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METHOD OF PRODUCING A DULL FINISHED FUSED TIN COATING

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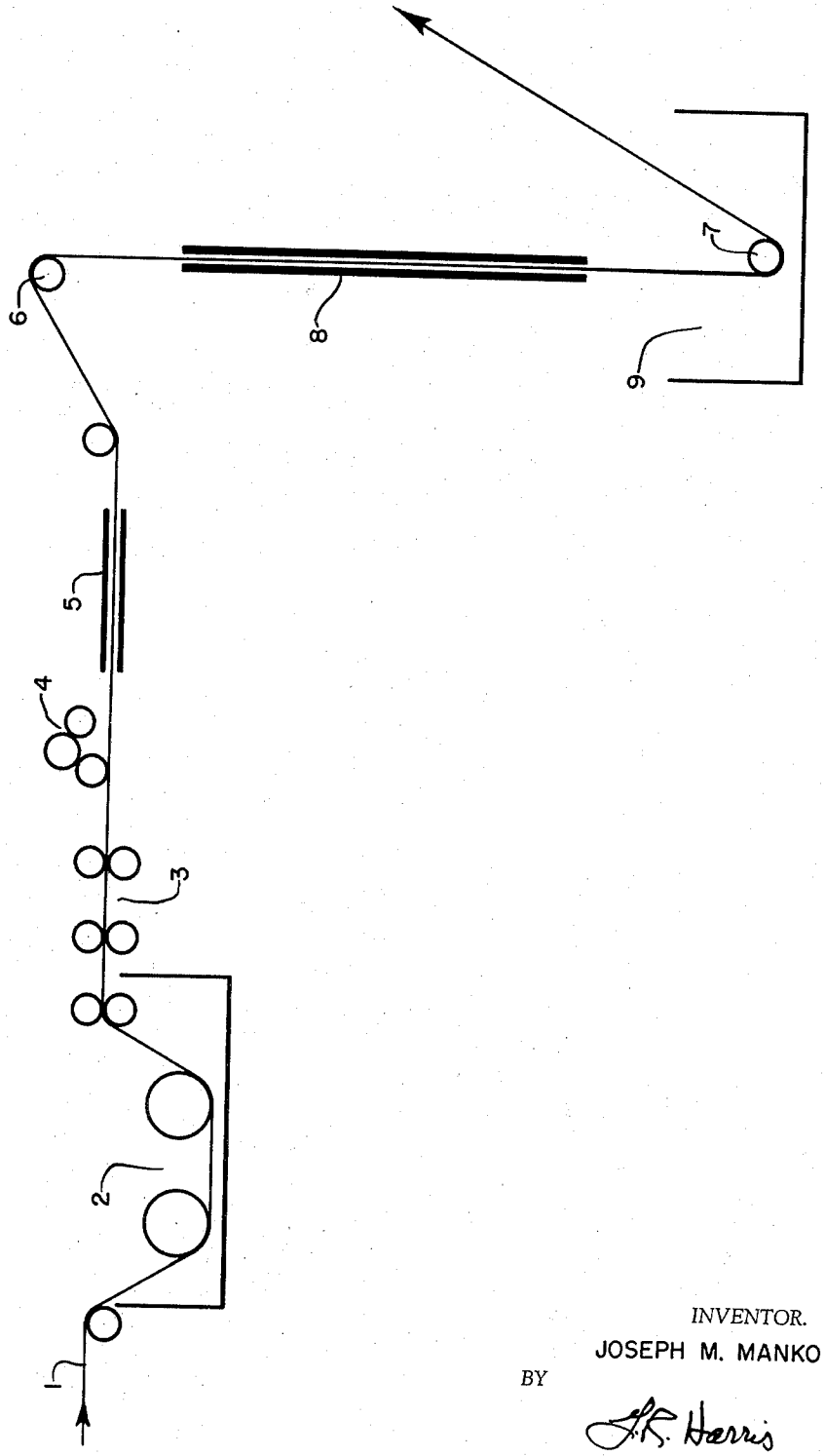

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METHOD OF PRODUCING A DULL FINISHED FUSED TIN COATING

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5 Claims. (Cl. 148—6.14)

This invention relates to a method of treating electrolytic tin plate to maintain a dull surface thereon during and after reflowing of the tin, and is more particularly concerned with a thermochemical method for achieving that result.

Tin plate produced by the well-known hot-dip process has a bright, lustrous surface. Electrodeposited tin has a matte or gray appearance, devoid of brightness or luster. Conventionally the tin coating of electrolytic tin plate is brightened and rendered lustrous by raising the temperature of the tin until it melts or flows and then quenching the tin plate in water or other cooling medium to solidify the tin coating from the fused condition. Electrolytic tin plate is commercially made as continuous strip by high speed continuous electroplating and brightening processes. The latter are usually carried out by passing the tinned strip vertically downwardly through heating means and into a quench tank of water or other medium. Tin plate so produced has a bright, lustrous surface corresponding to that of hot-dipped tin plate. For some purposes, however, it is desirable to produce tin plate having a surface which, although smooth, is not as bright as that of hot-dipped tin plate or electrolytic tin plate flow-brightened. Such a surface is referred to hereinafter as a "dull surface." Conventionally a dull surface is produced by mechanical processes, such as rolling the base metal before tinning with shot-blasted rolls to produce a controlled surface roughness, but such processes are expensive and do not produce tin plate of the smoothness desired. Furthermore, the contrast between such surfaces and flow-brightened surfaces is not as great as is frequently desired.

