March 6, 1962 R. C. WHITE 3,024,133

METHOD AND APPARATUS FOR COATING METAL PARTS

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FIG. 1

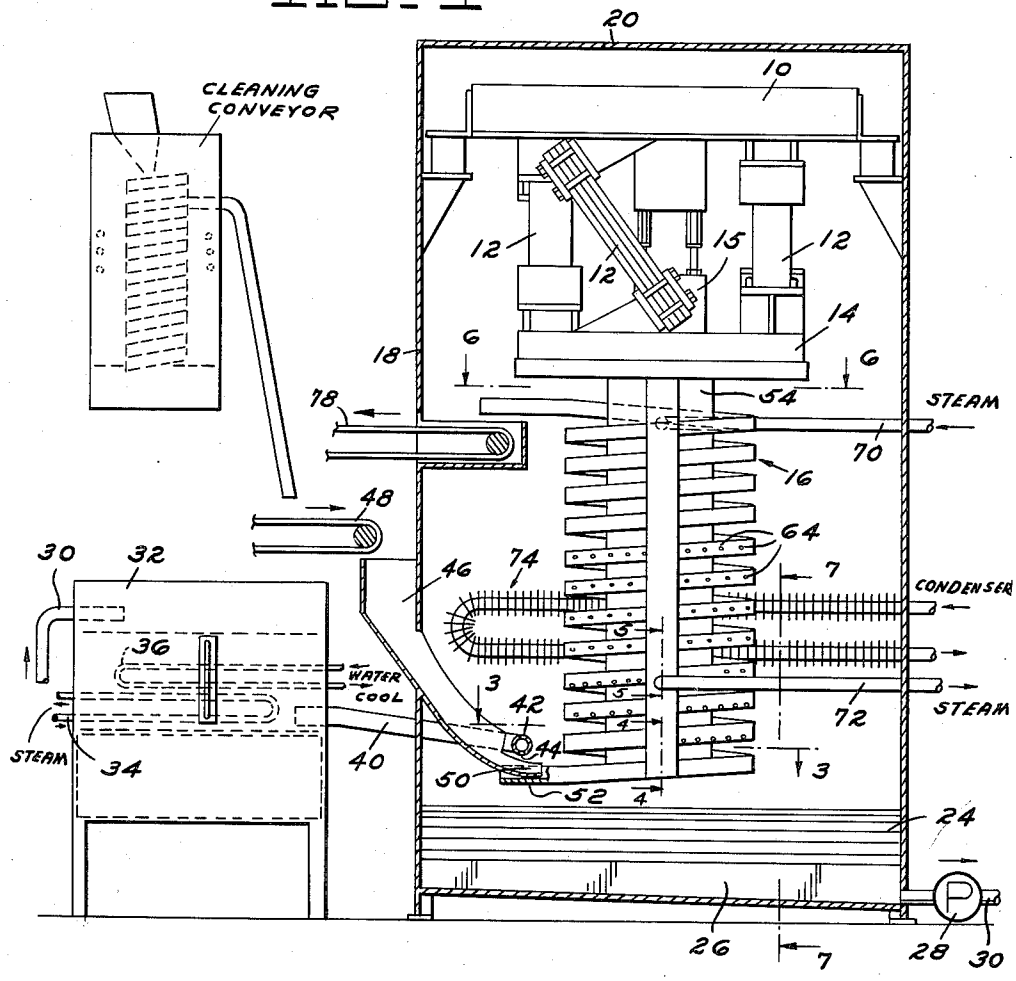
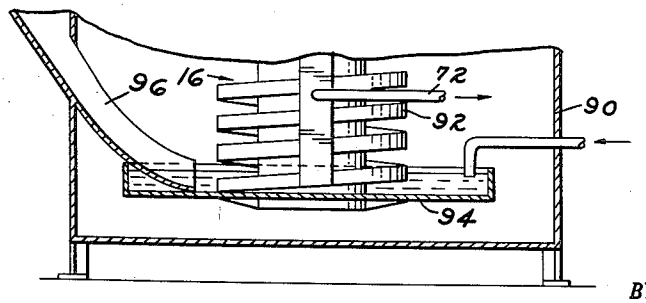


