

Sept. 20, 1966

R. A. NICKOLA ET AL
METHOD AND APPARATUS FOR APPLYING HOT-DIPPED
METAL COATING TO WIRE
Filed Dec. 14, 1961

3,274,027

FIG. 2.

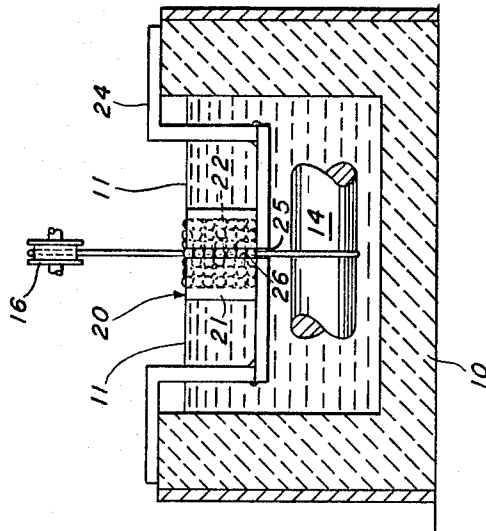
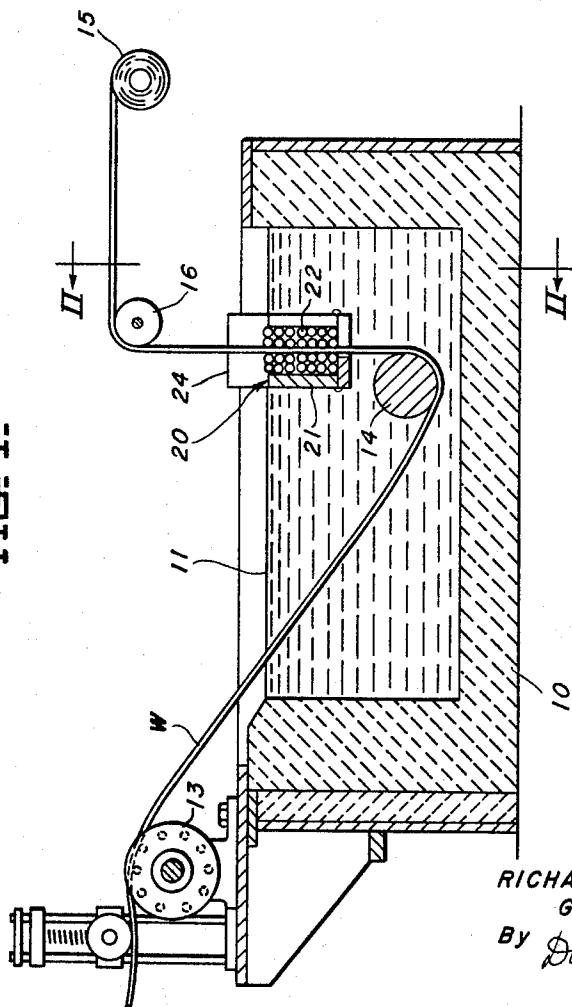


FIG. 1.



INVENTORS.
RICHARD A. NICKOLA and
GORDON T. SPARE

By *Donald L. Dalton*

Attorney

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METHOD AND APPARATUS FOR APPLYING HOT-DIPPED METAL COATING TO WIRE

Richard A. Nickola, Cleveland Heights, and Gordon T. Spare, Chardon, Ohio, assignors to United States Steel Corporation, a corporation of New Jersey

Filed Dec. 14, 1961, Ser. No. 159,278

2 Claims. (Cl. 117—114)

This invention relates to the coating of wires and, more particularly, to hot-dipped metal coating of steel wires.

One conventional method of applying hot-dipped metal coatings to steel wire is leading the wire into a bath of the molten coating metal, passing the wire under a sinker and then drawing the wire from the bath, thus applying a coating of the bath metal. It is well known that any vibration or oscillation in the wire as it leaves the bath tends to produce a rough and irregular coating and in some instances prevents coating from adhering to the wire. However, it is also known that certain types of vibration of the wire while it is in the bath have several beneficial effects and provide a better coating. Therefore, vibration of the wire is often induced as the wire enters the bath and is damped as the wire leaves the bath. A method and apparatus for inducing vibrations in a wire entering a bath are shown and described in United States Patent No. 2,989,942 dated June 27, 1961 entitled "Wire Vibrating Apparatus for Continuous Processing Lines."

Although there have been several prior proposals for damping the oscillation of wire as it leaves the bath, for various reasons none of these have proved altogether successful.

It is therefore a principal object of this invention to provide a method and apparatus for damping induced vibrations of wire being coated before it emerges from the bath.

It has also been found that oxide particles tend to cling to and embed in the coating material as the wire emerges from the bath causing a rough and irregular coating.

It is therefore another object of this invention to provide a device which in addition to damping oscillation will prevent adherence of oxide particles to the coating and promote a smooth surface on the coating material.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawing, in which:

FIGURE 1 is a longitudinal sectional view of a coating bath having an oscillation damping device; and

FIGURE 2 is a sectional view taken along the plane of line II—II of FIGURE 1.

