

April 6, 1937.

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2,076,262

APPARATUS FOR CLEANING RECEPTACLES

Filed April 12, 1933

2 Sheets-Sheet 1

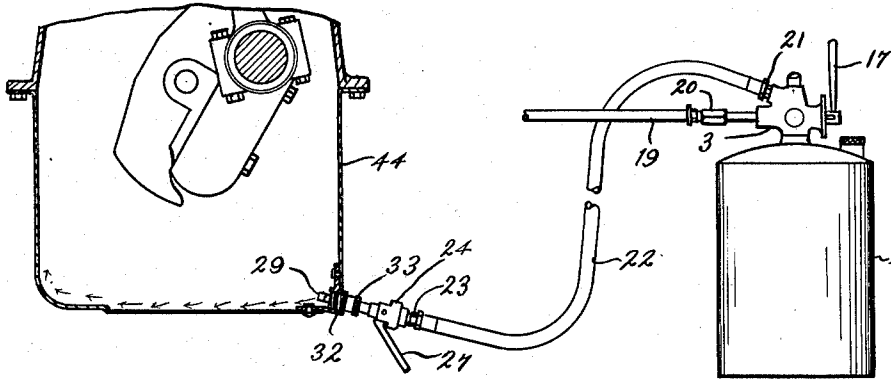


Fig. 1

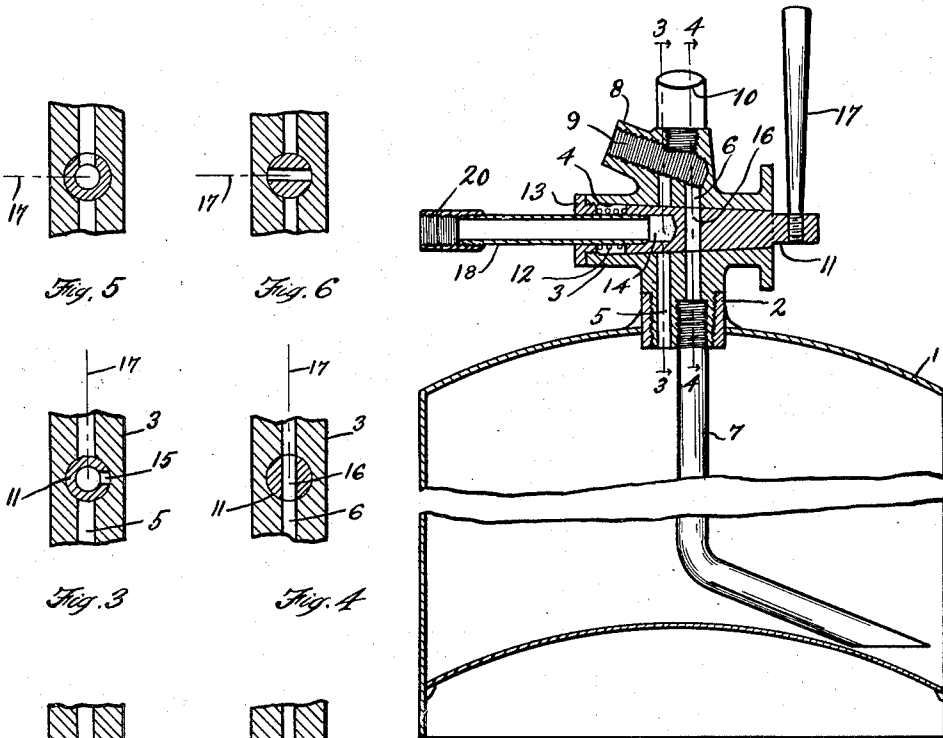


Fig. 2

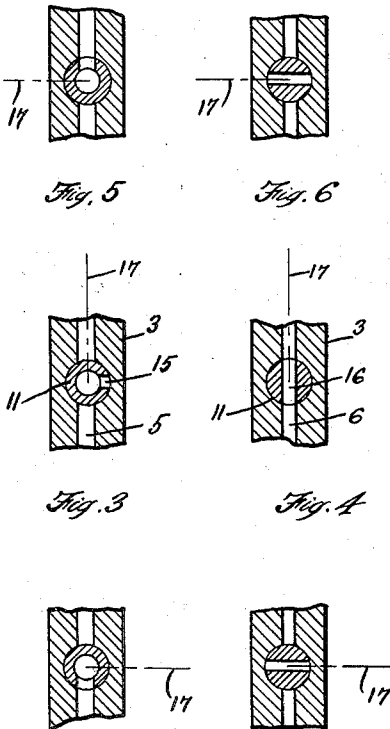


Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

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2 Sheets-Sheet 2

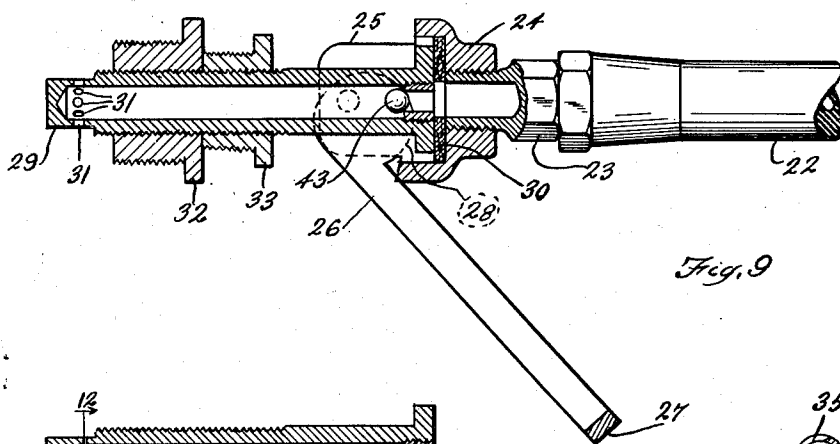


Fig. 9

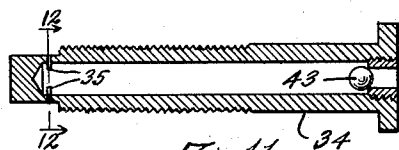


Fig. 11