FIG. 2



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FIG. 3

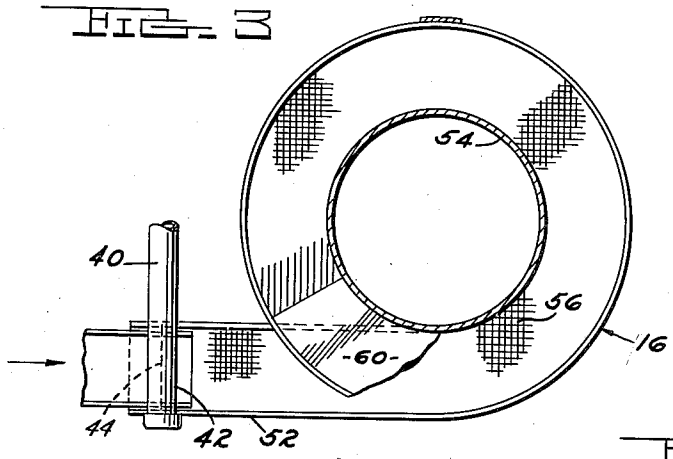


FIG. 4

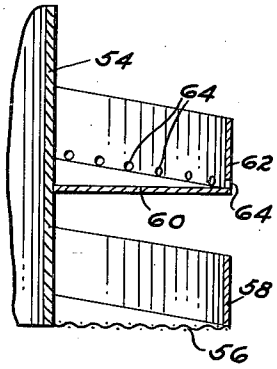


FIG. 5

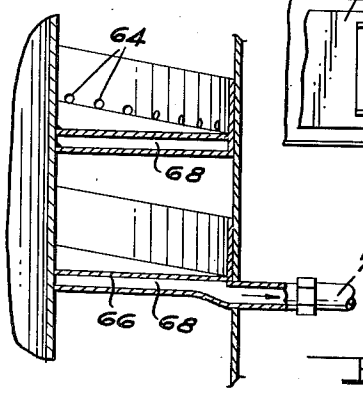


FIG. 6

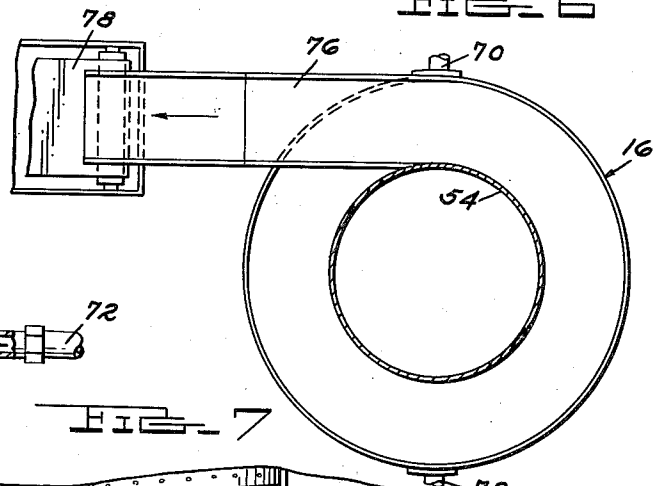
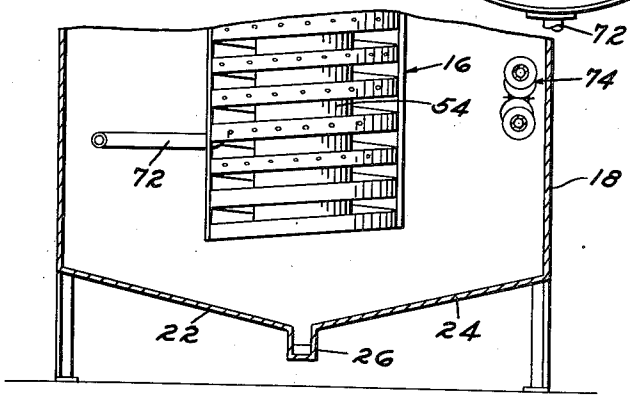


FIG. 7



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METHOD AND APPARATUS FOR COATING METAL PARTS

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4 Claims. (Cl. 117—102)

This invention relates to a method and apparatus for coating metal parts.

It is an object of the present invention to create a method and apparatus for taking small parts from a production machine and coating these parts in a continuous cleaning and coating operation, which removes all grease and foreign matter and applies the cocating when the parts are in proper condition to receive it.

It is a further object of the invention to provide a method and apparatus which is adaptable to the use of solvents for cleaning and solvents for coating material which are either inflammable or non-inflammable, the non-inflammable solvents being of the nature of chlorinated hydrocarbons; for example, carbon tetrachloride, trichlorethylene, methylene chloride, 1-1-1 trichloroethane or perchlorethylene. The invention is especially directed to the handling of small parts such as nails, electrical components and other small metal parts which can be readily handled in a vibratory conveyor of the type using a differentially oscillating conveyor mechanism.

