of nickel deposited chemically. The result obtained thereby is altogether different from that which might have been expected in the light of experience with prior art processes: the deposited lead obtained in accordance with the present invention adheres perfectly and is devoid of blisters; its thickness may vary from a few microns to several millimeters.

The best way of carrying out the present invention comprises, as the first step, a pickling treatment of the aluminum or aluminum base alloy article to be lead plated, for the purpose of forming on its surface asperities or unevennesses, facilitating the adherence of the lead. The article is next treated with a solution containing a nickel salt capable of producing a deposit of nickel by chemical reaction with aluminum. Electroplating is thereafter carried out in the usual lead bath containing a lead salt, as for example, lead perchlorate, fluoborate, fluosilicate, etc.

The following examples illustrate the manner of carrying out the present invention. However, it is understood that the invention is not limited to the particular details or numerical values set out therein.

Example I

Articles of aluminum are degreased with trichloroethylene. They are next pickled in a 10% solution of NaOH at 70° C. for 3 minutes and are then rinsed, neutralized in 40° Bé. nitric acid and again rinsed. There follows an immersion for 3 minutes in a solution—at 20° C.—saturated with nickel chloride and composed of: 400 gr. $NiCl_2$, 40 gr. H_3BO_3, 200 cc. HF and 1000 cc. water.

After rinsing, the articles are lead plated for 4 hours at 20° C. with a current density of 1.5 amp./sq. dm. in a bath having the following composition: 26 gr. of perchloric acid, 82.5 gr. lead perchlorate and 0.5 cc. oil of cloves per liter. The bath is agitated by air blowing. The deposit of lead so obtained is about 200 microns thick.

The articles are washed and air dried.

Example II

Articles of silicon-containing aluminum base alloys are lead plated in the same manner as described in Example I, but the neutralization is carried out by means of a solution comprising 4 parts by volume 48° Bé. HNO_3, 1 part of 48% HF, and 10 parts water.

I claim:

1. A method of electrolytically coating articles of aluminum and aluminum base alloys with an adherent lead coating devoid of blisters comprising the steps of: pickling the article to form on its surface asperities facilitating adherence of metal thereto; treating the pickled article with a solution containing a nickel salt capable of chemical reaction with aluminum, whereby a granular deposit of nickel is deposited chemically on the pickled article, and thereafter, electrolytically depositing a coating of lead on said nickel deposit from an acidic bath.

2. A method according to claim 1, in which the said nickel salt is nickel chloride.

3. A method according to claim 1, in which said solution contains boric and hydrofluoric acids.

4. A method according to claim 1, in which the electrolytic deposition of lead is carried out in a bath containing a lead salt selected from the group consisting of perchlorate of lead, fluoborate or lead and fluosilicate of lead.

5. An article of aluminum and alloys thereof coated with a granular layer of nickel formed by chemical deposition and, superposed thereon, an adherent deposit of electrolytic lead, said lead deposit being free of blisters.

6. A method according to claim 1 wherein the article is degreased before pickling and the pickled article is neutralized and immersed in a nickel salt solution containing boric and hydrofluoric acids.

7. A method according to claim 6, wherein the article is composed of an aluminum base alloy containing silicon, and the neutralizing solution comprises nitric and hydrofluoric acids.

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