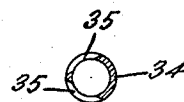


Fig. 12

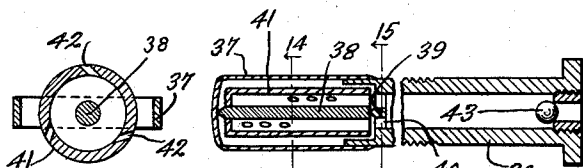


Fig. 14

Fig. 13

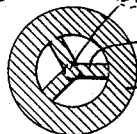


Fig. 15

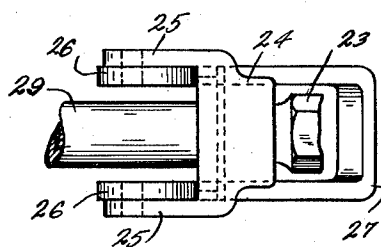


Fig. 10

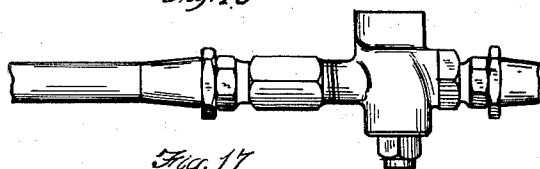


Fig. 17

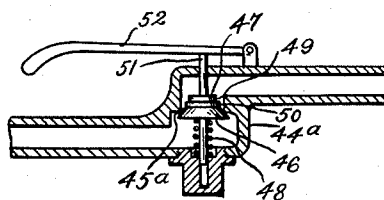


Fig. 18

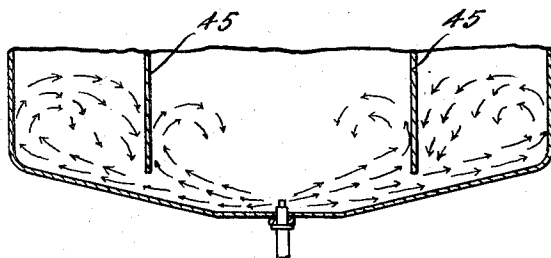


Fig. 16

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UNITED STATES PATENT OFFICE

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APPARATUS FOR CLEANING RECEPTACLES