It is another object to provide a device which has a self-cleaning conveyor track with a means for circulating coating material so that a relatively small quantity of material can be properly controlled temperature-wise and utilized to coat effectively the parts as they flow through a limited quantity of the material.

Other objects and features of the invention relating to details of construction and operation will be apparent in the following description and claims.

Drawings accompanying the disclosure and the various views thereof may be briefly described as:

FIGURE 1, a vertical sectional view showing the coating apparatus.

FIGURE 2, illustrates a modified method of depositing parts to be coated in an existing bath of coating material at the bottom of a vibratory conveyor.

FIGURE 3, a sectional view of the device taken on line 3—3 of FIGURE 1.

FIGURE 4, a sectional view on line 4—4 of FIGURE 1.

FIGURE 5, a sectional view on line 5—5 of FIGURE 1.

FIGURE 6, a sectional view on line 6—6 of FIGURE 1.

FIGURE 7, a sectional view on line 7—7 of FIGURE 1.

Referring to the drawings in FIGURE 1, I have shown a vibratory conveyor of the general type illustrated in U.S. Patent No. 2,853,180, issued to R. C. White, dated September 23, 1958. The conveyor is suitably suspended from a support 10 by leaf spring assemblies 12 which support a head portion 14 on which is mounted a spiral track 16. The entire device is housed in a cabinet or container 18, having a top 20 and a V-shaped bottom composed of angled plates 22 and 24 terminating at a trough 26 at the end of which is an outlet pump 28, discharging into a conduit 30 which enters a storage and conditioning tank 32 beside the main tank 18.

The conditioning tank 30 has steam coils 34 for heating fluid contained therein and also water cooling coils 36 for cooling liquid contained therein so that an accurate temperature control can be maintained for coating liquid in the tank. The coating liquid leaves the storage tank 32 through a pipe 40 which terminates at 42 in an end portion which has a bottom slot 44 for the discharge of coating material. This discharge overlies an entrance chute 46 which receives parts from a conveyor 48. The chute enters the wall of the housing 18 and passes downwardly to a discharge point 50 which overlies the tangential entrance platform 52 of the spiral track 16.

The track 16 shown in greater detail in FIGURE 6 is mounted around a center column cylinder 54 and the bottom turn of the track is formed of a reticulated metal or screen 56 having a retaining side wall 58 which merges with a solid bottom portion 60 having side walls 62 which are provided with perforations 64. The perforations 64 continue about half way up the spiral to facilitate the drainage of coating material. The spiral is formed as shown in FIGURE 5 after the first two or three turns with a false bottom 66 to provide a steam chamber 68 below the false bottom so that the tracks may be heated to drive off any volatiles that may remain in the coating material on the parts. The steam enters through a pipe 70 at the top of the track and discharges through a pipe 72 at the bottom.

Also in the tank 18 about midway of the spiral vertically is a refrigerating unit in the form of a condenser 74 which creates a cool area in the tank around the spiral to cause condensation of the vapors of the solvent to prevent their discharge and loss through openings of the container 18. The back-run of draining and condensing solvents aids in the cleaning of the spiral tarck. The drainage holes 64 return the draining liquids more rapidly to the collecting bottom.

As will be seen in FIGURE 6, the spiral 16 has a tangential exit path 76 which discharge over a conveyor 78 projecting into the cabinet 18 to carry parts from the spiral conveyor to a suitable packaging apparatus or shipping or storage bins.

In the modified form shown in FIGURE 2, the tank 90 has a spiral conveyor 92 on the bottom of which is a shallow pan 94 which could contain a coating material. An entrance chute 96 coming through the wall of the container 90 would deposit parts to be coated in the pan 94 which would contain a certain level of coating material. The parts will then be vibrated upwardly through the material into the drainage areas of the spiral track.

It is also contemplated that parts being coated are first treated in a composite method in a cleaning conveyor such as disclosed in the Jones Patent No. 2,662,851, dated December 15, 1953, after which the parts being free from grease are carried by a conveyor 48 from the spiral cleaning device to the entrance chute 46 where the parts plunge down through the fluid bath of coating material passing from the pipe 42. The coating material drains out of the bottom runs of the spiral through the open material 56 and into the bottom of the tank where it is received by the pump 28 and moved back into the top of the conditioning tank 32. Meanwhile, the coated parts vibrate upwardly by the differential oscillation of the track 16 caused by the electromagnet 15 acting against the springs 12 in a well-known motion. The parts are then heated by the steam passage 68 to drive off volatiles from the coating material and the parts dry as they move up the spiral to the exit track 52 which dumps on to the conveyor 78. The steam heat may be turned off in the event it is desirous to use an air dry coating material.

