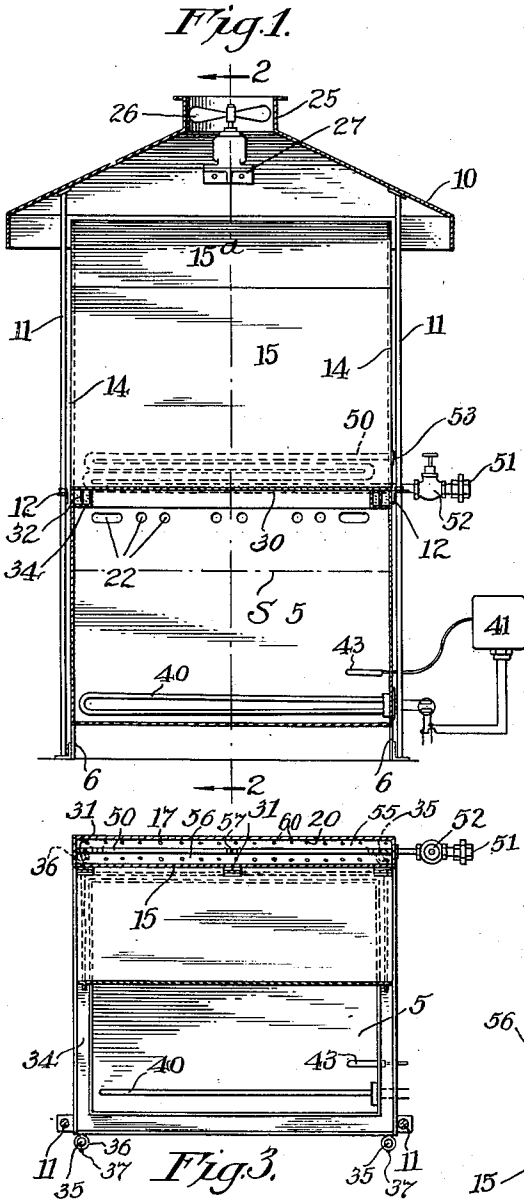
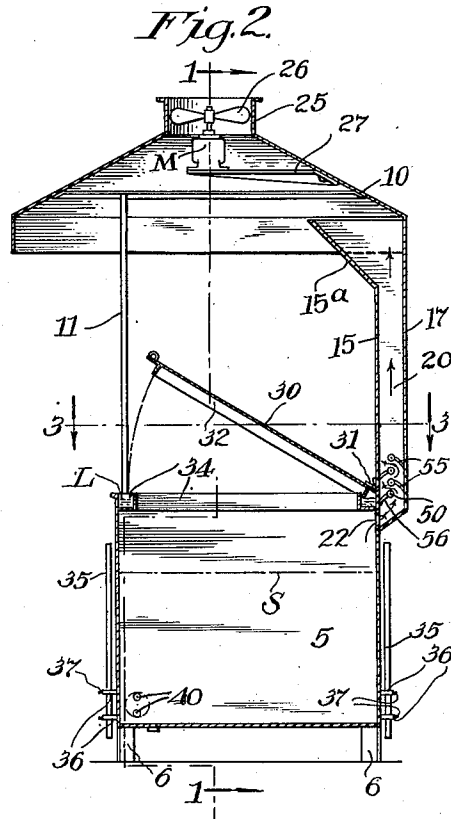
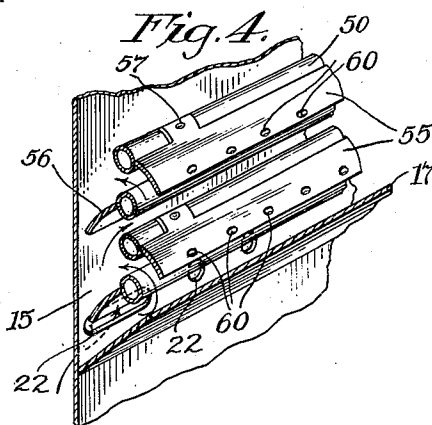


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APPARATUS FOR REMOVING CARBONACEOUS DEPOSITS FROM METALS AND THE LIKE

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This invention relates to apparatus for cleaning, and particularly for removing carbonaceous deposits from, metal parts and the like.

