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DEVICE FOR COATING METAL PIECES

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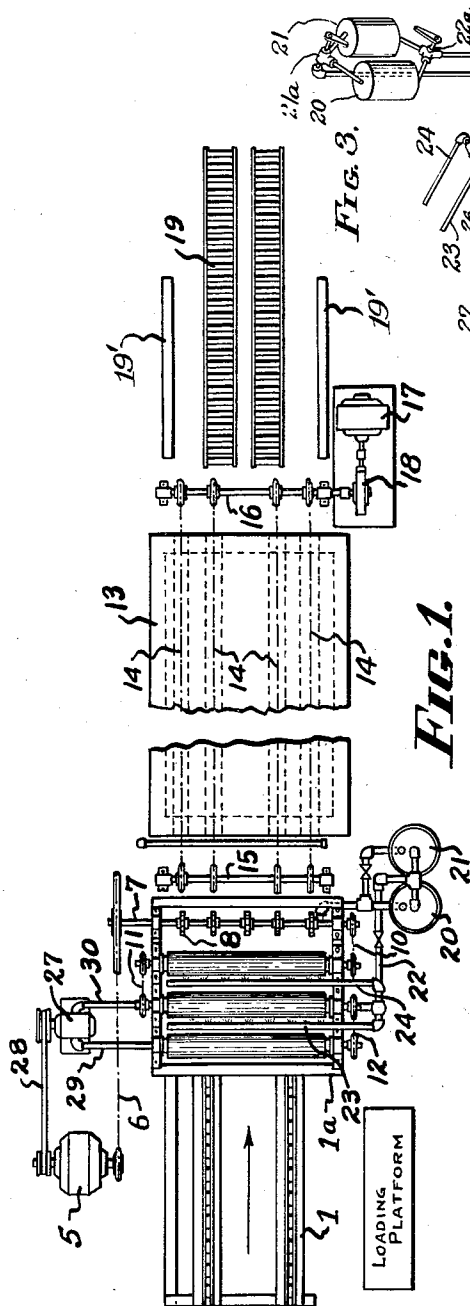


FIG. 1.

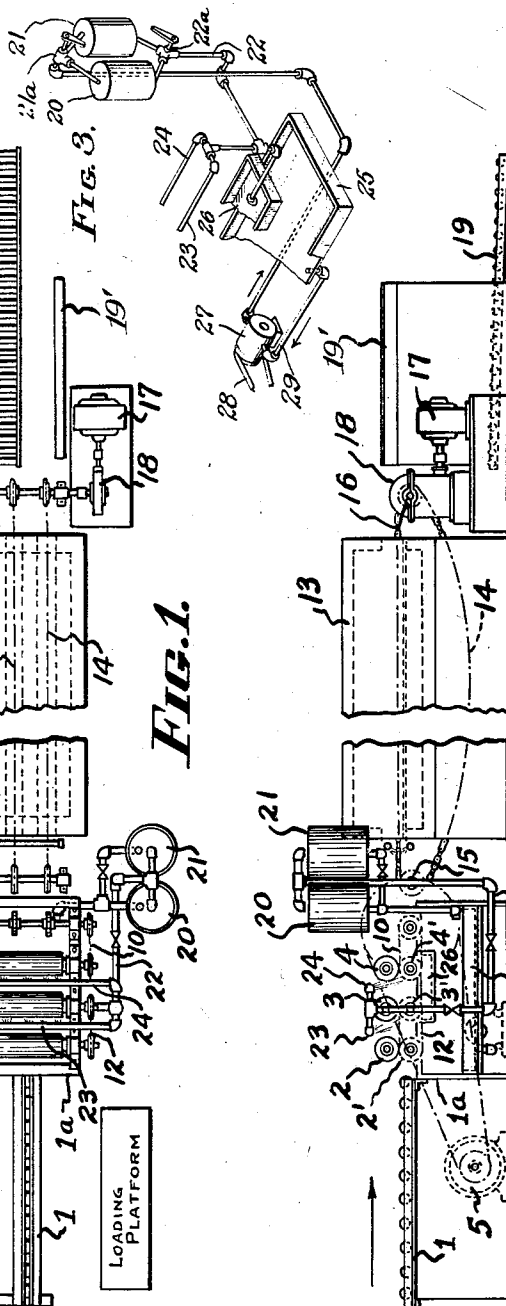


FIG. 2.

