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TIN DEPOSITING PROCESS

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This invention relates to the plating or depositing of tin on a metal base such as black iron plate, and relates more particularly to an improved method of tinning a metal base with the use of a tin lacquer.

The method commonly in use for depositing tin on a metal base such as black iron plate used in the can making industry is that of passing or dipping the iron plate through or into a molten tin bath. This method is ill adapted to the tin plating of selected areas such as marginal portions or areas of the metal plate, and particularly where it is desired to coat or plate marginally only one surface or face of the metal. The resulting tin coating obtained in the customary mill practice of this hot dipped process is relatively porous in the sense that it does not contain the minimum number of pores which may be secured in a tin coating. I am aware that many suggestions have been made to deposit tin and other metals on a metal base by the use of a tin (or other metal) lacquer, but these suggestions have not received any real commercial acceptance.

I have found that the tin depositing or plating method of my present invention may be used as a substitute for and constitutes an improvement on the customary hot tin dipping method, the same being serviceable where the tin dipping method would not be applicable, as, for example, in the coating of selected areas, such as selected marginal faces of iron plate, and the same yielding a finished deposit which provides a continuous tin film of controlled thickness, possessing the minimum number of pores per given area.

Briefly stated, the selected areas of sheet metal such as black iron plate, and such areas as a marginal face or faces thereof, are coated in accordance with the practice of the present invention, as by means of rollers with a tin lacquer, the said tin lacquer comprising powdered tin held in suspension in a vinyl resin binder. The lacquer is applied on one or opposite marginal faces of the base metal in layers or coatings of suitable thickness. The thus coated or lacquered areas of the sheet metal base are then passed through a flash oven to drive off the lacquer solvents. The treated sheet metal is then subjected to a heating or firing operation. In this heating or firing operation the powdered tin fuses and becomes adheringly attached to the metal base. This operation leaves, however, a film of carbon deposit. The carbon deposit may then be removed as by passing the treated area through a scrubber. The vinyl resin in this process serves as a vehicle for the coating application and as a

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fluxing agent in the tin fusing step. The resulting tin coating or deposit is a continuous coating of minimum porosity and one capable of making a most efficient soldered seam in the manufacture of metal cans or containers.

The method of the invention is especially adapted for applying marginal tin deposits on metal sheets which can be cut into can body blanks. Since the tin deposit may be applied only to the sheet margins or to one marginal face of the sheets or in differing widths to opposite marginal faces of the sheet, it thereby becomes possible to manufacture or fabricate black iron metal containers by employing a minimum of tin area for subsequent soldering. The process may be used in connection with all types of metal containers whether or not of the hermetically sealed type.

I have found that when a vinyl resin is used as the binder for the powdered tin particles, the tin may be effectively cold coated on the metal base and may be then effectively fired to produce a fused continuous deposit of the tin on the metal base, the vinyl resin serving as a vehicle in the coating application and as a fluxing agent in the tin fusing step. The vinyl resin is a co-polymer of vinyl chloride and vinyl acetate. Various ratios of the vinyl chloride and vinyl acetate polymers may be used to produce good results; I have found that the ratio of vinyl polymers preferred is 85 of the chloride and 15 of the acetate. A solution of the vinyl resin co-polymer is produced by dissolving the same in ordinary solvents such as methyl-ethyl-ketone, methyl - iso - butyl - ketone and toluene. The lacquer may be made by thoroughly admixing powdered tin with and in the vinyl resin solution. A good lacquer may be obtained, for example, with 380 grams of the powdered tin to one gallon of dissolved vinyl resin carrying one pound of the dry resin.

In applying the tin lacquer to the metal base, the tin lacquer is thoroughly mixed and held in suspension by continual stirring. In this condition it may be applied in the flat to black iron sheets by means of a roller or rollers suitable for marginal application. For metal containers which are to be soldered only on the inside, application of the tin lacquer may be made in a marginal film on one face of the metal sheet approximately 15 milligrams per square inch. For other types of containers the deposit may be made on opposite faces of the metal sheet in differing widths as economy demands.

The lacquered black iron sheet may then be passed through a flash oven to drive off the

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lacquer solvents, after which the prepared sheet is ready for the fusing step.

In the next or fusing step of the process, the tin and the vinyl resin bond permit interfacial fusion of the powdered tin. This is accomplished when the melting point or liquid-solid phase of the tin is attained in the presence of the vinyl resin which acts as the fluxing agent.

In the fusing step of the process the coated metal is subjected to a controlled heating operation either direct or indirect. I prefer to use a direct flame or the sheets may be passed through palm oil between rollers at a temperature of 500-550° F. At this temperature the tin fuses with the iron base leaving a film of carbon deposit. The fusing operation results in the fusion of the tin particles and their adhesion to the iron surface, producing a fused continuous deposit of tin on the iron surface.

The carbon deposit which is the residue of the binder is then removed. This is done by passing the prepared sheets through a washer-scrubber of either water or solvent or both in succession. The solvent is preferred, since by means of its use the black iron is degreased and prepared to receive lacquer or varnish over the exposed or non-tinned areas.

The practice of the method of the present invention, the advantages thereof and the advantageous characteristics of the resulting product will in the main be fully apparent from the above description. By means of the process, metal containers may be manufactured with a great economy in the saving of tin. Only those areas which are to be used in a subsequent soldering operation are plated with the tin. The remaining untinned area may be suitably coated with a lacquer or varnish. The tinning method of the invention

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may be employed where the commonly used molten tin bath method is inapplicable. The tin coating obtained in the practice of the method of the present invention is a continuous deposit of tin containing a minimum porosity. The vinyl chloride resin employed in the lacquer serves only as a temporary binder or bond in the application of the lacquer coating and in the firing of the tin, the same effectively also serving as a flux in the fusion step. The steps of the process may be practiced also with simplicity and economy.

I claim:

1. The method of depositing tin on an iron surface which consists in coating the iron with powdered tin held in a co-polymer of vinyl chloride and vinyl acetate vehicle and in then heating the same to effect the fusion of the tin particles and their adhesion to the iron surface producing a fused continuous deposit of tin on the iron surface, the vinyl resin serving as a vehicle in the coating application and as a flux in the tin fusing step.

2. The method of depositing tin on black iron plate can blanks which consists in coating marginal edges of the can blanks, which are to be subjected to a subsequent soldering operation, with a suspension of powdered tin in a co-polymer of vinyl chloride and vinyl acetate vehicle, in then driving off the vehicle solvent, in then heating the treated area to effect the fusion of the tin particles and their adhesion to the iron plate producing a fused continuous deposit of tin on the iron plate, and in then scrubbing the treated area to remove the vehicle remaining deposit, the vinyl resin serving as a vehicle in the coating application and as a flux in the tin fusing step.

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