

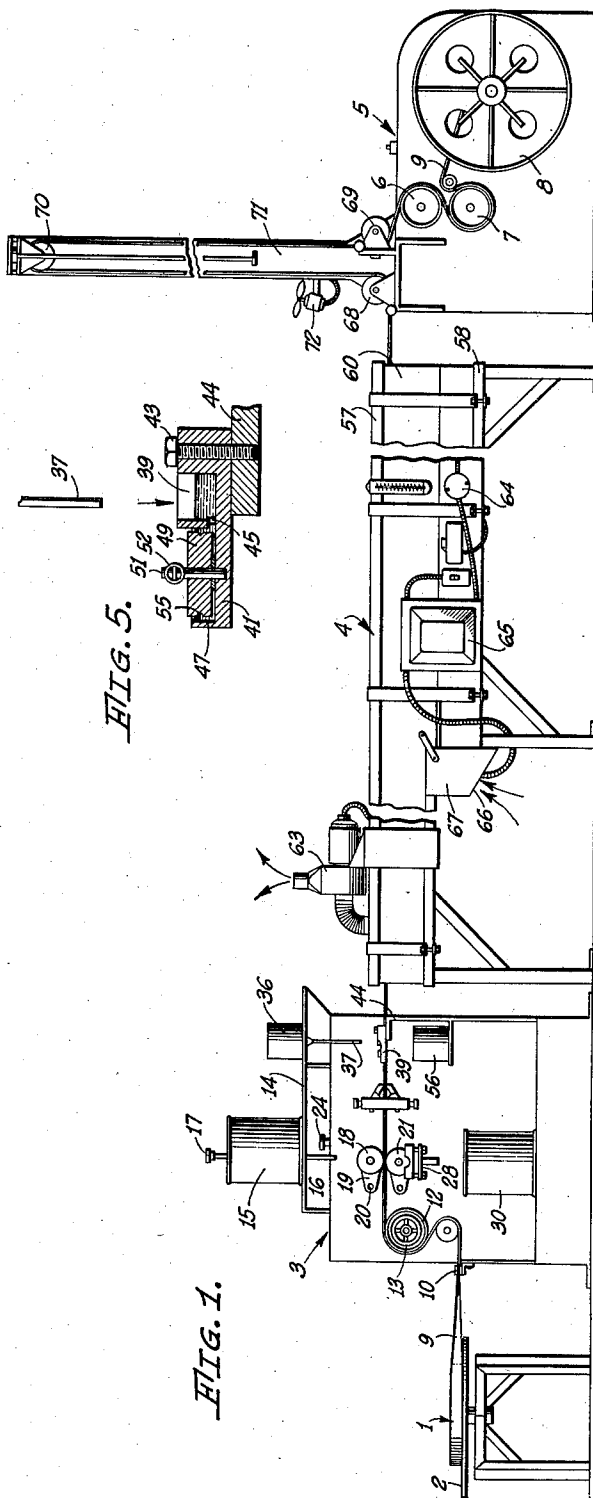
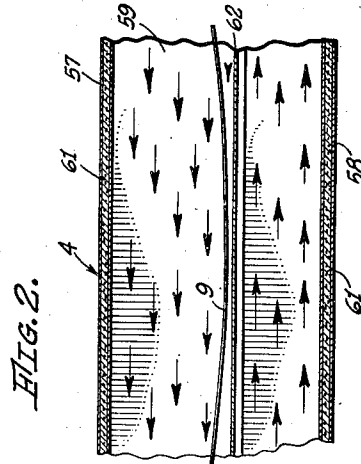
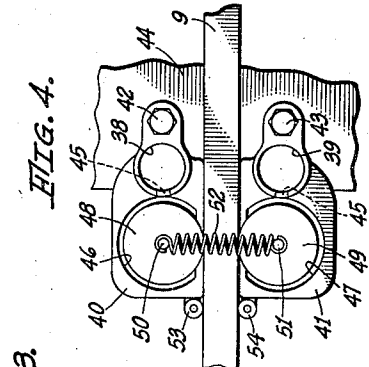
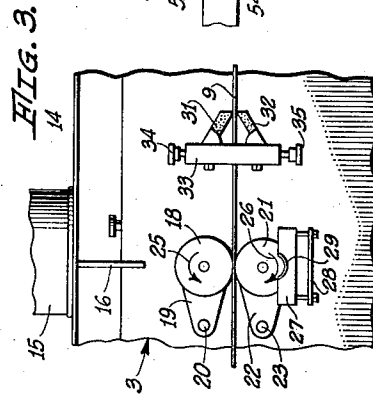
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J. L. HUNTER