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mesne assignments, of one-half to H. Howe
Fisher

Application April 12, 1933, Serial No. 665,637

5 Claims. (Cl. 184—1.5)

This invention relates, as indicated, to methods of and apparatus for cleaning receptacles, but is directed more particularly to the cleaning of sludge deposits and other foreign matter from automobile crank and transmission cases, differential housings, etc.

It is customary at the present time to periodically drain the oil from automobile crankcases and flush the interior thereof with a cleaning fluid, such as gasoline, kerosene, or flushing oil, preparatory to refilling the crankcase with new oil. In some cases, the cleaning fluid is introduced into the crankcase or other receptacle to be cleaned by injecting it, under light continuous air pressure and in geyser-like form, into the drainage opening of the receptacle and then withdrawing it by gravity flow or suction. The pressures employed are relatively small, such as about 25 lbs./sq. in., and the cleaning fluid is at most but mildly agitated, so that it is virtually impossible by this means to loosen and clean the tightly adherent sludge deposits from the bottom and walls of the receptacle. Moreover, the injection of the cleaning fluid into the crankcase in geyser-like form is apt to throw the fluid onto parts of the mechanism within the receptacle which are not desired to be cleaned.

In some types of crankcases, in which vertical baffles are employed to prevent surging of the oil, such baffles not only act as an impediment to the thorough cleaning of the crank case by the usual cleaning methods, but render it difficult to agitate the cleaning fluid sufficiently to clean both sides of the baffles.

In other types of crank cases, where drip or splash pans are used, the usual cleaning methods, as described above, result in a blowing or forcing of the cleaning fluid up into such splash pans. These pans usually hold from one to two quarts of fluid, and are provided with overflow ports only, so that if filled with the cleaning fluid, which cannot be drained therefrom, such fluid will dilute the new oil when a refill is made.

Where oil pumps are used, the lubricating oil, in the ordinary operation of the car, passes in only one direction through the screens of such pumps with the result that foreign matter becomes wedged in the openings thereof. Such matter is not removed to any appreciable extent by the ordinary cleaning methods which have been described.

It is a primary object of the present invention to provide methods of and apparatus for cleaning crankcases and the like, whereby sludge deposits and other tightly adhering incrustations on the walls thereof are quickly and efficiently loosened and brought into a condition wherein they may be easily drained from the case.

Other objects of the invention are to provide a method of the character described, whereby a

cleaning fluid is introduced into the crank case in such a manner as to effectively clean portions thereof which have hitherto been inaccessible for this purpose or cleaned only with great difficulty; to provide a method of cleaning in which air under relatively high pressure is employed to assist the solvent action of the cleaning fluid and to provide portable apparatus for efficiently practicing the aforesaid cleaning method, which apparatus consists of a minimum number of inexpensive, readily assembled parts.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the methods and apparatus hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain apparatus embodying the invention, such disclosed methods and apparatus constituting, however, but a few of the various forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a view, showing the apparatus employed in practicing the method of the present invention and the manner in which the nozzle thereof is connected to the drainage opening of an automobile crankcase; Fig. 2 is an enlarged vertical cross-sectional view through the cleaning fluid tank; Figs. 3 and 4 are cross sectional views through the cleaning fluid tank valve, taken on a plane substantially indicated by the lines 3—3 and 4—4 respectively in Fig. 2; Figs. 5 and 6 are views similar to Figs. 3 and 4 respectively, but showing a different rotational position of the valve; Figs. 7 and 8 are views similar to Figs. 3 and 4 respectively, but showing a still different rotational position of the valve; Fig. 9 is an enlarged cross sectional view of one of the nozzles used in practicing the novel cleaning method; Fig. 10 is a fragmentary plan view, showing the manner in which the nozzle of Fig. 9 is secured to the nozzle holder of the fluid supply hose; Fig. 11 is a cross sectional view through a modified form of nozzle; Fig. 12 is a cross sectional view through one end of the nozzle, taken on a plane substantially indicated by the line 12—12 of Fig. 11; Fig. 13 is a cross-sectional view through another modified form of nozzle; Figs. 14 and 15 are enlarged cross sectional views through the nozzle of Fig. 13 taken on planes substantially and respectively indicated by the lines 14—14 and 15—15 of Fig. 13; Fig. 16 is a diagrammatic view showing the manner in which crankcases having baffles therein are cleaned by the method of the present invention; Fig. 17 is a view of a thumb-operated air control valve; and Fig. 18 is a cross sectional view through a modified form of air control valve.

