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ART OF TIN-PLATING

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This invention relates to the art of tin plating and more particularly to a new process for carrying out such tin plating and the new product thereby produced.

The art of tin plating is well known and has been practiced substantially in the same manner for many years. At a certain stage in the art, a tinning machine is provided which in general consists of a rectangular cast iron pot resting upon a fire brick setting and provided with grates or other means so that the temperature of the bath maintained in the tinning machine may be controlled, the arrangement being such that the feeding and delivery sides of the tinning machine may be individually controlled as to temperature.

The pot is provided lengthwise with a partition so that the molten tin in the pot is divided into two metal baths. A slot is provided at the bottom of the partition so that the plates, sheets or other material to be tinned can pass from one bath or from one compartment to the other. In this pot there is provided a molten bath of tin about eleven inches deep divided, of course, into two baths by the partition, as stated. On one bath, the feeding side, zinc chloride floats on the surface of the molten tin as a flux and on the other bath, the delivery side, about 800 pounds of palm oil floats on the surface. The flux and the oil are kept at the proper temperature by contact with the molten tin which is, itself, kept at the desired temperatures.

The sheets to be tin plated are passed through the flux into the tin bath where they are gripped by feeding rolls, whence, via an apron guide, the sheets pass up through the molten tin until they pass to a second set of rolls submerged in the palm oil. After emergence from the second set of rolls a third set mounted over the oil bath grips them and removes them from the bath. They then drop down a chute onto a conveyor which conducts them to cleaning rolls. Suitable cleaning materials such as rye and wheat middlings, bran or ground peanut shells, are used to clean the sheets. The sheets are then buffed, piled and assorted. Rejects, called menders, must be retreated until they become primes.

The palm oil which has been invariably used has a number of known defects and disadvantages which have been accepted for lack of any manner of obviating them. Palm oil, for example, volatilizes to a considerable extent at the temperature of the tin pot and the residue becomes heavier so that the viscosity thereof is constantly changing and hence prevents a uniform condition and proper control. This means also that the changing condition of the palm oil necessitates constant changes in the adjustment of the tinning machine and the cleaning apparatus. During the volatilization of the palm oil bubbling or other disturbance occurs in the body of the oil which causes the scruff which collects between the oil and the molten tin to kick up and collect on the tin machine rolls or on the plate itself. This necessitates re-running of such plates to produce prime sheets.

Again, palm oil carries over or clings to the sheet as it comes out of the bath with the result that a considerable proportion of the oil is wasted and a considerable increase in the cleaning mixture is further required. The palm oil does not produce a tinned sheet with as bright a lustre as is desired nor does the palm oil have the properties of rendering the sheet impervious to rust or the like since it does not fill up the pin holes which occur in even the best sheets. Palm oil further absorbs moisture and the palmitic acid formed actually attacks the plates and causes warehouse spoilage, especially in the form of rusting.

In addition, palm oil relatively rapidly becomes unfit for use because of its lack of high heat-resisting properties and after one hundred to two hundred hours the palm oil must be drawn off and re-claimed by centrifuging to eliminate the heavier fraction. Palm oil is a solid at comparatively high temperatures and hence the handling costs are materially increased and it is impractical to operate at increased temperature due to the fact that the palm oil catches fire.

In using palm oil close control is required and in addition so-called veins or vein-like lines are produced on the sheet due to the manner in which the palm oil drains or is wiped off.

One of the objects of the present invention is to eliminate the above-noted defects and disadvantages and to provide additional advantages not capable of attainment with palm oil.

Another object is to eliminate the use of palm oil entirely and to use fish oil in place thereof.

A further object is to make use of an oil that volatilizes more slowly than palm oil, which is consumed less than palm oil, which is more liquid at normal temperatures and more easily cleaned off and at the same time which produces a sheet with a less coating of oil, but one which renders the tin sheet impervious to rusting, which has greatly improved drying qualities, which does not

rancidify and which in general makes possible the production of a greatly improved sheet.

A still further object is to provide a tinned sheet of greater lustre and having superior rust-resisting properties and which provides a sheet which is advantageous in lithographing purposes since fish oil itself is one of the ingredients used in lithography whereas palm oil has distinct disadvantages and must be entirely removed before lithographing can proceed.

A still further object is to make use of an oil which is more readily handled, more economical in use and which has no drawbacks during use and at the same time which allows the tinning process to take place at a higher temperature, if desired, than is possible with palm oil thereby still further improving the process and the product thereof.

I may produce my fish oil by refrigerating crude fish oil and pressing out the stearin or waxy matter. The resultant product is then filter pressed with suitable earths to remove any mucilaginous matter and the material is then kettled to a temperature of about 550° F. in a kettle provided with a vacuum thus removing all odors from the oil and at the same time polymerizing or bodying it to the desired viscosity, for example to 150 Saybolt at 210° F., or heavier. Such oil when so treated I term refined. Such a fish oil in the raw state has an iodine number of 120 or more and in general I find that an oil of such iodine value produces improved results and distinguishes from other oils of lesser iodine number.

Accordingly, I utilize the proper amount of fish oil in the tinning machine above described. The steel or other sheets or plates to be tinned are passed down through the zinc chloride flux and into the feeding side of the tinning bath after which they pass through the slot in the partition above mentioned and pass up through the tinning bath on the delivery side and then through the fish oil, and this procedure involving the use of fish oil completely obviates the above noted and other defects and disadvantages encountered in connection with palm oil, while at the same time producing a product having additional advantages as herein pointed out.