Thus the method steps comprise:

(1) Feeding a supply of manufactured parts to a cleaning conveyor;

(2) Subjecting these parts to a volatile cleaning fluid while moving them through a cleaning area;

(3) Drying the cleaned parts;

(4) Moving the cleaned parts from the cleaning conveyor directly to the coating conveyor;

(5) Passing the cleaned parts through a bath of coating material;

(6) Moving the coated parts in a spiral conveyor through a draining zone and a drying zone; and

(7) Discharging the coated and dried parts to a conveyor.

The method of coating includes the passing of the parts into a chute at the coating container, and flowing a supply of coating material through a supply pipe 40 over the end of the entrance chute 46 so that the parts to be coated will pass through the bath of material or are immersed in the metal as they reach the lower run of the vibratory conveyor 16.

It will be noted that the cooling means 74 is provided below the upper entrance of the chute 46 and also of course below the outlet conveyor 17, thus causing a condensation of volatile solvent vapors below the openings where they might otherwise escape. This not only economizes on the amount of volatile required but also prevents the entrance of noxious vapors into the room in which the machine is being operated.

I claim:

1. An apparatus in a new use for cleaning and coating small parts moving in a continuous supply which comprises a cleaning container containing a vertical conveyor for moving parts through a cleaning area, a coating container, means for conveying cleaned parts from said cleaning container to said coating container including an inlet chute in said coating container, means to provide a flowing supply of coating liquid which comprises an independent tank having a temperature control means and a supply pipe leading from said tank to said inlet chute having a discharge passage over asid chute, said coating tank having a collection area at the bottom thereof for collecting said coating material flowing from said supply pipe, means to return said coating material to said independent tank and means to convey coated parts to a draining and drying area comprising a spiral conveyor leading from said inlet chute upwardly into said coating container, the lower portion of the spiral conveyor having a perforate bottom, means for heating a portion of said conveyor above said perforate portion to create a drying action on said parts, and means to convey said dried parts to an outlet in said coating container.

2. A device as defined in claim 1 in which the spiral vibratory conveyor utilized for raising the coated parts from the bath area to a draining and drying area has the lower runs of said conveyor formed of a screen material to permit drainage of the coating material and the upper runs centrally of the conveyor formed with a double bottom to create a spiral passage having an inlet and an outlet, means to conduct steam to said spiral passage to cause a heating of the conveying track of said spiral, retaining walls on said track at the outer periphery thereof having perforations to permit further drainage, and a cooling unit in said coating container for condensing solvent vapors to permit collection at the bottom of the coating tank, said conveyor having a passage adjacent

the top adapted to discharge dried coated articles on to an outlet conveyor.

3. An apparatus in a new use for coating metal parts with a material carried in a volatile solvent which comprises a coating container, an independent conditioning tank for coating material, means in said conditioning tank for regulating the temperature of coating material, an inlet chute in the said coating container having a top opening and a passage directed downwardly therefrom, a supply pipe from said independent tank for conducting coating material in continuous flow to the bottom of said inlet chute passage, a spiral reciprocatory conveyor in said coating container having a track for receiving articles from said inlet chute beyond said supply pipe, means in said coating container for imparting differential reciprocation motion to said spiral conveyor, said conveyor being provided with perforations in the walls of a track thereof to permit drainage of coating material to the bottom of said coating container, means to return said collective coating material to said independent tank, means on said track to heat said coated parts to drive off the volatile solvent of said coating material, and a cooling means in said coating container positioned at a level intermediate the ends of said conveyor and below the entrance opening of said inlet chute passage to condense the vapors of said volatile solvent to prevent escape from said coating container, said spiral conveyor having an outlet above said cooling means to permit the discharge of dried coated parts.

4. A process which includes the new use of a machine which comprises coating small parts in a vertical spiral vibratory conveyor by passing said parts into the lower end of said conveyor within a vertical container, flowing a coating material including a volatile solvent in liquid form over said parts at the bottom of said conveyor, moving said parts incrementally up said conveyor as said material drains off and around said parts back to the bottom of the container, heating said parts at an area of their travel up the conveyor to drive off the volatile solvent of the coating, and cooling the container in an area around said conveyor to condense the volatile solvent and permit reclamation thereof at the bottom of the conveyor container.

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