Referring more particularly to the drawings, a tank 1 is provided which is adapted to contain a

cleaning fluid, such as gasoline, kerosene, fuel oil, or any flushing fluid. This tank has a ferrule 2 to which is threadably secured a coupling 3 having a conical valve seat 4 extending horizontally therethrough and vertically extending passageways 5 and 6 which intersect the valve seat. A pipe 7, in threaded engagement with the coupling 3 and in communication with the passageway 6 therein, extends substantially to the bottom of tank 1. Coupling 3 is further provided with an inclined portion 8 having a threaded passageway 9 therethrough which communicates with passages 5 and 6. A handle 10, secured to the coupling 3, enables the tank 15 to be readily carried about.

Seated on the valve seat 4 is a conical valve 11 which is maintained in proper position by means of a compression spring 12 and a plug 13 which is in threaded engagement with the coupling 3. The valve 11 has a recess 14 in one end thereof, which recess is in communication with a radial opening 15 (see Fig. 3) in the valve. The valve is further provided with a transverse opening 16 and with an operating handle 17, whereby the valve may be rotated to various operative positions, as will be presently described.

For the purpose of introducing air into the tank, a tube 18 is employed which extends through the plug 13 and is in threaded engagement with the valve 11. This tube may be connected to an air supply pipe 19 by means of a coupling 20 or other suitable coupling devices.

Secured to the inclined portion 8 of the coupling 3, as by means of a connector 21, is a fluid supply hose 22. Upon reference to Figs. 1, 9 and 10, it will be seen that the opposite end of the hose 22 is secured, as by means of a connector 23, to a nozzle holder 24 having furcations 25 to which are pivotally secured the furcations 26 of a locking lever 27. The furcations 26 are provided at their ends with cam surfaces 28, whereby a nozzle 29 may be clamped to the holder 24. A gasket 30 interposed between the nozzle 29 and holder 24 insures a leak-proof connection between these members. The nozzle 29 is closed at its outer end, but has a series of circumferentially spaced radial openings 31 adjacent such closed end, whereby the cleaning fluid may be discharged transversely from the nozzle in a series of fine streams. The nozzle 29 is externally threaded for connection to the drainage opening of a crank case or the like, but where such drainage is larger than the external diameter of the nozzle, adapters, such as 32, 33, may be used to make a suitable connection with the drainage opening. In such case, one of the adapters may be used as a lock-nut for retaining the other adapter in position.

In Figs. 11 and 12 is shown a modified form of nozzle 34 in which the radial openings 35 are in the form of slots, whereby to permit the ejection of the cleaning fluid in thin flat streams, closely adjacent the wall surface to be cleaned.

In Figs. 13, 14 and 15 is shown another modified form of nozzle 36, which has secured thereto adjacent its outer end a U-shaped member 37, the transverse portion of which serves as a bearing for one end of a shaft or spindle 38, the opposite end of which is supported on a bearing point 39 located at the intersection of radial ribs 40 extending from the inner wall of the nozzle. Rigidly secured to the spindle 38 is a hollow diffuser 41 having tangentially arranged openings 42, whereby when the cleaning fluid enters

such diffuser it is rapidly rotated, discharging the fluid in streams transversely of the diffuser.