The fish oil is not only completely deodorized but is very stable at the operating temperature of the tin pot which may be in the neighborhood of 465° F., but as above indicated the use of fish oil permits the tinning operations to be carried out at 500 to 550° F. which is very advantageous, hitherto long desired but never before satisfactorily accomplished. The fish oil maintains a substantially constant viscosity and thus lends itself to better control of the tinning process.

Again, the fish oil is more quiescent and is not subject to internal disturbances as is palm oil and, therefore, the scruff also remains quiescent and there is considerably less spoilage of sheets. The fish oil does not carry over and cling to the sheet as it comes from the bath to anywhere near the extent that palm oil does, so that there is less oil to be cleaned off ultimately and hence a real saving in the amount of cleaning mixture used for such purposes.

The tin plate produced with fish oil has a brighter lustre and is in general a much improved product. Since better cleaning is made possible and less cleaning is rendered necessary, there are fewer rejects from the sorting room and this represents a considerable economic advantage since rejects must be re-cleaned or otherwise retreated before they can be used.

The very fine film of fish oil serves as a rust preventative and the fish oil not only does not itself attack the tin plate, but it also prevents air and moisture from entering the minute imperfections or pin holes present in the tin plate. Fish oil has high heat-resisting properties and need not be re-claimed except at much greater intervals than palm oil, and fish oil remains at or near its original viscosity for a longer period of time. Fish oil has a relatively low cold test and does not solidify except in very cold weather. The nature of the fish oil permits the tinning pot to be run at 500° to 550° F. instead of the common temperatures of 465° to 475° F. and hence the use of fish oil eliminates delays commonly known as cold pot delays which occur when the temperature drops below about 440° F. at which temperature the molten tin will solidify on the rolls of the machine and prevent their operation.

A still further benefit in the use of fish oil is the elimination of the so-called veins on the finished plate as the plate is drawn up through the bath by the catcher rolls, whereat the tin drains off or is wiped off. In using palm oil this is always accompanied by a thin vein-like line on the sheet but this line or vein is more or less eliminated or much less apparent by the use of fish oil and by using the same at the higher indicated temperatures, which is only made possible by the use of such fish oil.

I have, therefore, provided a new process for carrying out certain steps in the tinning art and have also produced a new and superior product and my invention, therefore, contemplates both. Such a sheet with its thin coating of fish oil is advantageous in lithographing the sheet, especially since fish oil is one of the ingredients used in lithographing, whereas palm oil has distinct disadvantages and the sheet must be treated to remove all traces of palm oil before lithographing. Inasmuch as fish oil is more fluid at the tin bath temperature, the oxides formed are more readily enabled to settle out of the top of the tin layer thereby producing a cleaner sheet with less oxide deposit thereon.

It is to be understood that the foregoing description is intended more in an illustrative than in a limitative manner and that I may vary within appreciable limits from the foregoing without, however, departing from the spirit and scope of the invention, the metes and bounds of which are, rather, set forth by the subjoined claims. I may also make use of soya bean oil, linseed oil and perilla oil, or other drying or semi-drying oils having an iodine value, in the raw state, of about 120 or greater. The following fish oils may be included: whale oil, seal oil, menhaden oil, shark oil, tuna fish oil, salmon oil, sardine oil, herring oil, cod oil, pilchard oil, tope oil, etc.

What I claim as new and desire to secure by Letters Patent is:

1. In the art of manufacturing tin plate, passing a sheet to be tinned through a flux and through molten tin, and protecting the freshly tinned sheet by giving it a thin coating of a refined fish oil capable of sealing pin-hole imperfections and having an iodine value, in the raw state, of at least about 120.

2. As a new article of manufacture, tin plate having on both sides thereof a thin coating of deodorized, polymerized fish oil of low acid content and low cold test.

3. A tin-plated sheet having on the surfaces thereof a thin protective coating of a refined

fish oil which seals pin-hole imperfections and which is characterized by an iodine value, when in the raw state, of at least about 120.

4. A tin-plated sheet having on the surfaces thereof a thin protective coating of a refined fish oil which seals pin-hole imperfections and which is characterized by an iodine value, when in the raw state, of at least about 120, said sheet being characterized by exceptional luster and by substantial freedom from veins.

5. In the art of manufacturing tin plate, the steps of preparing a suitable bath of molten tin, providing the same with a supernatant layer of a refined fish oil having an iodine number, when in the raw state, of about 120 to 200, heating said bath of tin and consequently said layer of oil to about 500–550° F., and subjecting a sheet to be tinned, subsequent to passing it through a suitable flux, to said molten tin and then to said oil.

6. As a new article of manufacture tin plate having on the surface thereof a refined polymerized fish oil coating having a viscosity at least as heavy as about 150 Saybolt at 210° F. and an iodine number, when in the raw state, between about 120 and 200.

7. A process of making tin plate comprising forming a suitable bath of molten tin, providing such bath with a supernatant layer of fish oil which has previously been refined by purification and kettling, and subjecting untinned plate to said bath of molten tin and to said supernatant layer of fish oil.

8. As a new bath for tin plating operations, a layer of molten tin and a supernatant layer of polymerized fish oil which has been refined by purification and kettling and which, when in the raw state has an iodine number between about 120 and 200, said fish oil layer causing the formation of a thin sealing film on tin plate passed therethrough.

9. As a new constituent of a tin plating bath, polymerized fish oil which, in the raw state, has an iodine number between about 120 and 200 and which has been refined and polymerized by dewaxing and kettling, said fish oil being characterized by being resistant to high temperatures, by forming a thin sealing film and by increasing the luster and perfection of the tin plate passed therethrough.

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