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DEVICE FOR COATING METAL PIECES

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4 Claims. (Cl. 91—12.1)

In a co-pending application for Letters Patent, Serial No. 716,674, filed March 21, 1934, I have described a method of preparing metal pieces, particularly ferrous metal sheets, for enameling uses. This method comprises the steps of imposing upon the surface of a metal piece a coating of a salt of an adherence-promoting metal, e. g. sulphate of nickel, then heat treating the coated piece so as to derive the adherence promoting metal therefrom in metallic form. The result of the process when using sulphate of nickel is a metal piece the surface of which has been alloyed with metallic nickel to a relatively slight depth. Such an alloyed surface is especially adapted to take and retain with a good bond, a coating of vitreous enamel applied in the usual way, and is obviously superior to a mere superficial coating of nickel. In my said application, I have shown that the alloy formation process may be carried on either after the sheets or shapes have been otherwise finished, or prior to their complete reduction. Thus it is possible to form the alloy layer upon starting pieces for a rolling operation such for example as thin bar or sheet bars, and then carry the pieces down to finished gauge by hot rolling, cold rolling or a combination of both, with full retention of the alloy layer. When pieces are treated with the intention of rolling them, it is of course advisable to apply a greater amount of the adhesion promoting metal, proportioned to the expected elongation. It is, however, advisable to heat treat the articles or pieces so as to form the alloy within a short time after they have been coated with the salt of the adhesion promoting metal. Reference is made to my said copending application for further details and a discussion of my process and the article produced thereby.

In my present application, an object of my invention is the provision of a coating machine suitable for the carrying on of my process. It is an object of my invention to provide a single, simple and compact apparatus which is the sole mechanism necessary for addition to the usual rolling equipment to turn out my novel enameling stock. It is an object of my invention to provide a mechanism meeting the requirements referred to hereinabove, which yet will be economical to construct and relatively movable if desired. It is an object of my invention to provide a mechanism which may be employed at substantially any desired stage of modern rolling processes, and which will handle substantially all of the various pieces used from thin bar to finished sheets. It is an object of my invention to provide a mechanical means for coating flat shapes in a controlled and uniform manner. It is also my object to provide a mechanism in which the various steps of coating, drying and

alloy formation are carried on as a continuous operation.

These and other objects of my invention which will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain arrangement of parts of which I shall now describe a preferred embodiment. Reference is made to the accompanying drawing wherein:—

Figure 1 is a plan view of my device, and

Figure 2 is an elevational view thereof.

Fig. 3 is a perspective view showing details of the piping.

The sheet or bar to be coated is taken from a loading platform, so marked, and is placed upon a feed table 1. I provide a framework 1a which supports the various coating instrumentalities next to be described. Upper and lower pinch rolls 2 and 2' are journaled in this frame, as are also rubber covered sets of rolls indicated at 3 and 3', and at 4 and 4'. A motor 5 is connected by a chain 6 to a main shaft 7, which bears conveying discs 8, and which in turn is connected by chains 10, 11 and 12 to the pinch rolls and rubber covered rolls, so that the motor 5 serves to drive the entire coating device.

Beyond the coating device there is a furnace indicated at 13, equipped with conveyor chains 14 which run over sprockets on end shafts 15 and 16. A separate motor 17 having a suitable gear reduction 18 may, if desired, be employed to drive the furnace conveyor. A run out table 19 is provided, which may be employed as a stacker, for which purpose it may be located as shown below the delivery end of the furnace, and side guides 19' may be provided to facilitate edgewise alignment of the stack. A back stop (not shown) may also be provided as is known in stacking practice.

I have shown a pair of tanks 20 and 21 connected by a pipe line 22 to a pair of spray pipes 23 and 24 adapted to spray the coating solution onto a piece passing through the rolls, and preferably into the pinch between the piece and the rubber covered rolls 3 and 4. The piece is thereby coated on its upper side and the thickness of the coating is controlled by the rolls. The excess coating solution flows off the edges of the piece and is caught in a lower pan 25. There is also an upper pan 26 in which the lower rubber covered rolls 3' and 4' turn, and this pan is kept continuously full of the coating solution from a branch of the pipe line 22. Any overflow from the pan 26 is caught in the pan 25. The surfaces of the rubber covered rolls 3' and 4' transfer the coating solution from the pan 26 to the under surface of the piece and control the thickness of the film thereon.

The motor 5 also drives a pump 27 by means of a belt 28. The pump withdraws coating solution from the pan 25 through a pipe line 29 and 60

delivers it back to the tanks 20 and 21. Due to the scrubbing action of the rolls and the washing action of the solution, the coating solution collects a certain amount of iron oxide and hydroxide during the operation of the machine. Inasmuch as this material settles quickly, it is preferred to use the tanks 20 and 21 alternately so as to give the solution in one tank time to settle and become clear while the other tank is being used. This is accomplished by manipulation of the valves 21a and 22a, as best seen in Figure 3. These valves are of the well-known two way type.

