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METHOD OF DEGREASING

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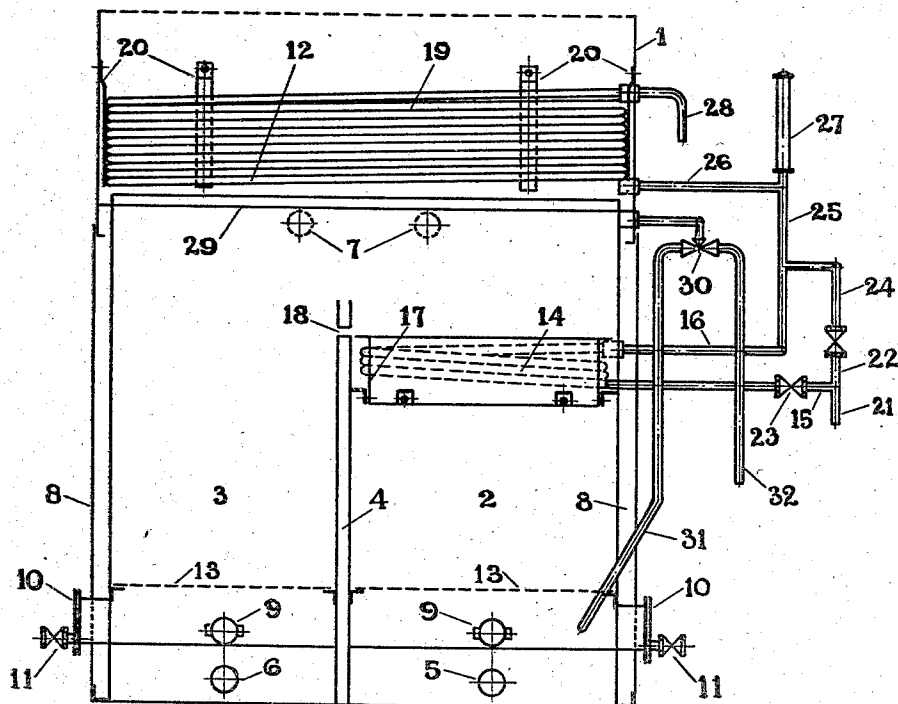


FIG 1

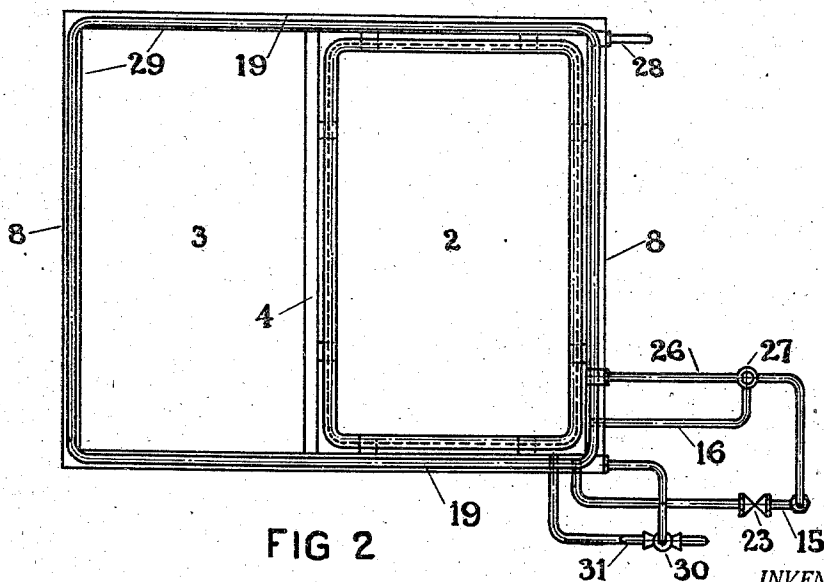


FIG 2

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METHOD OF DEGREASING

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1 Claim. (Cl. 87—6)

This invention relates to an improved method for degreasing by means of volatile solvents such as trichlorethylene. This application is a division of my copending application S. N. 669,610, filed May 5, 1933 now Patent No. 2,020,335 issued Nov. 12, 1935.

A large number of methods and types of apparatus have been proposed for the removal of grease and fat from various types of material, in which cooling surfaces are employed for the cooling and condensation of the vapours of the volatile solvent, the condensate being subsequently returned to the apparatus. In some cases the cooling surfaces are used for cooling a body of liquid solvent or a chamber through which materials to be degreased are passed before or during treatment.

