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ZINC PLATING BRIGHTENER

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This invention relates to new improvements in electrodeposition of zinc and is particularly concerned with depositing a bright zinc plate from a cyanide-zinc bath which contains an aqueous solution of anisic aldehyde bisulfite, ground glue, polyvinyl alcohol and sodium lignin sulfonate.

Field of invention

The electrodeposition of zinc is extensively utilized because electrodeposits of zinc coatings yield desirable protective finishes. Zinc is well known as a rust preventive when applied as a coating to iron or steel. This should be compared with metals such as copper and nickel which actually accelerate corrosion of iron or steel. Although these electrodeposited zinc coatings possess the aforementioned advantages, their action has been limited because of the fact that they do not retain a bright appearance over any substantial period of time.

The above noted disadvantage of electrodeposited zinc coatings is especially prevalent when a cyanide-zinc bath is utilized since, as compared to an acid-zinc bath, the initial deposit is dull and discolored, and hence, not satisfactory for many purposes. Although the deposits from cyanide-zinc baths are poor in appearance, they have a relatively fine crystalline structure and are, because of that characteristic, desirable.

In addition to the above noted advantage, cyanide-zinc baths have other advantageous characteristics. They have good throwing power and, as a consequence, make possible a relatively uniform zinc deposit on irregularly shaped and recessed articles. Further, these baths have a relatively high cathode efficiency and, as a result, the electric current applied to the bath is expended less upon the evolution of hydrogen, and more upon the deposition of zinc.

Despite the above advantages, cyanide-zinc baths have not been extensively used by those working in the art because of the poor appearance of zinc deposits obtained therefrom. Therefore, acid-zinc baths, even though yielding a relatively coarse crystalline structure and possessing disadvantages in operation, are favored because of the somewhat better appearing deposits obtainable by their use.

Accordingly, an extensive amount of work has been carried out to devise improvements in the existing methods for electrodepositing zinc, so as to produce coatings having the highest possible degree of brightness and freedom from discoloration and yet to obtain said deposits by utilization of the preferred cyanide-zinc baths. The ingredients of the plating bath have been experimentally varied. Additive agents such as alum, gum arabic and fluorides have been utilized but the results were none too satisfactory either because the deposits were not bright enough or because the additive agents were so expensive as to be commercially unfeasible.

Objects

A principal object of this invention is the provision of

a novel, low cost additive which when added to a cyanide-zinc plating bath produces brighter zinc deposits than those previously produced. Further objects include:

1. The provision of a novel additive to cyanide-zinc plating baths that will yield zinc coatings substantially free from discoloration.

2. The provision of a low cost, plating solution for the deposition of a zinc coating which is materially brighter in surface appearance than zinc coatings heretofore obtainable by commercial zinc plating processes and which is substantially free from discoloration.

3. The provision of a low cost, additive for a cyanide-zinc plating solution yielding great throwing power and extremely wide, bright, current-density ranges.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

Description

These objects are accomplished according to the present invention by the addition of a novel additive to a standard cyanide-zinc plating bath, said additive being obtained by dissolving four separate ingredients in hot water.

The success of the present invention is due primarily to the unique discovery that an aqueous solution of anisic aldehyde bisulfite, ground glue, polyvinyl alcohol and sodium lignin sulfonate when added to a standard cyanide-zinc plating bath results in an exceptionally bright-plated surface suitable for commercial purposes. It should be emphasized that the presence of all of the aforementioned ingredients is a critical aspect of the invention since the production of the extraordinarily bright surfaces is dependent thereon.

All of the above noted ingredients are comparatively inexpensive and, therefore, provide a low cost, brightening additive that yields a bright plate from a cyanide-zinc plating bath. Hence, this novel, low cost additive succeeds in making bright zinc-plating from a cyanide-zinc bath commercially advantageous.

In addition, the additive can be made up for sale as a powdered mixture. This mixture is then dissolved in water and is ready for use. As can be appreciated, this affords a substantial saving in shipping space since the powdered mixture takes up much less space than an actual working solution would. Also, powdered mixtures can be shipped in paper containers that can be thrown away and need not be returned to the seller.

As a basic plating solution I use the well known cyanide-zinc plating bath, which, as known to those skilled in the art, may vary within recognized composition limits in accordance with certain desired characteristics and process limitations. One such composition, for example, could be:

	Percent by weight
Zinc cyanide ($Zn(CN)_2$)	33⅓
Sodium cyanide (NaCN)	23⅓
Sodium hydroxide (NaOH)	43⅓

My present invention resides in the discovery of a novel product obtained by dissolving four separate ingredients in hot water. The product obtained, as hereinafter set forth, when incorporated in any conventional cyanide-zinc plating bath, as for example the composition set forth above, produces the exceptionally bright plated surfaces previously described. The identity and amount of

each material entering into the manufacture of the novel brightening additive is as follows:

	Percent by weight
Anisic aldehyde bisulfite	44 to 60
Ground glue	10 to 24
Polyvinyl alcohol	8 to 12
Sodium lignin sulfonate	8 to 20

More specifically, the following composition of ingredients has been found to produce the desired results when utilizing a cyanide-zinc plating bath within standard composition limits and under standard operating conditions.