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APPARATUS FOR COATING STRIP MATERIAL

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INVENTOR.

JOSEPH L. HUNTER

BY

BY *Harold R. Mattingly*
ATTORNEY.

ATTORNEY.

UNITED STATES PATENT OFFICE

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APPARATUS FOR COATING STRIP MATERIAL

Joseph L. Hunter, Riverside, Calif., assignor to
Acme Steel Company, Chicago, Ill., a corporation
of Illinois

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5 Claims. (Cl. 91—33)

My invention relates to an apparatus for coating strip material and has particular reference to an apparatus for applying paint to strip sheet metal, finding particular utility in the painting of strip metal to be employed in the manufacture of metallic Venetian blinds.

It has, in the past, been the practice to paint strip materials such as strip steel for decorative and preserving purposes. Prior to my invention such painting of strip steel was done in two or more operations in which one side of strip was first painted and then dried or baked and then the other side was given a similar treatment.

Numerous difficulties have been encountered in the painting of strip steel by this method, these disadvantages residing primarily in the fact that the first coat of paint is given twice the drying or baking treatment than the second coat occurring on the other side of the strip is given. This results in a difference in color between the two sides and it has also been found difficult to sufficiently bake one side to permit rehandling for the second painting operation without causing over-baking of the first coat in order to sufficiently bake the second coat to render it hard and enamel-like as is desired.

It is an object of my invention to provide an apparatus which applies a coating material simultaneously to both sides and both edges of a strip of steel.

It is a further object of my invention to provide an apparatus for coating strip steel which includes means for simultaneously applying a coating material to both sides and both edges of a substantially continuous supply of strip steel, together with means for drawing the coated material through a treating chamber and then winding the completed product on storage reels.

Other objects and advantages of my invention will be apparent from a study of the following specifications, read in connection with the accompanying drawing, wherein:

Fig. 1 is an elevational view of one form of apparatus of my invention illustrating a strip of steel as it is fed from a coiled supply through a painting apparatus, through a treatment chamber, and thence over a cooling apparatus and onto storage reels;

Fig. 2 is an enlarged fragmentary longitudinal section taken through the treatment chamber illustrated in Fig. 1 to show the manner in which the strip of steel is suspended therein;

Fig. 3 is an enlarged elevational view of part of the coating apparatus employed and illustrating the details of construction;

Fig. 4 is a fragmentary enlarged plan view illustrating the details of construction of the device employed to coat the edges of the material; and

Fig. 5 is a fragmentary vertical section illustrating the manner in which the coating material is fed to the coating device illustrated in Fig. 4.

Referring to the drawing, I have illustrated in Fig. 1 an elevational view of the preferred form of apparatus for carrying out the method of my invention as applied to the enameling of strip steel. The apparatus illustrated in Fig. 1 includes a supply storage reel structure 1 arranged to feed strip steel from a reel 2 to a coating or painting apparatus 3. The steel is passed from the painting apparatus 3 through an oven or baking device 4 and onto a cooling and rewinding mechanism 5.