Experience has shown that these cooling surfaces have a tendency to condense water from the atmosphere in addition to cooling and condensing the solvent. This condensed water then becomes associated with the solvent and thus comes into contact with the metal parts of the apparatus and with the material being treated. This increases the tendency of the metals to corrode and is particularly objectionable in the degreasing of metal goods such as iron or steel.

According to the invention I warm, to a predetermined extent, the cooling water which is used and thereby maintain the cooling and condensing surfaces at a temperature above the dew point of the atmosphere in which the operation is carried out, but substantially below the condensing temperature of the solvent. As a further feature of the invention, the solvent vapours are first brought into contact with the said cooling surfaces and then uncondensed vapours are brought into contact with still cooler surfaces. The condensate from these last surfaces, which may be a mixture of solvent and water, is collected separately from that of the solvent vapour obtained from the first cooling surfaces. Complete condensation is thus effected while at the same time the main bulk of condensate remains uncontaminated by water.

In the degreasing of metal goods by means of volatile solvents, the process may be carried out in the vapour phase or in the liquid phase, that is the goods may be exposed to the vapour of a volatile solvent or may be washed by a hot or cold liquid solvent. Combinations of these various methods of working may also be made. The present invention is of course only applicable to processes involving vapour phase degreasing or treatment of the goods with heated liquid solvent.

In most forms of apparatus for carrying out

these processes the cooling surfaces consist of pipes through which a supply of cold water flows. In such cases I maintain the desired temperature of the cooling surface by slightly warming the inlet water before admitting to the cooling pipes. This may be done in many ways, for example, by passing the water through a small electrical heater or gas heater, either of which may be conveniently controlled by a thermostatic device. This method is applicable when vapour phase degreasing is used alone or when vapour phase degreasing follows a treatment with cold liquid solvent.

In an alternative method, in processes and apparatus using a degreasing bath of solvent liquor at a raised temperature and with cooling coils arranged above the surface, I pass the cooling water through coils arranged in such a heated bath prior to its passage through said cooling coils. In this case the number of coils immersed in the liquid and the velocity of the cooling water are adjusted so that the desired temperature of the cooling surfaces is obtained. This method may also be applied when the process is a combination of vapour phase and liquid phase degreasing using the liquid at an elevated temperature.

An apparatus adapted for carrying out the process, referred to in the preceding paragraph, is illustrated in the accompanying drawing, in which Figure 1 shows an elevation and Figure 2 a plan of the apparatus. Referring to Figure 1, the apparatus comprises an outer casing 1 inside which are located the degreasing chambers 2 and 3 adapted to hold a body of liquid, and separated by the wall 4. Chamber 2 is used for degreasing in the liquid phase and 3 for degreasing in the vapour phase. Both chambers are open to the vapour space 12 in the upper portion of the casing 1. The wall 4 is preferably constructed in the form of a double wall so as to possess an insulating value retarding the transference of heat between the chambers 2 and 3. This enables the temperature of the chamber 2 to be more easily controlled if it is desired to work below the boiling point of the solvent used.

Heating means are provided for each chamber: in the present case the gas burners 5 and 6 are used for this purpose although suitably arranged steam coils or electrical heating devices may be used instead. Waste gases from the burners pass to the outlets 7, 7 by way of the space 8 left between the container 1 and the degreasing chambers 2 and 3. This space, in addition to providing a path for the waste gases, also acts as an insulating jacket for the degreasing chambers and thus obviates excessive loss of heat by radiation.

In the base of the degreasing chambers thermostatic devices 9, 9, are provided for the control of the supply of heat to the degreasing liquid. These devices control the supply of gas to the burners 5 and 6 and prevent overheating which may occur, for example, when the volatile solvent has become highly charged with dissolved oils. This control is of greater importance in the chamber 3 since, as will be explained below, a supply of boiling solvent is maintained in the base of the chamber to supply the vapour for the vapour phase degreasing. In chamber 2 the thermostat may, if desired, be used to control the temperature at some selected point below the boiling-point of the solvent.

Cleaning doors 10 and drain cocks 11 are fitted to the base of each degreasing chamber. In the lower portion of each of the degreasing chambers perforated plates 13 are fitted. These plates serve to carry the goods being treated and must be so arranged as to permit the total immersion of the goods in the solvent liquid or vapour, and also in the case of the chamber 3, to prevent contact of the goods with liquid solvent in the base of the chamber.

