

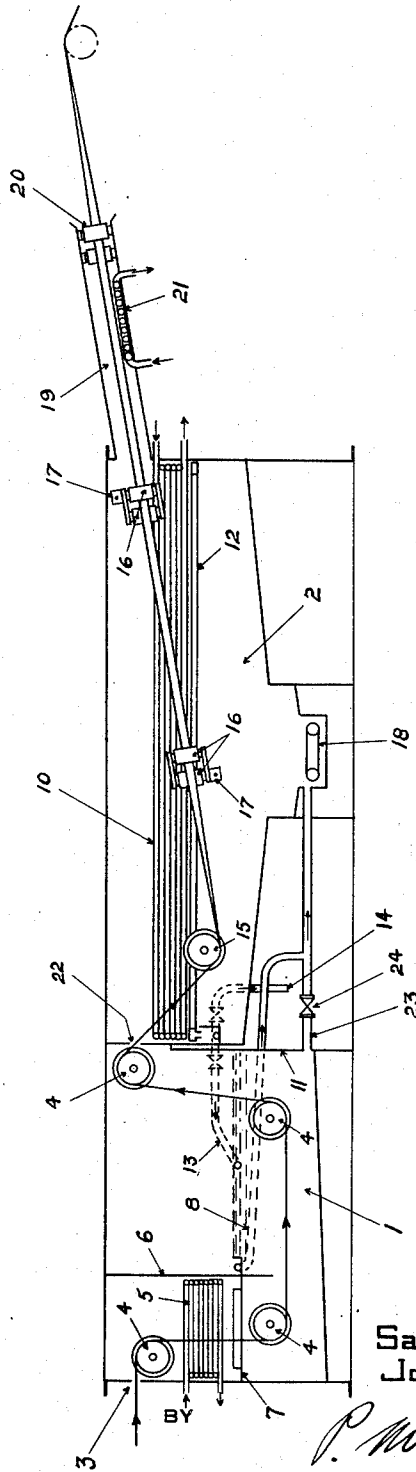
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DEGREASING METAL STRIP

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DEGREASING METAL STRIP

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This invention relates to the degreasing of metals and more particularly to the degreasing of metal strip.

It is known to degrease light gauge metal strip by passing it, usually guided by rollers, first through a bath of a cold volatile solvent, and then thru a bath of solvent vapor, where removal of grease and greasy solvent is completed by condensation of solvent vapor upon the metal strip. The strip then dries by draining and evaporation of adherent solvent during the latter part of its passage thru the hot solvent vapor, or thru a special heated zone.

In normal practice the strip has to be bent downwards to immerse it into the solvent bath and therefore must be introduced with its width in a horizontal plane. Hitherto the metal strip has been subjected to the entire treatment with its width so disposed, and during the latter stages of the process the disadvantage has arisen that draining from the upper surface of the strip has been impeded by the tendency of the condensate to run-down its usually sloping surface rather than to drip off it. Direct access of clean condensate to that surface has also been impeded by the presence of dirty condensate.

The object of this invention is to devise a method whereby the condensate drains rapidly from both surfaces of the metal strip. A further object is to devise a method of continuously degreasing metal strip which will be more rapid and economical. A further object is to provide apparatus for more rapid and economical degreasing of metal strip. A further object is to devise a method and provide apparatus whereby metal strip can be degreased and left clean and dry. Further objects will appear hereafter.

These objects are accomplished by the following invention. It has been found that both sides of the metal strip can be drained rapidly by passing the strip thru at least a portion of a solvent vapor degreasing zone and/or a drying zone with one edge of the strip substantially vertically over the other edge. A further feature of the invention is an apparatus for the continuous degreasing of metal strip having in association with means for vaporizing a volatile degreasing solvent to provide a vapor degreasing zone and/or drying zone, means for traversing the strip thru such degreasing and/or drying zone with one edge substantially vertically over the other edge. A preferred embodiment of the invention also includes the passing of the strip thru a bath of cold liquid solvent and the means for effecting such passage prior to vapor degreasing or dry-

ing. In such cases the most convenient manner of passing the strip thru the liquor bath is with the edges in a horizontal plane, and the invention accordingly includes in association with the above the still further features of the method of and means for twisting a strip in its passage from the horizontal to the vertical position.

