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CLEANING OF ARTICLES

Filed Aug. 26, 1929

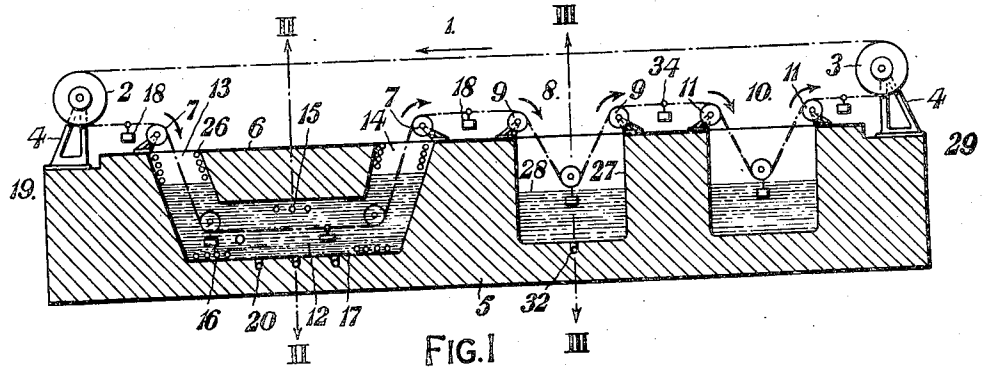


FIG. 1

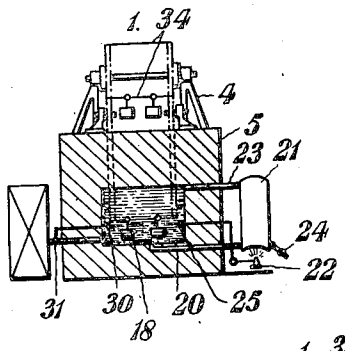


FIG. 2.

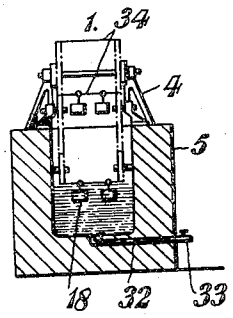


FIG. 3.

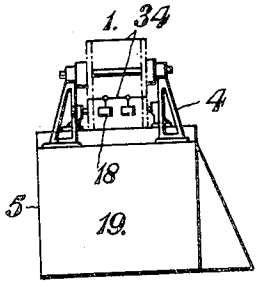


FIG. 4.

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UNITED STATES PATENT OFFICE

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CLEANING OF ARTICLES

Application filed August 26, 1929, Serial No. 388,522, and in Great Britain November 1, 1928.

This invention relates to the cleaning of articles and more especially to the cleaning of metallic articles as a preparatory to their coating with plate, paint, varnish, lacquer or the like.

In order to obtain the required finish in plated, painted, lacquered and similarly coated articles, it is essential that their surfaces be rendered free from any dirt, grease, scale or other foreign matter prior to the application of the coating, and it is the main object of the present invention to provide a method and apparatus for ensuring the required cleansing of articles by a complete removal of any grease, dirt or other foreign matter from their surfaces.

A further object is to minimize the losses of washing or solvent medium employed, thereby effecting economy, and a still further object is to provide a continuous cleaning process.

In accordance with the present invention the method of cleaning articles consists in conveying the articles firstly through a vapour solvent adapted to remove any soluble extraneous matter, particularly grease, from their surfaces, and secondly through a pickling bath adapted to remove any residue foreign matter such as scale and thus render the surfaces of the articles suitable for subsequent treatment.

Apparatus for carrying out the invention essentially comprises a vapour bath, a pickling bath and a conveyor arranged to traverse the articles in sequence through the said vapour bath and said pickling bath.

In a preferred embodiment of apparatus for carrying out the invention, an endless conveyor is associated with an open vapour bath and a pickling bath containing a suitable acid solution, the articles being fed to the conveyor and after passage through the respective baths being delivered with their surfaces cleaned from any foreign matter, and ready for subsequent treatment.

Where desired a water wash may be provided for the purpose of removing any traces of acid from the articles after their passage through the pickling bath.