Heretofore, it has been the practice, in removing carbonaceous deposits from internal combustion engine pistons and the like, to immerse the carbon coated parts in a cold bath containing solvents for the deposits. While such practices have been more or less successful in removing such deposits, they have been subject to the rather serious objection that they require considerable treatment or immersion time—for instance, of the order of two hours or more.

We have discovered that this treatment time can be reduced to a fraction of the time formerly required, and more efficient cleaning can be achieved, by employing a heated solvent bath.

As may be well understood, the heating of such a bath ordinarily would rapidly depreciate the strength and volume of the bath by virtue of escaping vapors, particularly since the preferable bath is a water emulsion containing chemical solvents which have a lower boiling point than water, but we have also discovered novel apparatus for utilizing a heated bath in a practicable and economical manner without any appreciable vapor loss.

Thus, the novel features of apparatus which render the carrying out of such a process possible and practicable, form the more particular objects of our invention. It will be readily understood by those skilled in this art, however, from the following detailed explanation of a presently preferred procedure and form of apparatus, that still further advantages are inherent in the invention, and we wish it understood that the details of apparatus now to be described may be varied and modified without departing from the broader aspects of our invention as defined by the appended claims.

In explaining our invention, we shall refer to the accompanying drawing showing one of its adaptations, in which drawing:

Fig. 1 is a vertical section taken on line 1—1 of Fig. 2, the tank lid being shown in closed position, however, while it is shown open in Fig. 2;

Fig. 2 is a vertical section;

Fig. 3 is a plan section taken on line 3—3 of Fig. 2; and

Fig. 4 is an enlarged fragmentary perspective view showing the cooling coil and baffles.

Referring now to the drawing, we show at 5 a solution tank for containing a solvent bath capable of removing carbonaceous deposits from metal and the like, the liquid level of the bath

in the tank being denoted by the letter S. While our invention is not to be limited to utilizing any specific solvent bath, many of which are well known in the art, we might mention that water emulsions of essentially water insoluble solvents for carbonaceous deposits, such as phenols and chlorinated hydrocarbons, are suitable and preferable.

The tank is normally supported on corner feet 6. A hood 10 is supported at its front portion and in position spaced above the top of the tank by posts 11, which may be secured to the sides of the tank by brackets 12.

The space between the top of the tank and the hood is enclosed at the back by back wall 15, the latter wall being disposed outwardly and upwardly at 15a at its top. If desired, side walls may be mounted along the planes denoted 14 in Fig. 1, although such side walls are not necessary.

An outer back wall 17, parallel with and spaced from wall 15, forms, together with the latter wall, a passageway 20 which communicates at its bottom end with the interior of tank 5 through perforations 22, and opens at its upper end under the hood 10. The hood has a central, circular neck 25 in which a blower 26 is mounted, the blower being driven by an electric motor M supported on a bracket 27. The inlet side of the blower is towards the tank.

Tank 5 is open at its top and has a cover 30 hinged at 31, the cover having a depending marginal flange 32. Around the top edge of the tank there is a marginal trough 34 which is normally kept filled with a liquid L, such as water, and when the cover is in closed position (Fig. 1), the flange 32 projects into the trough to a point below the liquid level L to provide a liquid seal to prevent vapors from escaping from the tank around the edges of the cover.

Since the unit illustrated is designed as a portable unit, we provide auxiliary leg elements 35 at the corners, said legs being vertically adjustably secured to the tank by brackets 36 and clamp screws 37. One or more of those auxiliary legs may be used to level the tank in order to insure an effective liquid seal between the tank and its cover, by virtue of equal distribution of liquid in the marginal trough 34.