It will be apparent that when one edge of the strip is vertically over the other the length of the strip may be disposed in any position from one slightly inclined to the vertical to the horizontal. It has been found, however, that the full advantages of the invention are not attained when the length of the strip is in a position which approaches the vertical. Accordingly still further features of the invention are the method of and means for passing the strip thru the vapor degreasing and/or drying zone with its length disposed at an angle to the horizontal of not more than about 45° and preferably not more than 30°.

Any suitable means may be adopted for passing and guiding the strip in the desired position thru the various zones. In the preferred form of the invention in which it is necessary to twist the strip from a horizontal to a vertical position this may be effected in a convenient manner by passing it between two or more pairs of cylindrical rollers, the first pair having their axes horizontal, while the last pair have them vertical, and any intermediate pairs have their axes inclined at corresponding intermediate angles. The same result may be accomplished by suitably disposed slits thru which the strip is threaded. Other means by which the same end may be accomplished will also be apparent to those skilled in the art, such as threading the strip thru suitably shaped channels which receive the edges of the strip.

The preferred invention is further illustrated with reference to the accompanying drawing which represents diagrammatically an apparatus for subjecting light gauge metal strip to a liquor treatment followed by a solvent vapor treatment.

The apparatus comprises a liquor compartment 1 and a vapor compartment 2, the latter being provided in the upper portion with condensing coils 10 supplied with cooling water by means not shown. Below the condensing coils is a distillate trough 12 from which condensate collecting therein may be diverted by pipes 13 and 14 to either the liquor compartment 1 or a stock tank placed outside the apparatus beneath pipe 14. The vapor compartment has a sump 9 in

which the vapor is generated by a heater 18 from solvent placed therein. The liquor compartment is, however, not heated, and may even be provided with cooling coils to prevent the solvent from being warmed due to its proximity to the hot vapor compartment. The liquor compartment is also provided with an overflow channel 7 which delivers liquid accumulating therein to sump 9 via pipe 8. Solvent can also be delivered to the sump from the liquor compartment via pipe 23 and valve 24. In operation it is arranged that the level of solvent in sump 9 is above the level at which solvent enters via pipe 8. Escape of solvent into the upper part of chamber 1 is thus prevented.

On the side of the liquor compartment remote from the vapor compartment and above the liquor level is an opening 3 thru which the light metal strip to be treated is introduced, with its edges in a horizontal plane, and in order to prevent any loss of solvent thru this opening a baffle 6 is provided extending below the level of the liquid to form an antechamber around the walls of which are placed cooling coils 5. Flanged rollers 4 lead the metal strip down thru the liquid solvent bath and up to an opening 22 in the wall 11 separating the vapor compartment from the liquor compartment. The opening is situated above the solvent level in the latter and also above the level of the condensing coils 10 in the former.

Within the vapor compartment and below the level of the condensing coils 10 is a flanged roller 15 which brings the strip down into the vapor zone, and two pairs of rollers 16 fixed to the walls of the compartment by brackets 17, which are arranged to guide the strip thru the vapor zone and simultaneously twist it so that one edge is substantially vertically over the other, that is, its surfaces have an angle to the vertical of not more than 10°-20°. The strip leaves the vapor compartment above the vapor level via a chamber 19 fitted with a cooling coil 21 and a pair of rollers 20 at the end of the chamber, between which the strip passes on its way out of the apparatus. This chamber ensures that the strip is completely dry before leaving the apparatus. The usual cleaning doors, water supply pipes and the like are also provided, but have been omitted from the drawing for the sake of clarity.

In operating this apparatus, light gauge metal strip is threaded through the opening 3 and over rollers 4, 4, 4, 4, and 15, between rollers 16, 16 and out between rollers 20. The vapor zone is established and a circulation of liquid thru the liquor compartment set up by opening valve 24 so that a suitably sized stream of liquid flows into sump 9, and is there vaporized to be condensed either on the strip to fall back to sump 9, or on coils 10 to be returned via trough 12 and pipe 13 to the liquor compartment.

The strip is then pulled thru the apparatus by suitable winding gear and fresh portions of the strip entering via opening 3, are led by rollers 4, 4, 4, 4, and 15 thru the cold liquor bath and into the vapor zone where solvent condenses upon the cold strip and washes it free from any slight residue of grease left from the liquor treatment; during this passage the strip is twisted by rollers 16, 16 so that its edges are in a vertical plane and thus draining and drying of the strip is facilitated. Finally the strip, heated to the temperature of the vapor bath by the heat of condensation of the vapor, emerges from the apparatus free from dirt and grease, and in a dry condition.