A set of coils 14 is arranged in the upper portion of the chamber 2. The coils are placed close to the walls of the chamber in order not to obstruct the passage into and out of the chamber of goods being treated. A suitable connection 15 to the main 21, and provided with a valve 23 is arranged for the supply of water to the coils and an outlet pipe 16 connecting through the pipes 25 and 26 to the condensing coils 19, is provided. I also find that it is advantageous to fit a shield 17 for the protection of the coils 14 against damage that might be caused by introducing or withdrawing the goods.

Towards its upper end the dividing wall 4 is provided with a small overflow outlet 18 leading from the chamber 2 to chamber 3 to enable excess liquid in 2 to pass into 3 at a relatively slow rate. This overflow is placed slightly higher than the coils 14 but at such a distance from the top of the wall 4 as to avoid a flow of liquid over the top of the wall into chamber 3 when goods are introduced into the normal volume of liquid in chamber 2.

In the upper portion of the casing 1 at any convenient height above the wall 4, condensing coils 19 carried by the supports 20 are arranged round the walls. The supply of water to these coils is from the coils 14 as previously stated and also from the main 21 through the pipe 22, fitted with a valve 24, and pipes 25 and 26. At any convenient point after the junction of the pipes 16 and 22 a pocket 27 carrying a thermometer is provided for the observance of the temperature of the water entering the condensing coils. The outlet 28 for the water from the condensing coils leads to waste. Below the condensing coils, around the walls of the casing and adapted to collect the condensate flowing from the coils and the walls of the casing, is arranged a gutter or channel 29. Condensed solvent collected by the gutter is delivered to the two-way cock 30 whence it flows by way of pipe 31 back to the chamber 2 or by way of 32 to a receptacle not shown, for clean condensed solvent.

A suitable cover (not shown) may be provided for the apparatus to prevent the loss of solvent by evaporation when the apparatus is not in use.

Prior to the commencement of the degreasing operation, chamber 2 is charged with the liquid grease solvent, e. g. trichlorethylene, until it com-

mences to flow through the overflow 18. Solvent is also introduced into the chamber 3, but in this case the volume must be adjusted so that its surface is below the perforated plate 13 even when it is in a state of ebullition. It will be obvious that this is a necessary precaution if the efficient degreasing of goods resting on the plate 13 is to be obtained, since after the apparatus has been in use for some time the solvent becomes charged with dissolved oils and if allowed to contact with the goods will leave a deposit or film of oil thereon which may not be removed while the goods are being raised through the vapour prior to removal from the apparatus.

After charging the apparatus with solvent the temperature of the chamber 2 is raised to the desired figure by means of the gas burner 5 and the solvent in 3 is heated to boiling to provide for the vapour phase degreasing. At the same time the condensing coils 19 are put into operation. The temperature of these coils is adjusted as required by the invention by suitably proportioning the feed of water through the coils 14 to the feed coming directly from the main, the valves 23 and 24 being provided for this purpose. It would of course be possible to maintain the water at the required temperature by passing the whole supply through the coils 14 at a suitable rate. Reference to the atmospheric temperature and humidity will indicate the minimum temperature of the coils 19 for any particular condition.

In the degreasing of metal goods in the apparatus described, they are preferably immersed first in the chamber 2 in order to remove the bulk of the oil impurities. Agitation at this stage is also desirable in order that any solid impurities such as swarf or dust, which may be adhering to the goods, may be removed by the mechanical washing action of the liquid. After this exposure of the liquid, the goods are transferred to the chamber 3 for removal of the residual film of oily matter which is effected by the condensation thereon of the solvent. It will, of course, be obvious that when working in this manner the liquid phase degreasing must be carried out at a temperature sufficiently below that at which the solvent boils, in order that the goods may condense an appreciable amount of solvent when exposed to the vapour.

Reference has previously been made to the desired temperature in the liquid phase degreasing chamber 2. When working with trichlorethylene I have found this to be about 20-30° C. below the boiling point of the solvent. I have also found that once such a temperature has been attained it is automatically maintained in this neighborhood by the condensate from the coils 19 without the necessity of heating by means of the burner 5.

I claim:

A method of degreasing materials with volatile solvents, which comprises treating the materials in a solvent vapor bath and limiting the upward extent of said solvent vapor bath by condensing the residual vapours by bringing them first into contact with cooling surfaces maintained at a temperature above the dew point of the atmosphere in which the operation is carried out, but substantially below the condensing temperature of the solvent, and then into contact with still cooler surfaces, the condensate from these last surfaces, which may be a mixture of solvent and water, being collected separately from that of the solvent vapours obtained from the first cooling surfaces.

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