All of the nozzles are also provided with ball valves 43 whereby back flow of the cleaning fluid is prevented.

When it is desired to use the apparatus for cleaning a crank case, from which the oil has been drained, the nozzle thereof is secured to the drainage opening of the crank case. In Fig. 1, the nozzle 29 is shown as secured within the drainage opening as by means of the adapter 32, and extending but a short distance into the crank case 44. The air supply pipe 19 of the apparatus is connected to a source of air at a pressure of from about 75 to about 200 lbs./sq. in. At this time the handle 17 is in the position indicated in Figs. 3 and 4 so that the air has access to neither the tank nor hose 22.

Upon rotating the handle 17 to the position indicated in Figs. 7 and 8, air pressure is built up within the tank to the desired degree, and the handle is then returned to the position indicated in Figs. 3 and 4. In this position of the handle, the cleaning fluid is discharged through the openings 31 in nozzle 29 in a series of fine streams closely adjacent to and parallel with the inner surfaces of the crank case. These high pressure streams of cleaning fluid cut through and loosen the sludge deposits or other incrustations on the walls of the crank case, the sharp piercing streams of fluid being particularly effective for this purpose. Alternately with this action, which may be called a purging action, the handle 17 is rotated to the position indicated in Figs. 5 and 6. In this position of the handle, the flow of cleaning fluid is cut off and air only is forced through the openings in the nozzle. The fine, high pressure air streams cause a violent turbulence or agitation of the cleaning fluid, causing the material which has been previously cut and loosened to go into suspension in the cleaning fluid, in which form it may be readily removed by drainage of the cleaning fluid from the crank case. By alternately introducing cleaning fluid and air into the crank case in the manner described, a violent agitation of the cleaning fluid and matter suspended therein is set up, causing a more or less mechanical action thereof against all of the walls of the crank case, which action assists the direct action of the streams of liquid and air in removing the sludge deposits from the walls.

This method of removing the sludge deposits is of particular advantage in cleaning crank cases having auxiliary splash or drip pans, as the action of the cleaning fluid and air is directed along the walls and bottom of the crank case, none of the liquid being forced or blown upwardly into the splash pan. Furthermore, the cleaning fluid is not thrown onto parts of the mechanism within the crank case which are not desired to be cleaned.

This method of removing the sludge deposits is also of particular advantage in cleaning crank cases having vertical baffles. As illustrated in Fig. 16, such a crank case is usually provided with a central drainage opening in the bottom thereof, and the lower edges of the baffles 45 are spaced from the bottom sufficiently to permit passage of the oil between the compartments. As indicated by the arrows, the alternate streams of cleaning fluid and air not only strike the opposed faces of the baffles, but are under sufficient pressure to strike the end walls of the crank case, rebounding onto and thoroughly cleaning the opposed

faces of the baffles. In this manner the sludge deposits are quickly and efficiently removed from all of the surfaces within the crank case. The cleaning action, which has been described also creates a backwash, which is effective to remove the particles of foreign matter lodged in the openings of the oil pump screens. It will be noted that in the nozzle shown in Figs. 11 and 12, one portion of the circumferential wall adjacent the end of the nozzle is not slotted. Such a nozzle is particularly adapted for use with crank cases having drain ports in the sides or ends thereof, as, for example, the crank case shown in Fig. 1. In such case, the nozzle is so inserted as to bring the unslotted portion thereof in its uppermost position, so that when air is forced through the nozzle into the crank case, it will be directed laterally and downwardly through the openings 35, and not upwardly, thereby confining the air to the lower portion of the crank case, which is, in some cases desirable.

