

UNITED STATES PATENT OFFICE

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TIN PLATE TREATMENT

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2 Claims. (Cl. 204—28)

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This invention relates to the treatment of electrolytically produced tin plate which has been subsequently burnished or brightened in any of the customary ways, notably by subjecting the tin plate to a so-called "fusing treatment" in a furnace or oil bath.

The object of the invention is to render the tin plate resistant to the action of food acids including sulfur stains and also improve its corrosion resistance to atmospheric conditions.

I have discovered if the brightened tin plate be first subjected to a treatment which will slightly abrade the tin surface followed by treatment in an alkaline or acidic electrolytic bath wherein the tin plate is the cathode, that the desired resistant properties are imparted to the tin plate in a most surprising manner.

The abrading or rubbing pretreatment prior to the electrolytic treatment is necessary, i. e., it is essential to rub or slightly abrade the surface of the brightened tin coating before it will react with the electrolytic solution. This pretreatment can be accomplished in various ways such as branning, cloth buffing and the friction action of rubber squeegee rolls. The last method is preferable and has been used with marked success.

In carrying out this method, one or more sets of rubber squeegee (pinch) rolls are placed in the electroplating line directly after the customary fusing and quenching operations. The tin coated metal strip passes through the bite of these rolls where it is slightly abraded by the flattening of the rubber caused by the screws being tightened to the desired amount.

Thereafter, and by way of example, an aqueous electrolytic bath consisting of about 2% trisodium phosphate and about 1/2% sodium dichromate is prepared in which the brightened metal to be treated is made the cathode and the anode consists of any suitable type of mild steel such as ordinary boiler plate. The temperature of the bath is maintained at about 180° F. and after a treatment of about five seconds in the bath, the brightened tin plate exhibits the resistant qualities desired to such a marked extent as to constitute a highly satisfactory commercial product. The current density is about 30 amperes per square foot at the cathode. The current density at the anode can be the same, namely, about 30 amperes per square foot although this is not necessary in that it may be more or less with relation to the cathode. I prefer, however, to have a ratio of current density at the anode and cathode of about 1 to 1.

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I have found that the temperature range of the bath may vary between about 170° F. and 200° F. and the time of treatment from about three seconds to about ten seconds. The current density at the cathode may vary from about 10 amperes per square foot to about 100 amperes per square foot.

The composition of the bath may vary in that as much as about 6% trisodium phosphate may be used and as much as about 2% sodium dichromate may be used. It is desirable, however, to keep the dichromate content as low as possible, and about 0.30% of sodium or potassium dichromate is a preferred lower limit since if an appreciably less amount is used, the operation usually takes more than a commercially feasible time period. About 1.5 to 2% trisodium phosphate is a desirable commercial lower limit for this constituent since if appreciably lower amounts are used the voltage increase is objectionable.

There is, in fact, no upper limit of concentration of the sodium dichromate other than added cost of operation with no apparent beneficial effects in protective quality. The trisodium phosphate concentration can be increased considerably but here again no benefit is derived from it with the added disadvantage of more difficult rinsing properties. The lower limit is governed by the conductivity imparted to the solution by the trisodium phosphate, about 1.50% being as low as commercially feasible.

Following the treatment in the electrolytic bath as above described, the tin plated metal may be subjected to a dilute chromic acid rinse to increase its value as a paint and lacquer base, i. e., its adhesive properties with respect to such coatings.

Instead of conducting the electrolytic treatment in an alkaline bath, I may use an acidic bath. For example, an aqueous bath having a concentration from about 0.25% to 5.0% of chromic acid is useful. A bath containing about 0.50% of chromic acid free of impurities is preferred. It is important that the acidic bath not contain more than about 0.01% of SO₄ radical either as sulfuric acid or as sulfates and preferably none is present. Such SO₄ radical, if present, is a residual impurity incident to the chromic acid manufacture.

The tin surface requires the same critical pretreatment before introduction to the acidic bath as described above and the temperature of the bath, the current densities, and time periods are about the same for the acidic treatment as de-

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scribed in connection with the alkaline treatment.

While I have referred to brightened electrolytic coated tin plate, namely, black iron or steel having a tin coating applied by an electrolytic process and brightened in any suitable manner, the invention is equally useful in connection with tin plate prepared by hot dip methods.

This application is a division of my allowed application Serial No. 615,916, filed September 12, 1945, and allowed March 3, 1948.

I claim:

1. In the method of treating a continuous strip of tin plate in a line wherein the tin coating is electrolytically deposited and then flow brightened, the steps of treating such bright finished tin plate to render the same resistant to the action of food acids and sulphur stains comprising subjecting the surface of the flow brightened tin plate to a light rubbing action which does not deteriorate the flow brightened finish, then subjecting the brightened tin plate to an aqueous acid electrolytic bath in which the tin plate is the cathode for from about three to about ten seconds, the bath being maintained at a temperature between about 170° F. and 200° F. and the current density at the cathode being about ten amperes per square foot to about 100 amperes per square foot, the bath consisting essentially of about 0.25% to 5.0% chromic acid and not more than about 0.01% SO_4 radical.

2. In the method of treating a continuous strip of tin plate in a line wherein the tin coating is electrolytically deposited and then flow brightened, the steps of treating such bright finished tin plate to render the same resistant to the action of food acids and sulphur stains comprising subjecting the surface of the flow brightened tin plate to a light rubbing action which does not

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deteriorate the flow brightened finish, then subjecting the brightened tin plate to an aqueous acid electrolytic bath in which the tin plate is the cathode for about five seconds, the bath being maintained at a temperature of about 180° F. and the current density at the cathode being about 30 amperes per square foot, the bath consisting essentially of about 0.25% to 5.0% chromic acid and not more than about 0.01% SO_4 radical.

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