Within the tank, at the bottom, we provide an electric immersion heater element 40, controlled by a thermostat 41; the numeral 43 denoting a heat sensitive bulb for the thermostat. Preferably the bath is maintained at a temperature of the order of 170° F. by the heat element and

thermostat control, although the chemical strength of the bath may alter this optimum temperature, which is found desirable for a bath having about 30% solvent concentration. The work to be cleaned is placed in the tank and the tank cover closed. It will be understood, of course, that other well-known heating means and mediums, such, for instance, as steam or gas, may be used.

Within passageway 20 we mount a cooling coil 50, which communicates at its inlet end with a cold water line 51, controlled by a valve 52, and communicates at its outlet end 53 with an outlet line, not shown. Staggered baffles 55, 56 of curved cross-section, are secured to the respective coil tubes, as by means of cap screws 57. These respective baffles are preferably tinned to facilitate heat transfer and extend from the respective coil tubes alternately in opposite directions and, at their outer ends, contact the side walls of the passageway. Thus as vapors rise from the bath in the tank, they pass out of the tank through the perforations 22, and then, due to the arrangement of the baffles, they follow a tortuous path, denoted by the arrows in Fig. 2, around the tubes of the cooling coil. The upward movement of the vapors is aided by the slight sub-atmospheric pressure created in the passageway by blower 26. Since blower 26 does not communicate with the passageway by means of any closed duct, but merely draws air from the entire hood which is open to atmosphere, only a slight depression is created in the passageway 20 by the blower. The rear portion of the hood 10 is supported atop wall member 17.

In operation, the cooling effect of the cooling coil is sufficient that the vapors become condensed before reaching the outer end of the passageway 20, and the condensate flows back into the tank, passing through the perforations 60 in the baffles and thence into the tank through perforations 22. Thus the bath is maintained at substantially its initial strength and volume.

Of course, some small amount of vapor will escape from the tank while the closure 30 is open to insert and remove work from the tank, but those vapors are collected and prevented from escaping into the work room by means of the hood, walls 14, 15 and the blower.

We find it particularly advantageous to position the cooling coil at the lower end of passageway 20, adjacent the tank, to insure against any vapor lock in the passageway due to the relatively heavy characteristics of the solvent vapors. Inasmuch as relatively low boiling point chemicals are used in the bath, most of the vapors entering passageway 20 are chemical vapors.

The advantages of refluxing in our apparatus

are many fold. Not only does it shorten the treatment period due to maintenance of the solvent strength of the bath, but it provides great economy in that it saves chemicals, because in a heated bath the low boiling chemicals rapidly vaporize. Moreover, the use of the reflux and suction from blower 26, reduces to a minimum the loss of vapor incident to opening the tank cover for inserting and removing work.

Having described one form of apparatus in which our invention may be carried out, we now claim as our invention:

1. In apparatus for removing carbonaceous deposits from articles by means of a solvent solution, the combination of a container for the solution, means for heating the solution in the container to a point sufficient to vaporize a portion thereof and means for condensing and refluxing the vaporized portion whereby to maintain the heated solution substantially at its initial strength and volume, said last-named means comprising walls defining a passageway communicating at one end with the container, cooling tubes disposed one above another in the passageway and baffle members secured to the respective tubes and projecting therefrom at opposite sides of adjacent tubes, each of the baffles extending from the tube to which it is secured to the adjacent wall of the passageway whereby to direct the vapors in a tortuous path around the several tubes until they are condensed, fluid-passing perforations through the baffles whereby to permit reflux of the condensate to the container and suction means communicating with the other end of the passageway.
2. In apparatus for removing carbonaceous deposits from articles by means of a solvent solution, the combination of a container for the solution, means for heating the solution in the container to a point sufficient to vaporize a portion thereof and means for condensing and refluxing the vaporized portion whereby to maintain the heated solution substantially at its initial strength and volume, which last-named means includes walls defining a passageway leading upwardly from and communicating at its lower end with the tank through perforations provided in a side wall of the tank at the bottom of the passageway, cooling tubes in the passageway for condensing vapors entering through the perforations, baffle members directing the vapors in a tortuous path around the cooling tubes, openings through the baffle members through which the condensate is moved by gravity flow into the container and suction means creating a subatmospheric pressure at the top end of the passageway.

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