The method of the present invention is also applicable to cases where the strip is subjected to the action of jets of liquid solvent in conjunction with its liquor-vapor treatment; for example the degreasing apparatus may be provided with such a spraying zone between the liquor bath and the vapor treatment zone.

Employing the methods and apparatus of the present invention the advantage is gained that liquid solvent carried from a bath or condensed on the surfaces of the strip drains rapidly from the lower edge without flowing along the length of the strip and impeding the condensation of fresh solvent thereon. In this way, the whole of the strip is washed with a greater quantity of pure condensate than would otherwise be possible, and a more efficient cleansing of the strip is attained. It will be appreciated that this rapid removal of impure liquid is more important for metal strip than for heavy goods on account of the lower heat capacity of the former, since the total amount of solvent which can be condensed before the strip is heated to the temperature of the vapor bath is smaller. When the vertical disposition of the strip is utilized for drying there is also an advantage in that a lesser amount of solvent is required to be vaporized from the surface of the strip.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.

We claim:

1. A method of degreasing metal strip which comprises orienting said strip so as to dispose one of the longitudinal edges thereof substantially vertically above the other longitudinal edge thereof, and passing the thus oriented strip through a zone of solvent vapor.

2. A method of degreasing metal strip which comprises orienting said strip so as to dispose one of the longitudinal edges thereof substantially vertically above the other longitudinal edge thereof, and passing the thus oriented strip successively through a zone of solvent vapor and a drying zone.

3. A method of degreasing metal strip which comprises orienting said strip so as to dispose one of the longitudinal edges thereof substantially vertically above the other longitudinal edge thereof, and to dispose the longitudinal axis thereof at an angle to the horizontal not exceeding 45°, and passing the thus oriented strip through a zone of solvent vapor.

4. A method of degreasing metal strip which comprises orienting said strip so as to dispose one of the longitudinal edges thereof substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis thereof at an angle to the horizontal not exceeding 45°, and passing the thus oriented strip successively through a zone of solvent vapor and a drying zone.

5. A method of degreasing metal strip which comprises orienting said strip so as to dispose one of the longitudinal edges thereof substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis thereof at an angle to the horizontal not exceeding 30°, and passing the thus oriented strip through a zone of solvent vapor.

6. A method of degreasing metal strip which comprises orienting said strip so as to dispose one

of the longitudinal edges thereof substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis thereof at an angle to the horizontal not exceeding 30°, and passing the thus oriented strip successively through a zone of solvent vapor and a drying zone.

7. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, means for drawing metal strip through said vessel, and guide means for orienting the said metal strip within said vessel so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof.

8. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, a drying compartment disposed adjacent said degreasing vessel, means for drawing metal strip successively through said vessel and said compartment, and guide means for orienting the said metal strip within said vessel and said compartment so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof.

9. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, means for drawing metal strip through said vessel, and guide means for orienting the said metal strip within said vessel so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis of said strip at an angle to the horizontal not exceeding 45°.

10. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, a drying compartment disposed adjacent said degreasing vessel, means for drawing metal strip successively through said vessel and said com-

partment, and guide means for orienting the said metal strip within said vessel and said compartment so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis of said strip at an angle to the horizontal not exceeding 45°.

11. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, means for drawing metal strip through said vessel, and guide means for orienting the said metal strip within said vessel so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis of said strip at an angle to the horizontal not exceeding 30°.

12. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, a drying compartment disposed adjacent said degreasing vessel, means for drawing metal strip successively through said vessel and said compartment, and guide means for orienting the said metal strip within said vessel and said compartment so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof and to dispose the longitudinal axis of said strip at an angle to the horizontal not exceeding 30°.

13. An apparatus for degreasing metal strip which comprises a degreasing vessel, means for maintaining a bath of solvent vapor therein, means for drawing metal strip through said vessel, and guide means comprising spaced rollers arranged to orient the said metal strip within said vessel so as to dispose one of the longitudinal edges of said strip substantially vertically above the other longitudinal edge thereof.

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