The rewinding mechanism 5 includes suitable source of motive power (not shown) drivably connected to a pair of drive rollers 6 and 7 which are preferably fitted with rims of friction material such as rubber, leather, or the like. A take-up reel 8 is also drivably engaged with the rollers 6 and 7 through a suitable take-up mechanism such as a slip clutch so that as a strip of steel 9 is fed from the driving rollers onto the take-up reel, this reel will operate to wind the strip of steel thereon for storage purposes. The driving rollers 6 and 7 operate to unwind the strip steel 9 from the reel 2 and pull it through the painting apparatus 3 and the oven 4.

I prefer to maintain that portion of the strip 9 which is disposed with the oven 4 in a tensioned condition so as to be entirely self-supporting since additional intermediate supports would operate to spoil or mar the enameled coating which is applied by the painting machinery 3. The strip 9 is accordingly received in a pair of edge engaging guide rollers 10 supported at one end of a framework 11 which also carries a roller 12 over which the strip of steel 9 is passed. The roller 12 is pivotally supported upon the framework 11 and is provided with a tire or rim portion of friction material such as rubber, leather or the like. A friction clamping device 13 is provided which may be adjusted to frictionally restrain the roller 12 against rotation. It will be observed that the force which is applied by the feed rollers 6 and 7 required to pull the strip of steel 9 through the oven 4 must be sufficient to overcome the frictional resistance to rotation of the drag roller 12 as controlled by the adjusting means 13. The adjusting means is preferably so adjusted as to maintain the strip

of steel 9 in a highly stressed condition so that it is entirely self-supporting throughout the length of the oven 4.

In order that paint or enamel may be applied to all surfaces of the strip of steel 9 as it is passed through the painting apparatus 3, I provide a shelf member 14 upon which is disposed a receptacle 15 adapted to hold a supply of enamel. The receptacle 15 is provided with a downwardly depending discharge pipe 16 through which paint may be discharged under control of a needle valve 17 to the upper surface of an upper spreading roller 18. The spreading roller 18 is preferably mounted for vertical adjustable movement upon a link member 19 which is in turn pivotally secured by means of a pivot pin 20 to the frame member or supporting structure 11. Disposed immediately below the upper spreading roller 18 I place a lower spreading roller 21 which is similarly mounted for rotation and vertical adjustable movement upon a link member 22 which is in turn pivotally supported by means of a pivot pin 23 to the supporting structure 11.

Suitable mechanism for resiliently adjusting the spacing between the upper and lower spreading rollers 18 and 21 may be controlled by means of an adjusting knob 24 which is coupled to the links 19 and 22 in any suitable fashion so as to move these links toward or away from each other through a resilient connection.

As the strip of steel is fed over the drag roller 12 and between the upper and lower spreading rollers 18 and 21, these rollers will be rotated in the direction indicated by arrows 25 and 26 in Fig. 3. Paint or enamel falling from the discharge pipe 16 onto the upper surface of the upper spreading roller 18 will be distributed more or less uniformly over the upper surface of the strip of steel 9.

I prefer to flow an excess of enamel out of the discharge pipe 16 so that in addition to coating the upper surface of the strip of steel, enamel will flow over the edges thereof and onto the lower spreading roller 21 and into a pan 27 which is supported by means of a shelf-like structure 28 directly below the lower spreading roller 21. The pan 27 is provided with an overflow 29 adapted to conduct the excess enamel into an overflow receiving receptacle 30 disposed immediately therebelow.

It will be observed that the pan 27 is so disposed that the level of enamel maintained therein by the overflow 29 will lie above the lower surface of the lower spreading roller 21 so that this roller is, in effect, rotated in a pool of enamel. The roller 21 thus operates to carry enamel upwardly from the pan 27 and into contact with the under surface of the strip of steel 9 as it is fed between these rollers.