Referring now to the drawing, a tank 10 is shown in which is disposed a molten bath of coating metal 11 such as aluminum. Any conventional tank may be employed. The wire to be coated, designated W, is fed from a pay-off reel (not shown) across a vibrator 13 and into the bath 11. A suitable vibrator is shown and described in said Patent No. 2,989,942. The wire W enters the bath 11 and is held submerged therein by a sink roll 14. A take-up reel 15 pulls the wire through the bath and over a guide roll 16. The vibrator 13 induces oscillation in the wire W which oscillation is somewhat damped by sink roll 14 and guide roll 16. However, these rolls do not provide enough damping to prevent some detrimental oscillation in the wire as it leaves the bath. Therefore, an oscillation damper 20 is provided beneath the surface of the bath between the rolls 14 and 16.

The oscillation damper 20 includes a metal box or casing 21 in which a plurality of hard steel or ceramic balls

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22 are disposed. The casing 21 is suitably secured, as by welding, to the lower section of a U shaped bracket 24. The bracket 24 is mounted on the tank 10 so that the casing 21 is submerged below the surface of the bath 11. The casing 21 is open at the top to provide for insertion of the balls and the exit of the wire W. A groove or slot 25 is formed in the bracket 24 to permit the entry of the wire W through the bottom of the casing 21. To provide for easy threading of wire the casing 21 has a slot 26 cut into one side and extending along the length thereof. The slot 26 joins with slot 25. In order to thread the wire W through the damper 20 the wire is merely pushed through the slots 25 and 26 into the mass of balls 22. The wire is then ready to be drawn through the balls 22 and out of the open top of the casing 21 by the take-up reel 15. Obviously, the slots 25 and 26 must be narrower than the diameter of the balls in the casing.

The wire is drawn through the coating bath by take-up reel 15 and vibrations are induced in the wire by the vibrator 13. As the wire passes through the damper 20 the balls dampen out substantially all of the oscillations and allow the wire to emerge from the coating bath free of vibration. This tends to promote a uniform smooth coating of the bath metal on the wire.

As was indicated above, oxides of the coating metal tend to cling and adhere to the coating giving it a rough and uneven texture. The balls 22 wipe off any oxide particles or other undesirable particles which are picked up as the wire passes through the bath.

It has further been found that intimate contact of the balls with the wire tends to enhance the heat transfer from the bath to the wire. This increased rate of heat transfer accelerates the coating action thus permitting an increase in the speed of the wire passing through the coating bath.

We have found that it is preferable to have the balls 22 all of the same size with the size depending upon the size of the wire. Generally speaking, for finer wire smaller balls should be used. For example, we have found that the optimum size for .040 inch diameter wire is $\frac{1}{8}$ inch diameter balls and for .120 inch diameter wire $\frac{3}{4}$ inch balls.

The selection of material for the balls depends to a large extent on physical and chemical characteristics of the bath. The balls of course must have a liquidous temperature above that of the coating bath. Further, the balls should not contain any material which would alloy to any appreciable amount with the bath. This prevents both erosion of the balls and contamination of the bath. We have found that for coating aluminum on steel wire AISI 52100 steel balls provide excellent results. Also, various types of ceramics have proved to be satisfactory. The balls 22 should have the further physical characteristic of being relatively hard in order to provide the mechanical wiping action necessary to prevent the adherence of oxide particles and to provide suitable damping.

Various arrangements of the steel balls within the casing have been investigated, and it has been determined that no particular or regular orientation is necessary. Equally good results have been obtained with the balls randomly oriented and regularly oriented.

While one embodiment of our invention has been shown and described it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

We claim:

1. A molten metal wire coating bath comprising a vibrator to induce oscillation in the wire during coating; a sink roll positioned between said vibrator and the point

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of wire emergence from the molten metal of the bath; means for withdrawing the wire from the molten metal upwardly from the sink roll; and an oscillation damper positioned at and beneath the surface of the molten metal at the point of wire emergence therefrom, said damper comprising a box secured in position at and beneath the molten metal surface, said box including means to permit wire passage axially upward therethrough and having disposed therein a mass of hard balls at and beneath the molten metal surface to surround and contact the wire.

2. A method for applying hot-dipped metal coating to wire comprising inducing oscillation in the wire, immersing the oscillating wire in a bath of molten metal, passing the wire around a sinker roll, located in the wire path beyond the oscillation induction means, and withdrawing the wire upwardly from the bath through a mass of hard balls surrounding the wire and disposed at and below the surface of the bath metal whereby to dampen oscillations not damped by the sinker roll and to provide a mechanical wiping action to prevent the adherence of oxide particles.

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15 MURRAY KATZ, *Primary Examiner.*

JOSEPH B. SPENCER, JOSEPH REBOLD, RICHARD D. NEVIUS, *Examiners.*

J. A. HAUG, J. P. MCINTOSH, *Assistant Examiners.*