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ELECTROLYTIC STRIPPING OF NONFERROUS METALS FROM A FERROUS METAL BASE

Russell L. Bowers, Columbus, Ind., and Larry E. Napier, Little Rock, Ark., assignors to Hamilton Cosco, Inc., Columbus, Ind., a corporation of Indiana
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3 Claims

ABSTRACT OF THE DISCLOSURE

A method and composition for electrochemically removing metallic layers from a work-piece in which the work-piece is disposed in an electrolytic bath of an aqueous solution of ammonium nitrate, tartaric acid and sodium hydroxide.

BACKGROUND OF THE INVENTION

In the metal plating of different articles, the articles are normally carried through plating baths on carriers formed from a ferrous base metal and mounted on a conveyor. Consequently, the metal being plated onto the articles is also plated onto the carriers with the result that after the carriers have been in use for a period of time they are coated with layers of the metal or metals being deposited by the plating baths through which they have passed. Our invention is directed to a process and stripping composition which will quickly remove such coating layers without etching the ferrous base material of the carrier and which avoids the use of any of the toxic cyanides.

SUMMARY OF THE INVENTION

In accordance with the invention, a stripping bath for removing brass, chrome, nickel, cadmium, zinc, or the like from a ferrous based work-piece is prepared, said bath consisting of an aqueous solution of ammonium nitrate, tartaric acid, and sodium hydroxide. The bath is maintained at an elevated temperature while the work-piece which is to have the metal removed therefrom is passed therethrough. The work-piece immersed in the bath and said work-piece and an electrically conductive member in contact with the bath are made the anode and cathode, respectively, of an electrolytic circuit through which a high amperage current is passed with the result that the metal on the work-piece is electrolytically stripped therefrom and forms a sludge in the bath and/or a coating on the electrically conductive member.

DETAILED DESCRIPTION

Our invention is concerned with a stripping process and agent for removing layers of brass, chrome, nickel, cadmium, zinc, or the like from ferrous based metals. It therefore finds particular utility in removing such metals from carriers on conveyors, which carriers may have been previously used to carry various parts or items through metal plating baths.

Our stripper is comprised of an aqueous solution of ammonium nitrate, tartaric acid, and sodium hydroxide. The ammonium nitrate is present in an amount ranging from 1.0 oz. to 80.0 oz. per gallon of solution, the tartaric acid in an amount ranging from .01 oz. to .80 oz. per gallon of solution, and the sodium hydroxide in an amount ranging from .037 oz. to .36 oz. per gallon of solution. The ammonium nitrate serves as the stripping agent for the coating layers to be removed, and consequently, as the amount of ammonium nitrate in the solution is decreased, the rate of the stripping action of the solution is reduced. The tartaric acid acts as a buffer for

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the work-piece, and thus, if it is present in the solution in amounts less than .01 oz. per gallon, etching of the work-piece will occur. Amounts of ammonium nitrate and tartaric acid in the solution greater than 80.0 oz. per gallon and .80 oz. per gallon, respectively, show no improved results, and thus it is not economically sound to use greater amounts of these two materials. Desirably, the tartaric acid is present in the solution in an amount equal to one-hundredth of the amount of ammonium nitrate in the solution. The sodium hydroxide neutralizes the solution into a pH range of from 6.8 to 8.0. If the pH of the solution drops below this range, etching of the work-piece will occur, and if the pH of the solution goes above this range, the rate of stripping action of the solution is substantially reduced. Thus, a typical example of a stripping solution which we have successfully employed consisted of an aqueous solution containing 24.0 oz. of ammonium nitrate, .24 oz. of tartaric acid, and .11 oz. of sodium hydroxide for each gallon of solution.

As previously indicated, the pH of the stripping solution should be maintained between 6.8 and 8.0. Under normal operation the pH of the solution should remain stable. However, if the pH falls below this range, it can be raised by the addition of sodium hydroxide, or if it rises above this range, it can be lowered by the addition of nitric acid.

In order to remove coatings of brass, chrome, nickel, cadmium, zinc, or the like from a ferrous based work-piece, such as a conveyor carrier, a bath of the stripper is prepared and placed in a tank where it is maintained at an elevated temperature, desirably in the range from 155° F. to 165° F. We have found that at temperatures below this range the rate of the stripping action is substantially reduced, and that at temperatures above this range ammonia is evolved from the bath. The work-piece is placed in said bath, and it and an electrically conductive member in contact with the bath are connected to an electrical circuit to form an electrolytic cell with the work-piece constituting the anode and the electrically conductive member constituting the cathode. A current of from 100 to 200 amperes per square foot of work-piece surface at a voltage of from 5 to 8 volts is applied to circuit. If the amperage and voltage are below this range, we have found that the stripping rate will be substantially reduced, and if the amperage and voltage are above this range, etching of the work-piece will occur.

The metal of the coating being stripped is electrolytically stripped from the work-piece at the rate of about .10 mils per minute and becomes a sludge in the bath and a deposit on the cathode forming member. The bath life can be increased by periodic filtration or decanting to remove the sludge and by cleaning the cathode forming member.

A typical example of our invention is seen wherein a nickel and chrome plating was removed from a series of steel plates having a total surface area of about 1.5 square feet. A stripper bath was prepared using water as the diluent and containing 24.0 oz. of ammonium nitrate, .24 oz. of tartaric acid, and .11 oz. of sodium hydroxide for each gallon of the bath. The bath had a pH of about 7.1. The bath was placed in a steel tank and heated to a temperature of about 160° F. The plates were placed in the tank and said plates and tank were connected to an electrical circuit with the plates forming the anode and the tank the cathode. A current of 180 amperes at 6 volts was impressed on the circuit. In 5 minutes the nickel and chrome coating was reduced in thickness by .5 mil, the stripped nickel and chrome forming a sludge in the tank and a film on the tank walls.

Although our invention has been referred to herein as being used to strip metal coatings from ferrous based,

conveyor carriers, it is to be understood, of course, that it can be used to strip coatings from any ferrous based work-piece.

We claim:

1. A process for removing coatings of brass, chrome, nickel, cadmium, zinc, or the like from a ferrous based work-piece comprising the steps of placing said work-piece in a bath of an aqueous solution consisting essentially of at least 1.0 oz. of ammonium nitrate and at least .01 oz. of tartaric acid per gallon of solution, adjusting the pH of the solution into the range of from 5.8 to 8.0, connecting said work-piece and an electrically conductive member in contact with said bath to an electrical circuit with said work-piece and member forming an anode and cathode, respectively, and impressing a current on said circuit while maintaining said bath at an elevated temperature.

2. The invention as set forth in claim 1 in which said bath is maintained at a temperature in the range of 155° F. to 165° F.

3. The invention as set forth in claim 1 in which a

current of from 100 to 200 amperes at from 5 to 8 volts is impressed on said circuit.

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ROBERT K. MIHALEK, Examiner

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