Cl. 204

Published May 18, 1943

Serial No. 340,362

ALIEN PROPERTY CUSTODIAN

ELECTRODEPOSITION OF METALLIC COATINGS

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No Drawing. Application filed June 13, 1940

This invention relates to the electrodeposition of metallic coatings of, for instance, nickel, copper, chromium, silver, gold or the like on zinc alloys, particularly on zinc alloys with a high content of zinc, whereby an intermediate layer of white brass is applied to the zinc alloy. If desired, a pickling with an alkaline solution of zinc oxide may be carried out before the application of the intermediate layer.

It is known that zinc alloys with high contents of zinc, such as are known under the trademark "Zamak", containing a large quantity of zinc and minor quantities of other metals, preferably copper and light metals, such as aluminium and/or magnesium, give only very bad results when electrodeposited.

This is mainly due to the fact that such alloys rich in zinc are subjected in course of time to a recrystallisation phenomenon leading to changes in volume and consequently to an inferior capacity of adhesion of the coatings which tend to warp and to peel off.

According to my invention a way was found to coat these alloys with perfectly adhesive electrodepositions, for instance, of metals, such as nickel, copper, cadmium, chromium, silver, gold or their alloys, for instance, yellow brass. Thorough investigations yielded to the result that perfect and strongly adhesive coatings may be deposited on these zinc alloys or objects or parts of articles made therefrom, if an intermediate layer of white brass, preferably bright white brass (containing of about 10 to 30% Cu) is inserted between the zinc alloy and the final coating.

There are various methods and baths which may be used for the production of electrodeposited white brass or bright white brass coatings. Expediently the zinc alloy may be degreased as usual, for instance, with a treatment of soda lye or alkali lye or other degreasing means. If the degreasing is carried out electrolytically, the object to be treated may be suspended as cathode in a solution of carbonates, phosphates, cyanides or the like whereby the grease is saponified and lifted off through the evolving hydrogen. Thereafter a short pickling in diluted acids, preferably hydrochloric acid, is carried out. Sometimes it is also expedient to clean the surface mechanically, for instance, by brushing.

It has proved advantageous to subject articles from alloys with higher aluminium contents, for instance, more than 10%, to a further pickling with zinc oxide ("zinkate pickling") as it is already known in the treatment of high percentage aluminium alloys. The previously treated objects are immersed for several seconds into an alkaline solution of zinc oxide and afterwards thoroughly rinsed with water.

Now the degreased, pickled and, if desired and necessary, mechanically brushed objects are thinly plated with white brass or bright white brass from a suitable bath. If a bright white brass bath is used for the formation of the intermediate layer, a simple rinsing of the coating is sufficient. The use of a white brass bath necessitates a common planishing treatment, for instance, with rotating steel brushes.

To the intermediate layer of white brass or bright white brass the final layer of, for instance, nickel, copper, chromium, silver, gold, yellow brass or the like is applied, according to the well known methods and baths.

In carrying out my invention I proceed, for instance, as follows: An object made from an alloy rich in zinc is electrolytically degreased, pickled with diluted hydrochloric acid (1:4) and treated for example 5 minutes in a white brass bath at suitable conditions, for instance, at a current density of 1 to 2 amp:dm², hereby a thin coating, containing about 20% Cu, is deposited. After a short rinsing with water the final layer is produced, for instance, in such manner that the object is treated in a usual bright nickel bath with a current density of 1 amp/dm² for a time of about 30 minutes.

Examples

(1) Sheet strips 2.5 x 10 cm from a zinc alloy, containing 2.7% Cu, 4.0% Al, 0.03% Mg, rest zinc are treated at room temperature at a current density of 2 amp/dm² in a bright white brass bath during a period of 5 to 10 minutes. The bright white brass bath has the following composition:

	Grams
$Zn(CN)_2$	60
NaCN	83
NaOH	78
CuCN	20
NaS	0.5
Piperonal	3
MoO_3	8

To the intermediate coatings of bright white brass which have a thickness of 3 to 5μ, the desired final electrodeposits are applied as usual in a suitable electrodeposition bath.

(2) Zinc die casting strips of ¼ qdm are electroplated at ordinary temperature with a current

density of 5 to 10 amp/dm² in a white brass bath containing the following substances:

	Grams
$Zn(CN)_2$	60
$Cu(CN)$	20
NaCN	83
NaOH	80

To the intermediate layers having a thickness of about 2 to 4μ a smoothing aftertreatment is applied, if desired or necessary, whereupon the final coatings are electrodeposited.

According to my invention coatings of perfect adhesion are obtained.

Investigations made with sheets which were treated according to my invention, having an intermediate layer of white brass or bright white brass and a final coating of nickel or copper, have shown that after a one month storage in drying ovens at a temperature of about 95 to 100° C the sheets were entirely unharmed, i. e. no warpage was to be seen. A treatment of several hours in a steam vessel at 1 and 2 atm. excess pressure revealed no defects either. It is now possible to apply strongly adhesive perfect coatings to zinc die casting alloys which hitherto could not be electrogalvanized with stable deposits.

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