In order to provide a high quality finish as regards the distribution of enamel over the surface of the steel, I prefer to provide a pair of brushing members 31 and 32 which engage the upper and lower surfaces of the strip 9, respectively, to smooth out the ripples or waves which are left in the enamel coating applied by the rollers 18 and 21. It has been found that this brushing operation may be advantageously performed by means of gelatin pads which, as illustrated in Fig. 3, may be adjustably carried on a supporting structure 33 which is fitted with independent adjusting means 34 and 35. The adjusting means 34 and 35 are preferably so connected to the gelatin pads 31 and 32 as to permit independent

movement of these members toward and away from the upper and lower surfaces of the strip 9.

As the strip 9 leaves the brushing devices 31 and 32, the upper and lower surfaces of the strip are uniformly covered with enamel which has been brushed out to a fine finish. It will be observed, however, that at this time there has been no direct application of enamel to the edges of the steel. The strip of steel is accordingly next fed to an edge coating mechanism which, in the preferred embodiment of my invention, may be constructed along the lines illustrated in Figs. 1, 4 and 5. For this purpose I employ another enamel storage receptacle 36 which is provided with a pair of downwardly depending discharge pipes 37 disposed in positions to discharge enamel from the receptacle 36 into a pair of sumps or wells 38 and 39 disposed on opposite sides of the strip 9. The wells 38 and 39 are preferably formed in block members 40 and 41 pivotally secured by means of pivots 42 and 43 to a shelf member 44 carried by the supporting framework 11 and disposed in a position immediately beneath the strip 9.

As illustrated in Figs. 4 and 5, an opening 45 is provided near the bottom of each of the wells 38 and 39, these openings communicating with substantially cylindrical recesses 46 and 47. The recesses 46 and 47 receive roller members 48 and 49 centrally disposed therein and supported for pivotal movement about a vertical axis by means of pivots 50 and 51. The pivots 50 and 51 are preferably extended above the upper surface of each of the rollers 48 and 49 a distance sufficient to permit a tension spring 52 to be secured thereto and connected between these protruding upper ends. It will be observed that the tension spring 52 operates to swing the block members 40 and 41 about their pivotal supports 42 and 43 so as to bring the edges of the rollers 48 and 49 into engagement with the edge of the strip of steel 9.

In order to insure accurate alignment of the strip 9 with the edge coating rollers 48 and 49, I employ a pair of auxiliary guiding rollers 53 and 54 which are supported for pivotal movement about vertically disposed axes by means of suitable pivot arrangements carried by the blocks 40 and 41. The guiding rollers 53 and 54 are preferably provided with a peripheral groove engaging the edges of the strip 9 so as to restrain the strip against vertical movement relative to the block members 40 and 41. In a similar manner the edges of the rollers 48 and 49 are provided with a V-shaped groove 55 adapted to receive the edge of the strip of steel.

In operation enamel discharged from the discharge pipes 37 enters the sumps 38 and 39 and flows through the openings 45 into the recesses 46 and 47 filling these recesses full so that the rollers 48 and 49 mounted therein are substantially covered with enamel. The edges of the recesses which are adjacent the strip 9 are cut away to allow the rollers 48 and 49 to pass there-through. It will be observed that as the strip 9 is moved between the rollers 48 and 49 these rollers will be rotated therewith by virtue of the frictional engagement between these rollers and the strip 9 and that as these rollers are rotated enamel is carried in the V-shaped notch 55 and applied to the edges of the strip 9. In order to accommodate an excess of enamel which may be applied to these edge coating rollers, I dispose directly therebelow an overflow receiving receptacle 56 which is adapted to catch the excess

enamel which will flow over the top of the recesses 46 and 47.

It will be observed that the mechanism described thus far operates to apply enamel in a uniform fashion to not only the upper and lower surfaces of a strip of steel as it is continuously fed through the machine, but also to the edges of such strip and that means is also provided for brushing the paint after it is applied to achieve the desired smooth and glossy finish.

In preparing a strip of steel for the later manufacture of Venetian blinds, it is common practice to employ baked enamel and for this purpose I utilize the furnace or oven 4 as a means of sufficiently heating the enamel during the time the strip of steel is passing therethrough to complete the usual baking operation employed with well known forms of enamel.

