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METHOD OF TREATING MATTE TIN PLATE TO PREVENT DARKENING

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1 Claim. (Cl. 204—37)

This invention relates to the manufacture of tin plate and, in particular, to a method of making matte tin plate, i.e., tin plate coated by the electrolytic process, which is not heated to a temperature above the melting point of tin after coating to effect melting or brightening of the surface.

Matte tin plate is used extensively and, like the surface brightened product, is subject to discoloration on storage evidenced by the formation of yellow stain. This tendency can be cured by chemical treatment but, in the case of matte tin plate, the treatment which is most effective gives rise to another undesirable effect, i.e., darkening during the baking incident to lacquering and lithographing. Such darkening is particularly objectionable in cases where portions of the tin surface are left un-inked to provide a light background for lithographed design.

I have invented a novel method for making matte tin plate which effectively eliminates the bake-darkening tendency of plate which has been treated in the conventional manner to inhibit yellow stain. I have found that mattee tin plate, if heated briefly to a temperature approaching but below the melting point of tin, may then be given the usual chemical treatment to resist yellow staining without developing the tendency to brake darkening which has heretofore been the result of such treatment. More particularly, after plating with tin, I heat the matte tin plate to a temperature between 420 and 445° F., for a few seconds then quench it in water and subject it to cathodic electrolysis in a sodium-dichromate solution. The dichromate treatment provides the desired yellow-stain resistance and my pre-heating keeps the product free from darkening during subsequent baking incident to lacquer coating or lithographing.

A complete understanding of the invention may be obtained from the following detailed description of a typical example thereof.

A continuous strip of tin plate was produced in the conventional manner by electroplating tin on a base of low-carbon steel. After being electroplate, the strip was dried and then heated to a temperature of 430° F. by passing it through an induction-heating coil (10,000 cycles per second). The moving strip was held in this temperature for approximately three seconds by supplemental resistance heating. For this purpose sixty-cycle alternating current was supplied to the strip by two conductor rolls spaced 34 feet apart. The temperature of the strip was then lowered abruptly by passing it through a water-quenching tank. The strip was next passed between anodes immerse din an aqueous solution containing 24 grams of sodium dichromate per liter, adjusted to a pH of 4.7, at a temperature of 125° F. The strip was made cathode in the solution and an electric current of 52 coulombs per square foot of strip was passed between the strip and the anodes. After emerging from the treating solution, the strip was rinsed with cold water, dried with steam, and electrostatically oiled.

Subsequent analysis of the treated strip indicated presence of 0.65 milligram of chromium (calculated as metallic chromium) per square foot of strip surface. Despite the presence of chromium in this quantity, however, the surface of the strip did not darken when baked at lacquer-curing temperature (375° F.) for thirteen minutes; in fact, the surface brightened slightly.

Another section of the same strip was treated in the same manner as described above, except that the heating step was not included. After the strip was baked, the total reflectance from its surface was 10% less than that from the surface of the strip processed by the method of my invention.

The duration of the heating step prior to electrochemical treatment may be varied from 0.1 to 10 seconds at the maximum temperature, depending on the rate of heating and and the maximum temperature attained. The heat may be applied by any convenient method consistent with the speed of the strip through the plating line. All electrolytic tin-plating lines include a melter for flow-brightening the tin surface when a bright product is desired. In present practice, the melter is not used during the production of matte tin plate. The method of my invention may therefore be practiced commercially by merely operating the melter, utilizing either resistance or induction heating or both, with a reduced electric current to heat the strip to a temperature approaching but below the melting point of tin.

It will be evident from the foregoing that my invention makes possible the production of matte tin plate which is protected against yellow staining but is not subject to darkening when subsequently baked.

Although I have disclosed herein the preferred embodiment of my invention, I intended to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

I claim:

In a method of making matte tin plate, the steps comprising electroplating a tin coating onto a sheet-steel base giving it a matte apearance, then, while maintaining the temperature of said base continuously below the melting point of tin, heating the tin plate to a temperature of from 420 to 445° F. for from 0.1 to 10 seconds, then immediately quenching the tin plate and subjecting it to electrolysis as cathode in an aqueous solution of an alkali-metal dichromate containing about 24 grams of said dichromate per liter, thereby leaving the tin plate with its initial matte appearance and reducing its normal tendency to darken on subsequent baking.

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