A filter device may be added to remove this foreign material from our solution, in which case one of the tanks 20 and 21 may be eliminated.

In the operation of the machine, the pieces are pushed from the feed table 1 into the pinch of the rolls 2 and 2', which feed it through the rubber covered coating rolls, where a controlled film of the coating liquid is deposited, upon its surfaces. The discs 8 assist in transferring the coated piece to the conveyer chains 14 of the furnace 13. The furnace may be heated by any suitable burners or fuel. Its purpose is to dry and set the coating primarily, though it may be employed to break down the coating salt and form the desired alloy, in accordance with the instructions in my said co-pending application. If the stock is subsequently to be reheated for rolling, a mere drying may be sufficient in the furnace 13. If the stock is to be hot rolled immediately, the furnace 13 may be of a type to heat the stock for rolling, and may be located to deliver the stock to the mills.

A modification of the foregoing is as follows:— Thin bars are pickled in sulphuric acid, washed and while still warm are stacked. The thin bars at a temperature of about 140° F. are removed from the pile and are coated with my solution. By this procedure, the drying furnace is eliminated and in place thereof I have devised a conveyer roller table which conveys the material away from the coating machine and to a piler, or they may be piled by hand. The bars being warm during the process the coating dries immediately. and in one installation I have introduced a zone of jets of warm air through which the sheets pass before being piled. If the stock as it comes from the mill is bent, or otherwise deformed, the upper and lower pinch rolls 2 and 2' may be constructed of larger diameter than shown in my figure so that they will not only perform the function of pinching the material but may be used for the purpose of straightening and leveling.

It will be clear that other modifications may be made in my invention without departing from the spirit thereof. Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a device for coating metal pieces, the combination of a set of elements coacting to drivingly grip the metal piece and advance said piece, a set of elements coacting in receiving relation to the first mentioned elements to receive the advancing piece between them, said elements having surfaces contacting with the opposite sides of the metal piece for effective application of coating fluid to said sides, for the adherence of said fluid to said sides, means for supplying fluid to one of said sides between the two sets of elements, in the course of passage of the metal piece from one set of elements to the other, and means for supplying fluid to the other side of the metal piece, the said means for supplying coating fluid

between the two sets of elements comprising a conductive element discharging between said two sets toward the metal piece passing therebetween, and means to cause forced flow of the fluid from said conductive element, said device comprising a container receiving fluid from the applying elements and the metal piece, in excess of that adhering to the metal piece, in which fluid there may be adulterant coming with the fluid from the metal piece, means to force the caught fluid from this container to the means for causing forced flow of the fluid, this last mentioned means including a provision for preventing passage of the adulterant with the fluid as it is again forced between the set of elements onto a metal piece.

2. In a device for coating metal pieces, the combination of a set of elements coacting to drivingly grip the metal piece and advance said piece, a set of elements coacting in receiving relation to the first mentioned elements to receive the advancing piece between them, said elements having surfaces contacting with the opposite sides of the metal piece for effective application of coating fluid to said sides, for the adherence of said fluid to said sides, means for supplying fluid to one of said sides between the two sets of elements, in the course of passage of the metal piece from one set of elements to the other, and means for supplying fluid to the other side of the metal piece, the said means for supplying coating fluid comprising a plurality of containers and means for conducting fluid from said containers to the space between the sets of elements, said device also including means for catching and returning to said containers fluid in excess of that adhering to the fluid applying means and the metal piece, which fluid may carry adulterant from the metal piece into said containers, and said device also including means for alternately connecting each container with the fluid conducting means while preventing connection of the other container thereto, whereby the adulterant may be removed from one or the other container while it is disconnected.

3. In a device for coating metal pieces, the combination of a set of pinch rolls for feeding a metal piece, coating rolls disposed on each side of the metal piece, means for supplying fluid to the two sides of said piece, a container and means to force flow of fluid therefrom to said supplying means, said container adapted to receive fluid from the supplying means in excess of that adhering to the metal piece, in which fluid there may be adulterant coming from the metal piece, and means for preventing passage of the adulterant with the fluid during recirculation.

4. In a device for coating metal pieces, the combination of a set of pinch rolls for feeding a metal piece, coating rolls disposed on each side of the metal piece, means for supplying fluid to the two sides of said piece, a plurality of containers and means to force flow of fluid therefrom to said supplying means, said containers adapted to receive fluid from the supplying means in excess of that adhering to the metal piece, in which fluid there may be adulterant coming from the metal piece, means for selectively connecting each container with the supplying means while preventing connection of another container thereto, whereby the adulterant may be removed from one or another of the containers while it is disconnected.

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