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[54] APPARATUS FOR STEAM DEGREASING

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[51] **Int. Cl.**.....**B08b 3/02,** B08b 15/00

[58] **Field of Search**.....134/11, 15, 64, 122, 108, 109

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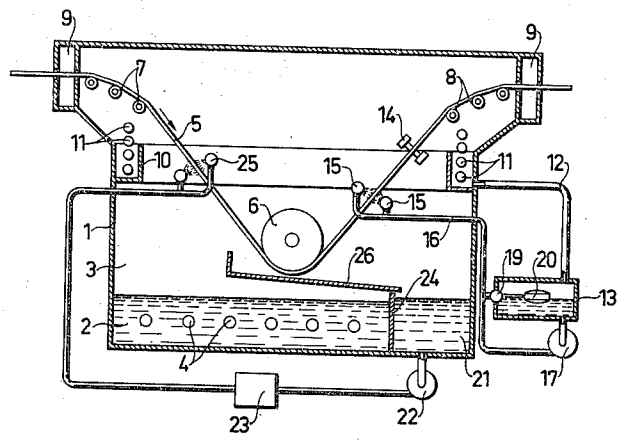
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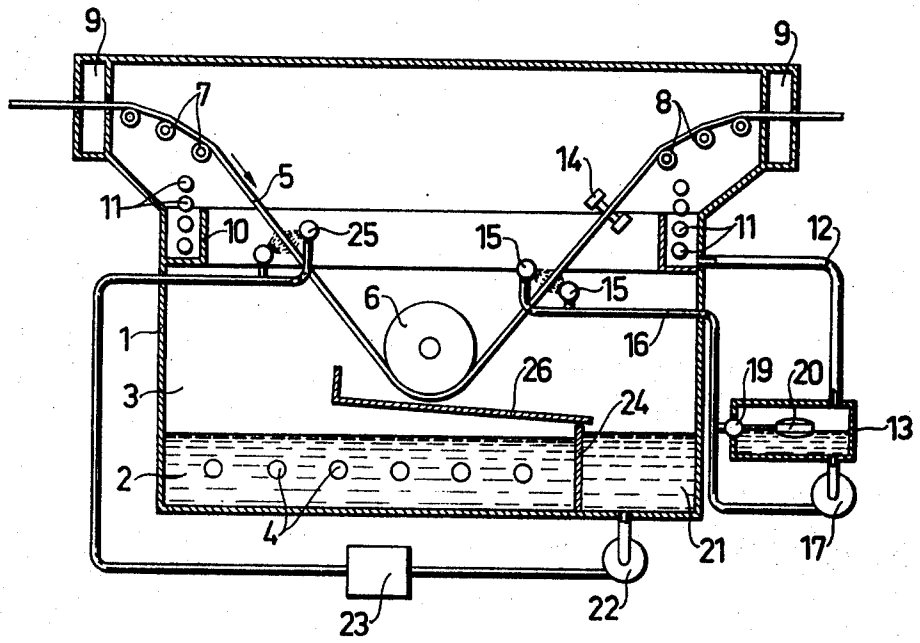
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[57] **ABSTRACT**

Oily articles are degreased by being immersed into the vapour of a boiling solvent, such as trichloroethylene. Immediately after the articles have entered into said vapour they are exposed to a powerful jet of oily solvent. Said oily solvent jet removes foreign particles adhering to the surface of the articles.

3 Claims, 1 Drawing Figure





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APPARATUS FOR STEAM DEGREASING

The invention relates to an apparatus for degreasing articles, preferably metal articles, by immersing them in vapor from a boiling solvent, preferably trichloroethylene or tetrachloroethylene. The vapor condenses on the relatively cool articles and oil and other fat is therefore dissolved in the condensed solvent and runs off the articles.

It has been found with degreasing of this type that small solid particles have a strong tendency to adhere firmly to the articles although the oil is removed satisfactorily. When sheet metal is being degreased, for example, such particles may have remained from when the sheet metal was rolled. Particles of foreign origin may also have adhered to the article, for example due to dust.

Attempts have been made to remove such particles from the articles by finishing off the degreasing process by rinsing the articles in clean solvent. Not even if the solvent was sprayed on to the articles under high pressure have all particles been successfully removed. Remaining particles are a disadvantage for instance if the articles are to be painted or subjected to electrolytic treatment.

It has now been found, according to the present invention, that adherent particles can be effectively removed from articles if they are rinsed with liquid solvent, preferably containing oil, immediately after they have been immersed in the solvent vapor. The explanation of the favourable technical result achieved is probably that the solid particles can easily move about on the surface of the articles as long as the oil film present acts as a lubricant, so to speak. If, however, the oil film is first removed by condensation of the solvent vapor the particles come into direct contact with the surface of the articles and thus such electrostatic forces come into operation that the particles are bound rather firmly to the surface.

The apparatus according to the invention is thus characterized in that a vessel is arranged to collect oily solvent running off the articles and that a pump is arranged to pump the oily solvent from the vessel to nozzles which are situated at the top in the vapor space and which are directed towards the place where the articles are lowered into the vapor space, whereupon the articles are exposed to a strong jet of oil solvent immediately after they have been immersed in the vapor and before all the oil has had time to be dissolved from the surface of the articles.