	Percent by weight
Anisic aldehyde bisulfite	58
Ground glue	18
Polyvinyl alcohol	12
Sodium lignin sulfonate	12

The material prepared in accordance with the above formulation is a powdered product which is then dissolved in hot water to form an aqueous solution. From 5 to 25% by weight of the dry product is dissolved in hot water to produce an aqueous solution suitable for additive purposes. A 15% solution has been found satisfactory for conventional cyanide-zinc plating processes and produces bright zinc deposits.

When the aqueous additive solution is made up it is added to the cyanide-zinc plating bath in the proportion of about 0.001 to 0.0035% by dry weight, i. e. by weight of dry mixture in the additive solution. For a standard bright plate, 0.0017% by dry weight of a 15% solution is recommended.

Sodium lignin sulfate is also known under the trade name of "Marasperse N." Its function is as a dispersing agent when the dry powdered additive is dissolved in water. In addition, the Marasperse N exerts a definite action in the plating bath in that it serves to increase the current density range thus giving a wider range of brightness.

The ground glue, anisic aldehyde bisulfite, polyvinyl alcohol and Marasperse N, when taken as an entity, are believed to have a definite synergistic effect which results in the extraordinarily bright zinc plate. In other words, each ingredient taken alone will yield some increase in the brightness of the plate but combination of the four produces an unexpected increase in brightness. The primary function of the ground glue constituent is believed to be that it increases the covering power and throwing power of the cyanide-zinc plating bath in areas of low current density. In other words, this function is quite advantageous when recessed articles are being plated in that the depths of the recesses are low current density areas and normally would not be plated as brightly as the remainder of the article. By use of this ground glue the throwing power of the solution is increased and facilitates bright plating over the entire article surface.

In addition to the four ingredients set forth above that constitute the novel brightening additive, sodium sulfate can be added in compounding the mixture to serve as an inert filler. The sodium sulfate serves no useful purpose when added to a plating bath and is primarily utilized as a cost reducing ingredient due to its low price.

As is customary, the article to be plated, constituting the cathode, and a zinc anode are immersed in the solution, the anode being eventually consumed. The customary factors in plating processes, namely time, temperature, solution concentration and current density, have their usual effects on the plating solution herein disclosed. The optimum temperature for the operation of such a bath is from 24° to 35° C.

After the plating cycle has been completed, the plated article should be thoroughly washed in clean running

water to remove all traces of alkali. If desired, a chemical polishing dip may also be used. The plated coating obtained by means of my novel bath composition, as heretofore disclosed, has a surface appearance having a smooth, brilliant, silvery lustre. It is wear resistant and corrosion resistant, and its brightness is substantially permanent.

Conclusions

The present invention provides a new low cost additive for use in cyanide-zinc plating baths. The new additive is most effectively employed in the formation of zinc plate from a cyanide-zinc plating bath which heretofore produced discolored products but which now yields, by the utilization of said novel additive, the bright blue-silver coatings heretofore described.

The novel principles of this invention are broader than the specific embodiments recited above and rather than unduly extend this disclosure by attempting to list all the numerous modifications which have been conceived and reduced to practice during the course of this development, these novel features are substantially defined in the following claims.

I claim:

1. In a process for the electrodeposition of zinc, the step comprising depositing zinc from a cyanide-zinc plating bath containing from 0.001 to 0.0035% by dry weight of an aqueous additive solution comprising water, 44 to 60% by weight of anisic aldehyde bisulfite, 10 to 24% by weight of ground glue, 8 to 12% by weight of polyvinyl alcohol and 8 to 20% by weight of sodium lignin sulfonate said percents by weight of anisic aldehyde bisulfite, ground glue, polyvinyl alcohol and sodium lignin sulfonate being on a dry basis.

2. A process as set forth in claim 1 wherein deposition is carried out at a bath temperature between 24° C. and 35° C.

3. An additive for a cyanide-zinc plating bath comprising a mixture, on a dry basis, of 44 to 60% by weight of anisic aldehyde bisulfite, 10 to 24% by weight of ground glue, 8 to 12% by weight of polyvinyl alcohol and 8 to 20% by weight of sodium lignin sulfonate.

4. An additive as claimed in claim 3 including an inert filler.

5. An aqueous additive solution for a cyanide-zinc plating bath comprising water containing from about 5 to 25% by weight of an additive comprising 44 to 60% by weight of anisic aldehyde bisulfite, 10 to 24% by weight of ground glue, 8 to 12% by weight of polyvinyl alcohol and 8 to 20% by weight of sodium lignin sulfonate.

6. An aqueous additive solution as claimed in claim 5 wherein said additive includes an inert filler.

7. A cyanide-zinc plating bath containing an aqueous additive solution comprising water containing an additive comprising, on a dry basis, 44 to 60% by weight of anisic aldehyde bisulfite, 10 to 24% by weight of ground glue, 8 to 12% by weight of polyvinyl alcohol and 8 to 20% by weight of sodium lignin sulfonate.

8. A process as claimed in claim 1 wherein said aqueous solution contains an inert filler.

9. A cyanide-zinc plating bath as set forth in claim 7, wherein said additive is present in the bath in an amount of from 0.001 to 0.0035% by dry weight of the additive.

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