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METHOD OF ELECTROPLATING OF TIN ON FERROUS STRIP

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2 Claims. (Cl. 204—28)

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The present invention relates to the electroplating of tin on black iron or steel i. e., unplated ferrous metal.

The primary object of the invention is to produce a tin coating having better adherence and brighter finish, and also to obtain economies in the use of tin.

I have discovered that such results are obtained when a continuously traveling strip is made the anode for a critical time period during its travel just prior to the electroplating operation wherein the strip is made the cathode. In carrying out the invention, the continuously traveling strip may be made the anode during initial travel through the electroplating bath or in a separate bath from which it is immediately introduced to the electroplating bath where the current is reversed. The success of the invention depends upon having the traveling strip of indefinite length successively made first the anode for a critical time period and then the cathode so that as the strip travels, portions thereof simultaneously have reversed signs, i. e., a portion immediately before the plating operation is positive while the portion being electroplated is negative.

As stated above, the time period during which the traveling strip is made the anode before plating is a critical consideration. For practical purposes, satisfactory results are obtained in the case where the traveling strip is made the anode initially in the plating bath if the strip is allowed to make one loop, i. e., travels once down and up in the bath before plating under a current density of preferably about 10 to 50 amperes per square foot. It is customary in a tin plating bath to carry the strip continuously over electrodes and guide rolls in the form of vertical loops extending within the bath, and a time period embraced by the formation of one such loop as explained, gives the improved results. Where the strip is treated in a separate bath, a loop of substantially similar character is traversed by the strip as the anode from which it is then introduced into the plating bath and made the cathode for plating. In order to express the time period more definitely, the improved coatings are produced when the strip is made the anode preferably for from about 2 to 10 seconds preliminary to the plating step and under a current density preferably of about 10 to 50 amperes per square foot. The time period may be increased up to 30 seconds in some cases and the current density may be increased to 100 amperes per square foot if the time period is not too long. The time and current density are controlled relative to one another so that at no time is the

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strip oxidized as would occur at a high current density and long time period. Therefore, when the current density is high the time period is shortened and vice versa.

An equally important consideration which is of substantial commercial advantage and contributes markedly to the success of the invention, is the utilizing of a customary alkaline tin plating bath composition as the electrolyte in the electrolytic treatment of the strip as the anode. I have discovered that a bath having a composition similar to that of the tin plating bath gives the most effective results whereby the treatment with the strip as the anode may be conducted in the tin plating bath and, simultaneously with the plating operation which is continuous with such treatment. This result is also true when the strip is initially made the anode in a bath of the plating composition maintained separate from the electroplating tank.

I employ any customary alkaline tin plating solution for the preliminary treatment of the strip as the anode. For example, a solution containing about 12 grams per liter of sodium hydroxide and about 50 grams per liter of tin gives effective results. Where the treatment of the strip takes place in the plating tank, the temperature of the bath containing such solution is, of course, at the same temperature employed for plating, namely at about 170° F. to 210° F., preferably 200° F.

Where the treatment is carried out in a bath separate from the plating tank, a similar solution is used but the temperature may be lower e. g., about 135° F. to 160° F., preferably 140° F. In such separate bath a temperature suitable for plating is not required and hence a lower temperature can be used with the same tin plating solution.

While other alkaline tin plating solutions may be used, I prefer to use the same solution for the electrolytic treatment of the traveling ferrous strip as the anode, as is used in the tin plating operation, since in this manner, very substantial economies are realized.

The preliminary electrolytic treatment of the traveling strip as an anode appears to condition the strip in such a manner that the tin plating adheres in a markedly improved manner and a brighter plate is obtainable. The electrolytic treatment of the strip as the anode takes place just prior to the plating whether in the plating tank or in a separate tank and the effect of the treatment is thus made immediately available to the plating step. The treatment of the strip as the anode and the plating operation take place successively, simultaneously and continuously

whether in the plating bath or where separate treating and plating tanks are used so that present tin plating operations are not in any way interefered with or slowed down.

I claim:

1. The method of electroplating a continuous ferrous strip comprising continuously traveling unplated ferrous strip through an alkaline tin plating bath in which the strip is made the anode for about 2 to 30 seconds at a current density of about 10 to 100 amperes per square foot, and then immediately thereafter electroplating the treated unplated ferrous strip with tin in an alkaline tin plating bath of the same composition where the strip is made the cathode.

2. The method in accordance with claim 1 wherein the anodic and plating treatments take place simultaneously but upon successive portions respectively of the continuously travelling strip.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,475,198	Potthoff	Nov. 27, 1923
1,533,447	Newman	Apr. 14, 1925
1,954,473	Dunn	Apr. 10, 1934
2,078,868	Oplinger	Apr. 27, 1937
2,437,474	Orozco	Mar. 9, 1948
2,451,341	Jernstedt	Oct. 12, 1948

OTHER REFERENCES

Transactions of the Electrochemical Society, volume 27 (1915), pages 141, 142; volume 84 (1943), pages 190 and 249 to 252.

Journal of the Electrodepositors' Technical Society, volume 18 (1942–43), pages 24 and 27.