The invention can be used for manually operated degreasing apparatuses, in use sporadically, the operator in this case spraying solvent on the articles by means of a manually operated rinsing nozzle immediately after they have been surrounded by the vapor. In order to avoid the air above the vapor being filled with vapor the operator should hold the rinsing nozzle below the level of the vapor. The rinsing nozzle may suitably be arranged to be connected as desired either to the oily solvent in the apparatus or to clean solvent, preferably that which is formed when the vapor condenses on the cooling means normally used to determine the highest level of the vapor.

The invention can also be applied in an apparatus in which the articles are automatically carried by a transport means into and out of the vapor zone.

An example of such an apparatus is shown in the accompanying drawing.

The apparatus illustrated is intended for continuous degreasing of a steel strip, but may be modified so that the steel strip is replaced by an endless conveyor which carries the articles to be degreased.

A container 1 has a zone 2 at the bottom for liquid solvent, in which is a heating element 4 for boiling the solvent. The vapor from the solvent rises into a vapor zone 3, the highest level of which is determined by a wall 10, the upper edge of this forming an overflow. When the heavy solvent vapor runs over this overflow, or comes into contact with the cooling pipe 11 on which it condenses, the condensate runs to a vessel 13 through a tube 12.

The strip 5 to be degreased is led down into the container 1 over rollers 7, deflected around a roller 6 in the vapor zone,

and led out of the container over rollers 8. At the points where the strip is led into and out of the degreasing apparatus, suction boxes 9 are arranged to prevent solvent vapor from leaking out into the surroundings.

Immediately after the strip has entered into the vapor zone 3 it passes between two pipes 25 which are perforated on the side facing the strip. The pipes 25 are situated 100 – 300 mm. below the upper edge of the wall 10. The pipes 25 are in communication with a pump 22 via a filter 23 and the suction side of the pump is connected to a tank 21 for oily solvent. The vessel 21 is separated from the boiling zone 2 by a wall 24. The vapor zone 3 has a substantially horizontal tray-like wall 26 which collects liquid solvent and oil solvent and directs it to the vessel 21.

At the point where the strip 5 leaves the vapor zone 3 wipers 14 are arranged which operate across the entire width of the strip on the upper and lower sides. The wipers may consist of brushes or, for example horse-hair or nylon, or of a resilient lip of, for example, leather or plastic. The wipers are placed so that they touch the strip 5 at the level defined by the upper edge of the wall 10.

In the vapor zone 3, between the roller 6 and the wipers 14, two pipes 15 are arranged extending horizontally across the entire width of the strip on its upper and lower sides. On the side facing the strip the pipes 15 are provided with perforations or spray nozzles. Via conduct 16 the pipes 15 are in communication with a pump 17 which is fed with condensate from the previously mentioned vessel 13. The conduit 16 communicates with the vessel 13 via a valve 19 which is regulated by a float 20 situated in the vessel 13. When the level of the solvent in the vessel 13 is low, the valve 19 is opened, and when the level is high it is closed.

The apparatus described operates in the following manner. The strip 5 is fed through the degreasing apparatus in the direction of the arrow. When the relatively cool strip comes into the vapor zone 3 the vapor from the solvent starts to condense on the strip. The condensate dissolves oil and other fat on the strip and runs back to the liquid zone 2. Before all the oil has had time to be dissolved, however, the strip has had time to be exposed to a powerful jet of oily solvent from the perforated pipes 25. Adherent solid particles are thus effectively removed. The strip 5, which is still relatively cool, continues into the vapor zone 3 where the remainder of the oil is removed by the condensing solvent vapor. The cleaning result is further improved by the condensate which may be sprayed onto the strip through the pipes 15. Solvent which may remain on the strip when it leaves the vapor zone is removed by the wiper 14. In this way there is little mixing of air and solvent vapor and the quantity of solvent vapor which is wasted through the suction boxes 9 can be kept low. When a thick strip is being degreased a great quantity of solvent will condense on the strip and the amount of solvent which condenses on the cooling tubes 11 and flows to the vessel 13 will then be relatively small, so that the level in the tank 13 drops. The float 20 then opens the valve 19 so that some, possibly all the solvent from the pump 17 is pumped back into the vessel 13 via the tube 18. It is thus guaranteed that the pump 17 is always fed with solvent.

We claim:

1. Apparatus for degreasing strip material comprising a container, a wall in the bottom of said container for dividing the lower portion thereof into a first and a second open compartment for collecting degreasing solvent, means for heating the solvent in said first compartment for vaporizing at least a portion of the solvent therein to form a vapor zone in the upper portion of said container, condenser means at the top of said container for condensing vapors at the top of the vapor zone to delimit the upper surface of the vapor zone, means for returning the condensed vapor to said second compartment, means for transporting strip material to be degreased in a V-shaped path downwardly into the vapor zone on one side of said container and then upwardly out of the vapor zone on the opposite side of the container, spray means disposed in the

vapor zone adjacent the inlet side of the container for spraying solvent on the strip material, a tray-like wall disposed beneath the lower central portion of the path defined by said strip material for collecting a substantial portion of the run-off oily solvent after being sprayed onto the strip material and for directing the collected oily solvent to said second compartment, means for pumping oily solvent from said second compartment to said spray means, whereby the run-off oily solvent and the condensed solvent accumulating in said second compartment will exceed the volume of said second compartment and overflow said dividing wall into said first compartment for collection of contaminants and for revaporization of solvent therefrom.

2. Apparatus as claimed in claim 1 wherein said spray means are disposed from about 100 mm. to 300 mm. below the upper surface of the vapor zone.

3. Apparatus as claimed in claim 1 and further comprising a filter means for removing solid contaminants from the oily solvent being pumped to said spray means.

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