As illustrated in Figs. 1 and 2, the furnace 4 comprises an elongated duct-like member supported a sufficient distance above the floor to receive the strip 9 as it is passed from the painting apparatus 3. The duct-like portion of the furnace 4 may include upper and lower walls 57 and 58 held in spaced relationship relative to each other by means of a pair of coating side walls 59 and 60. For the purpose of conserving heat, the walls 57, 58, 59 and 60 are preferably insulated by means of insulating material indicated at 61 in Fig. 2. The duct thus formed is divided by means of a horizontally extended partition member 62 into an upper and a lower portion, the upper portion operating as a passage through which the strip 9 is passed and the lower portion operating as a housing for the heaters employed in the oven.

As is illustrated somewhat diagrammatically in Figs. 1 and 2, an exhaust fan 63 is provided for withdrawing air from the entrance end of the upper portion of the furnace. The fan thus operates to draw air from the discharge end of the oven toward the entrance end through the upper section thereof, the air being supplied to the upper section near the discharge end from the lower section in which is housed the heaters.

The heaters may be distributed along the length of the lower section in any desired manner and, as illustrated in Fig. 1, I prefer to employ for this purpose a group of electric heaters which may be supplied with conventional electrical connections such as that illustrated at 64 in Fig. 1, the fan 63 and the heaters which are supplied by the connection 64 being under the control of a master switch 65. The air which is discharged from the furnace by the fan 63 is admitted to the furnace at an intake opening 66 which is provided with an adjustable damper mechanism 67 arranged to control the rate at which the air is passed through the oven.

It will be observed that as the air passes from left to right as viewed in Fig. 3 through the lower portion of the oven, it is heated by means of the electric heaters contained therein to a relatively high temperature and is then conducted to the upper portion of the oven at the discharge end thereof so that the highest temperature to which the enameled strip of steel is subjected occurs just prior to its discharge from the oven.

As the heated air is passed through the oven in a direction opposite to the direction of travel of the strip of steel therethrough, it is gradually cooled due to conduction and radiation losses in the oven and the absorption of heat by the steel strip so that the air which the steel first encounters upon entering the oven is maintained at a

temperature somewhat lower than that surrounding the steel as it leaves the oven. This operates to first, under relatively low temperatures, drive off the volatile materials in the enamel and then later subject the enamel to a temperature sufficient to accomplish the desired baking operation.

Attention is called to the fact that the strip of steel is unsupported throughout its entire length as it passes through the oven, the tension to which the steel is subjected by the driving rollers 6 and 7 and the drag rollers 12 being so adjusted that the steel will enter and leave the oven near the upper edge of the duct portion through which it is passed, while at the center thereof (which is the point of greatest sag) it will be held above and clear of the dividing partition 62. By this means I am able to dry and bake the enamel coating which is applied by the painting device 3 without in any way marring or disfiguring the finish of such surface.

As the strip of steel 9 is passed from the oven 4 it is passed over the cooling portion of the cooling and driving mechanism 5. The cooling portion of this mechanism may include a pair of rollers 68 and 69 which are mounted for rotation about a horizontally disposed axis and cooperate with similarly disposed rollers 70 mounted at the upper end of an elongated upstanding frame member 71. The strip is passed under the rollers 68, up and over the roller 70 and back under the rollers 69 and from thence to the feed rollers 6 and 7.

I place an electric fan, blower, or similar device 72 for directing a stream of relatively cool air against the strip steel as it is passed upwardly and downwardly relative to the standard 71 so that during its passage from the rollers 68 over the rollers 70 and 69, back to the driving rollers 6 and 7, the strip 9 is cooled from a temperature corresponding to the baking temperature of the oven to substantially room temperature by the time it reaches the driving rollers 6 and 7. This has been found necessary since the cooling is required to complete the hardening of the baked enamel and to protect the friction surfaces which are provided on the drive rollers 6 and 7.