It is an object of my invention, therefore, to provide a process of producing a dull finish on flow-brightened tin plate by thermochemical action. It is another object to provide such a process which does not reduce the smoothness of the tin coating. It is another object of my invention to provide such a process which produces a dull surface without reduction in smoothness of the underlying steel base. It is another object to provide such a process which produces a dull surface having a high degree of contrast with flow-brightened surfaces. Other objects of my invention will appear in the course of the following description thereof.

In a preferred embodiment of my process I treat the matte finish tin plate with a dilute aqueous solution of sodium nitrite. This solution may be applied by dipping the tin plate in a tank, by spraying, or by roll transfer methods which may produce a solid or intermittent pattern, as desired. The tin plate so treated is then dried, preferably in a conventional hot air drier, so as to evaporate the water from the treating solution and leave the sodium nitrite on the surface of the tin coating. It is necessary that the surface of the tin plate be completely dried if a uniform dull surface is to be produced.

The tin plate so treated and dried is then flow-brightened in the conventional manner by heating to a temperature sufficient to flow the tin coating and then quenching

in water or other medium so as to solidify the tin from its fused or flowed state. After quenching, the surface of the tin exhibits a dull appearance which is readily distinguishable from bright tin plate by its silvery or satin finish luster.

The single figure of the drawing illustrates schematically an arrangement of apparatus suitable for carrying out the process of my invention. In this figure the matte finish strip 1 from the electroplating apparatus is passed into a tank 2 which contains a hot rinse solution. From tank 2 the strip 1 passes through wringer rolls 3 which remove excess rinse solution and thence to roller coater apparatus 4 which applies the oxidizing agent, for example, a dilute aqueous solution of sodium nitrite, to the surface of the strip. The strip then passes through a dryer 5, which may be a conventional hot air dryer, in which the water from the treating solution is evaporated. The treated strip 1 then passes over a horizontal roll 6 and vertically downward through flow-brightening apparatus 8, which may be induction heating means, and into a tank 9 provided with quenching liquid where it passes under a horizontal roll 7 in the quench tank and from thence upwardly outward.

Although I prefer to use a solution of sodium nitrite in the process of my invention, I find that other alkali metal nitrites, alkali metal nitrates, alkali metal chlorates, and hydrogen peroxide are also satisfactory. Mixtures of the above mentioned reagents are also satisfactory. All the above reagents are recognized oxidizing agents. I have tried aqueous solutions of other oxidizing agents but do not find them satisfactory in my process. No aqueous solution of oxidizing agent which I have tried will react with tin at normal room temperature with any degree of rapidity. In the flow-brightening operation the tin is raised to its melting temperature for a few seconds and under these conditions only the oxidizing agents I employ react sufficiently with the tin to produce the dull surface I have described.

My dilute aqueous solutions of oxidizing agents above mentioned need not contain more than 15% by weight of the oxidizing agent or mixture of agents and may contain less. If the tin plate is dipped into a tank containing the solution, a satisfactory dull finish is produced with no more than about 8% by weight of the oxidizing agent. On the other hand, if the solution is applied by a roll coating device which puts on a very thin coating, it requires up to about 15% of the oxidizing agent, as has been mentioned.

I claim:

1. A method of producing a dull finished fused tin coating on electrolytic tin plate comprising applying to the matte tin coating a dilute aqueous solution of an oxidizing agent selected from the group consisting of alkali metal nitrites, alkali metal nitrates, alkali metal chlorates and hydrogen peroxide, and mixtures thereof, drying the solution on the tin coating, then heating the tin coating to a temperature sufficient to flow the tin, and then quenching the tin plate so as to solidify the tin coating.

2. A method of producing a dull finished fused tin coating on electrolytic tin plate comprising applying to the matte tin coating a dilute aqueous solution of an oxidizing agent selected from the group consisting of alkali metal nitrites, alkali metal nitrates, alkali metal chlorates and hydrogen peroxide, and mixtures thereof, evaporating the water from said solution, then heating the tin coating to a temperature sufficient to flow the tin, and the quenching the tin plate so as to solidify the tin coating.

3. A method of producing a dull finish fused tin coating on electrolytic tin plate comprising providing on, the matte tin coating a film of an oxidizing agent selected

from the group consisting of alkali metal nitrites, alkali metal nitrates, alkali metal chlorates and hydrogen peroxide, and mixtures thereof, then heating the tin coating to a temperature sufficient to flow the tin and react it with the oxidizing agent, and then quenching the tin plate so as to solidify the tin coating.

4. A method of producing a dull finished fused tin coating on electrolytic tin plate comprising applying to the matte tin coating an aqueous solution of an oxidizing agent selected from the group consisting of alkali metal nitrites, alkali metal nitrates, alkali metal chlorates and hydrogen peroxide, and mixtures thereof, in amount between about 8% and about 15% by weight, drying the solution on the tin coating, then heating the tin coating to a temperature sufficient to flow the tin and then quenching the tin plate so as to solidify the tin coating.

5. A method of producing a dull finished fused tin coating on electrolytic tin plate comprising applying to the matte tin coating a dilute aqueous solution of sodium nitrite, drying the solution on the tin coating, then heating the tin coating to a temperature sufficient to flow the tin, and then quenching the tin plate so as to solidify the tin coating.

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