In crank cases which are not provided with elevated splash pans, it is sometimes desirable to introduce the cleaning fluid into the crank case by pouring it into the filler tube. Prior to filling the crank case in this manner, any one of the nozzles which have been described is secured within the drainage opening of the crank case and the opposite end of the hose to which such nozzle is secured may be connected directly to a source of air under high pressure instead of to a tank, as previously described. After the desired amount of cleaning fluid has been introduced into the crank case through the filler tube, intermittent blasts of air are introduced into the cleaning fluid through the nozzle, a thumb-operated control valve, such as shown in Fig. 17, being interposed in the air supply line for this purpose. Such control valves are well-known and readily available, so that a detailed description thereof is believed to be unnecessary. By quickly opening and closing the control valve, streams of air under high pressure are blown along the bottom and walls of the crank case, creating a violent turbulence of the cleaning fluid which, in combination with the direct cutting action of the air streams, results in a quick removal of the sludge deposits. It will be understood that this method of cleaning is a modification of my preferred method, which, as hereinbefore described, consists in alternately injecting cleaning fluid and air into the drainage opening of the receptacle.

Where it is desired to use this modified method for cleaning small crank cases, in which the use of a thumb-operated valve, as shown in Fig. 17 is undesirable on account of the fact that provision is not usually made for controlling the air flow in graduated amounts, a modified form of air control valve, such as shown in Fig. 18, is employed. Such a valve includes a body 44a having a knife-edge seat 45a, upon which the tapered portion 46 of a valve 47 is adapted to be normally seated by means of a spring 48. The valve is provided with portions 49 and 50 of a diameter less than that of the seating contacting circle of the tapered portion 46, and a stem 51, extending through the valve body and adapted to be engaged by an operating handle 52 pivotally connected to the valve body. Upon depressing the handle 52, it will be seen that the air flow may be controlled in graduated or gradually increasing volume, which action is particularly desirable in the cleaning of small crank cases.

ods are practiced with air under a pressure of from about 75-200 lbs. per sq. in. Such pressures are available at practically all service stations, gas stations, garages, etc. The necessity of providing special air compressors or pumps is therefore dispensed with.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any of the following claims or their equivalent be employed.

I therefore particularly point out and distinctly claim as my invention:

1. Apparatus for cleaning receptacles comprising a tank adapted to contain a cleaning fluid, a coupling secured to said tank having a discharge passageway and a plurality of spaced passages, each of said passages communicating at one end with the interior of said tank and at the other end with said discharge passageway, and a valve having angularly related openings for controlling said passages.

2. Apparatus for cleaning receptacles comprising a tank adapted to contain a cleaning fluid, a coupling secured to said tank having a discharge passageway and a plurality of vertically extending passages, each of said passages communicating at one end with the interior of said tank and at the other end with said discharge passageway, and a valve extending horizontally through said coupling and having angularly related openings therein for controlling said passages.

3. Apparatus for cleaning receptacles comprising a tank adapted to contain a cleaning fluid, a coupling secured to said tank having a discharge passageway and a plurality of vertically extending passages, each of said passages communicating at one end with the interior of said tank and at the other end with said discharge passageway, a tapered valve rotatably mounted in said coupling and provided with spaced openings therein, each of which is adapted to communicate with one of the passages in the coupling, and an air supply tube in communication with one of the openings in said valve.

4. Apparatus for cleaning receptacles comprising a tank adapted to contain a cleaning fluid, an air supply conduit, a fluid discharge conduit, and a single valve-controlled means for selectively causing air from said air-supply conduit to flow directly to said discharge conduit or to flow into said tank to force the contents of said tank to flow to said discharge conduit.

5. Apparatus for cleaning receptacles comprising a tank adapted to contain a cleaning fluid, a coupling secured to said tank having a discharge passageway for air or cleaning fluid, and a plurality of spaced passages, each of said passages communicating at one end with the interior of said tank and at the other end with said discharge passageway, a valve having spaced angularly related openings for respectively controlling said passages, and an air supply conduit in communication with one of said openings, said valve being rotatable to selectively position said openings with respect to said passages so as to cause air from said air-supply conduit to flow directly to said discharge passageway while preventing escape of fluid from said tank or to pass directly into said tank to force said fluid into said discharge passageway while preventing flow of air directly to said passageway.

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As previously mentioned, these cleaning meth-