The vapour bath can conveniently consist of a shallow trough containing a suitable vapour solvent, for example trichlorethylene, maintained in a vapourous form by any suitable means, for example, by heating pipes disposed in the trough, and the articles— which are conveyed through the bath at normal or room temperature, i. e. below the condensation temperature of the solvent—on contacting with the vapour, effect its condensation on their surfaces, so that any soluble matter on the surfaces is dissolved in the condensate and falls to the bottom of the bath in solution.

The pickling bath to which the articles are conveyed after their initial treatment in the vapour bath, may comprise a well containing a suitable acid, say sulphuric, hydrochloric or phosphoric acid, depending on the finish which is to be applied to the articles, and the conveyor is arranged with regard to the bath so that the articles are dipped in the acid during their progress along the conveyor, whereby removal of any scale or other matter deleterious to the resultant finish is effected.

If desired, a drying chamber or chambers can also be included in the circuit of the conveyor subsequent to the pickling bath and/or between the vapour and pickling baths.

The invention will be further described with reference to the accompanying sheet of explanatory drawing which illustrates diagrammatically and by way of example one embodiment of apparatus for carrying out the invention, and in which:

Fig. 1 is a longitudinal section of the apparatus illustrating the arrangement of conveyor and associated vapour and pickling baths, and an additional water wash for removing any traces of acid from the cleaned articles after their passage through the pickling bath;

Fig. 2 is a section through the vapour bath on the line II—II of Fig. 1 also illustrating a regenerating apparatus for the vapour;

Fig. 3 is a section through the pickling bath on the line III—III of Fig. 1; and

Fig. 4 is an end elevation of the general apparatus shown in Fig. 1.

Referring now to the drawing, 1 represents a conveyor driven by any suitable source of power, for example an electric motor, and rotating in an anti-clockwise direction on carrier wheels 2 and 3 suitably supported on frames 4 from the bed 5 of the apparatus. 6 generally designates a vapour bath, hereafter more fully described, guide pulleys 7 directing the conveyor 1 through the vapour zone, and 8 generally designates the pickling bath, the conveyor being directed into this bath by means of guide pulleys 9.

An additional water wash bath 10 is also indicated in Fig. 1, through which the conveyor is directed by means of guide pulleys 11.

The vapour bath 6 comprises a hollow trough 12 open at 13 and 14 to permit entry and exit respectively of the conveyor 1. The trough 12 is kept supplied with a suitable vapour solvent, say trichlorethylene, through inlets 15 disposed in the side of the trough, and the trough is maintained at a temperature sufficient to maintain the solvent in vapourous form by means of heating coils or pipes 16 shown disposed on the base 17 of the trough 12.

The articles 18 to be cleaned are fed to the conveyor at 19 at a temperature below the condensation temperature of the particular solvent in use in the vapour bath 6 so that on their contacting with the vapour in the bath 6 condensation is effected on their surfaces with resultant solution of any grease, the solution of grease and solvent falling to the base 17 of the trough 12 where it is drawn off through conduits 20, say to a still 21 as illustrated in Fig. 2. When using trichlorethylene the articles can be fed to the vapour bath 6 at a normal or room temperature of about 60° F. while the vapour bath is conveniently maintained at a temperature of about 190° F. with this solvent.

A source of heat 22, conveniently a Bunsen burner, steam coils or electric resistance, is shown associated with the still 21 in Fig. 2, and serves the purpose of heating the condensed solvent to effect its regeneration, the regenerated vapour being returned to the bath 6 through the inlets 8 with which the still communicates by means of a conduit 23.

Residue grease removed from the articles 18 by the solvent is drawn off as required from the base of the still 21, a drain cock 24 being provided for that purpose.

Preferably a plurality of stills are associated with the vapour bath so as to permit of continuous operation of the apparatus even during the cleaning of one or other of the stills, and the source of heat 22 can conveniently be regulated by a thermostat 25 disposed in the trough 12 of the vapour bath 6 and subject to temperature fluctuations in the vapour so as to cut down the regeneration as required. Thermostatic regulation of the heating coils 16 may also be provided as illustrated in Fig. 2 where a thermostat 30 disposed in the vapour zone controls the supply of heating medium to the coils 16 by means of a valve 31.