While I have described in detail the preferred form of my invention as it is used for the enameling of strip steel, it will be apparent that I have provided a device which may be operated to feed in a substantially continuous manner a strip of material from a coil or other substantially continuous source of supply through a device which simultaneously coats all four sides of the strip of steel with the desired coating material and then subjects the coating material to a treatment process for setting and hardening the coating material before the material is rewound on reels for storage purposes.

This apparatus overcomes the objections encountered hitherto in the enameling of strip steel in which it has been the practice to enamel different surfaces of the strip at different times with the result that an uneven coating and a difference in color between the sides thus coated was obtained.

It will be observed also that the device of my invention may be operated to dry and bake an enamel coating which is applied to all four sides of a strip of steel without requiring that the strip be intermediately supported during such baking operation.

While I have shown and described the preferred embodiment of my invention, I do not desire to be limited to any of the details of construction

shown or described herein, except as defined in the appended claims.

I claim:

1. In an apparatus for coating both sides of a strip of flexible metallic material, the combination of: means supporting a substantially continuous supply of said strip material; driving means engaged with said strip for moving said strip substantially horizontally and at a substantially constant rate in the direction of its length; means operated in unison with said driving means for recoiling said strip upon reels for storage purposes as it is moved by said driving means; a pair of spreading members engaging opposite sides of said strip; another pair of spreading members disposed to engage opposite edges of said strip; means for supplying coating material to said spreading members; and brushing means engaging both sides of said strip as it leaves said first-named spreading members to remove irregularities in said spread coating material.

2. In an apparatus for coating both sides of a strip of material, the combination of: means supporting a substantially continuous supply of said strip material; driving means engaged with said strip for moving said strip substantially horizontally and at a substantially constant rate in the direction of its length; a pair of rollers having axial width exceeding the width of said strip; means mounting said rollers for rotation about axes extending transversely of the length of said strip and disposed in such positions as to cause said rollers to engage opposite sides of said strip; means for supplying coating material to the upper side of the uppermost one of said rollers; a pan disposed beneath the lowermost one of said rollers to catch excess coating material and provide a pool of coating material submerging the lower side of said lowermost roller; and brushing means engaging both sides of said strip as it leaves said rollers to remove irregularities in said coating material.

3. In an apparatus for coating both sides of a strip of material, the combination of: means supporting a substantially continuous supply of said strip material; driving means engaged with said strip for moving said strip substantially horizontally

and at a substantially constant rate in the direction of its length; means operated in unison with said driving means for recoiling said strip upon reels for storage purposes as it is moved by said driving means; a pair of spreading members engaging opposite sides of said strip; means for supplying coating material to said spreading members; a pair of rollers engaging opposite edges of said strip and having circumferentially extending grooves formed therein for receiving the edges of said strip; pan means at least partially encircling each of said rollers; and means for maintaining a supply of coating material in each of said pan means.

4. In an apparatus for coating both sides of a strip of material, the combination of: means supporting a substantially continuous supply of said strip material; driving means engaged with said strip for moving said strip substantially horizontally and at a substantially constant rate in the direction of its length; means operated in unison with said driving means for recoiling said strip upon reels for storage purposes as it is moved by said driving means; a pair of spreading members engaging opposite sides of said strip; means for supplying coating material to said spreading members; a pair of rollers engaging opposite edges of said strip and having circumferentially extending grooves formed therein for receiving the edges of said strip; pan means at least partially encircling each of said rollers; means for maintaining a supply of coating material in each of said pan means; means on said pan means mounting said rollers for rotation about vertically disposed axes; and means pivotally mounting said pan means for movement of said rollers toward and away from the edges of said strip.

5. The combination in apparatus for coating a strip of flexible metallic material, of means for supporting a supply of said strip material, means for withdrawing said strip from said supply means, means for applying coating material to the surface of said strip while it is in motion, and a gelatin pad engaging said strip for distributing the coating material thereon.

JOSEPH L. HUNTER.