Alternative or as a supplement to the automatic regulation by the thermostats, a series of refrigerating coils 26 may be provided at the open entry 13 and exit 14 of the trough 12 to prevent leakage of the vapour by causing condensation on the vapour attaining their vicinity so that the condensed vapour falls to the base 17 of the bath, while if desired the refrigerating pipes 26 may be pivotally and adjustably mounted so as to vary the opening to atmosphere at the entry 13 and the exit 14 according to particular requirements.

After treatment in the vapour bath 6 the conveyor 1 carries the articles in the pickling bath 8 being directed by guide pulleys 9 suitably attached to the bed 5 of the apparatus.

The pickling bath 8 in its simplest form comprises an open rectangular well 27 containing acid or other pickling solution usually sulphuric, hydrochloric or phosphoric acid depending on the particular articles under treatment, and the finish which it is desired to apply to them, so that the articles 18 passing along the conveyor are simply dipped in the liquid of the pickling bath so as to remove any scale, although if required, provision may be made for more prolonged contact between the articles and the liquid of the bath.

To enable the pickling bath 8 to be emptied when required a drain 32 is provided and is closed by a suitable tap 33.

In order to remove any acid which the surfaces of the articles 18 under treatment may retain after passage of the articles through the pickling bath 8, which would deleteriously affect the finished article, the conveyor 1 next directs the articles 18 by means of the guide pulleys 11 into a water wash 10 shown identical in construction with the pickling bath 8, but containing plain water, the articles 18 moving along the conveyor being dipped in this water so that any traces of acid are removed before discharge of the articles at 29.

Any other suitable wash can be employed if desired, while provision may be made for drying the articles 18 by means of hot air zones or the like.

It will be seen from Figs. 2, 3 and 4 that the conveyor 1 is of duplex nature with double carriers 2 and 3, and that transverse members 34 connect the two chains of the conveyor and serve for the attachment of the articles 18 to be cleaned. In the example shown each transverse member 34 is arranged to carry a pair of articles 18 and the series of transverse members are arranged equidistantly around the conveyor so that an

equal distance separates the articles carried.

It will be understood that although trichlorethylene forms a convenient vapour solvent for use in the vapour bath, any other suitable solvent may be utilized depending on the purpose in view, and that the pickling baths and water washes may also be constituted by any suitable solution depending on the particular conditions required for the articles under treatment.

It will also be understood that no claim is herein made to the vapour treatment of the articles per se or to the apparatus for carrying out this treatment, such treatment and apparatus being the subject of co-pending application Serial No. 302,038 filed the 25th August, 1928.

What we claim is:

1. In a combination of apparatus of the character described, a plurality of baths, means for supplying a solvent in vaporous form and at a desired temperature to one of the baths, a pickling solution in another of the baths, means for controlling the temperature of the vapor in said first bath, means for immersing an object to be degreased within the vapor whereby some of the vapor will be condensed upon the relatively cooler object, and the temperature of the object raised, means for removing the object from said bath, the temperature of the object and the volatile character of the solution causing degreased material on the surface of the object to assume a dry condition, and means for immersing the object within the pickling bath, wherein the dry residue will be removed.

2. In a combination of apparatus of the character described, a conveyor system for immersing articles to be degreased progressively within a plurality of baths, means for supplying vapor to one of said baths, a pickling solution in another of said baths, means for maintaining the vapor in the first bath at a temperature considerably higher than the temperature of articles to be immersed therein for degreasing, whereby some of said vapor will condense upon the articles and raise the temperature of the articles, the vapor being relatively volatile solvent, so that the articles at their higher temperature will cause the evaporation of condensate upon the removal of the articles from the bath, the articles being delivered by the conveyor in substantially dry condition to the pickling bath for removal of dry residue.

3. A combination of apparatus for converting greasy material to dry residue and then removing the residue, comprising a vapor bath and a liquid pickling bath, means for converting liquid solvent into a vapor and feeding said vapor at a desired temperature to the vapor bath, means for immersing an object having a surface bearing greasy material within the vapor bath, said means being adapted to remove the object therefrom and then immerse it within the pickling bath, said surface being adapted to become substantially dry during the interval between its removal from the vapor bath and its immersion within the pickling bath.

In testimony whereof we affix our signatures.

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KENNETH JAMES RENNIE ROBERTSON.