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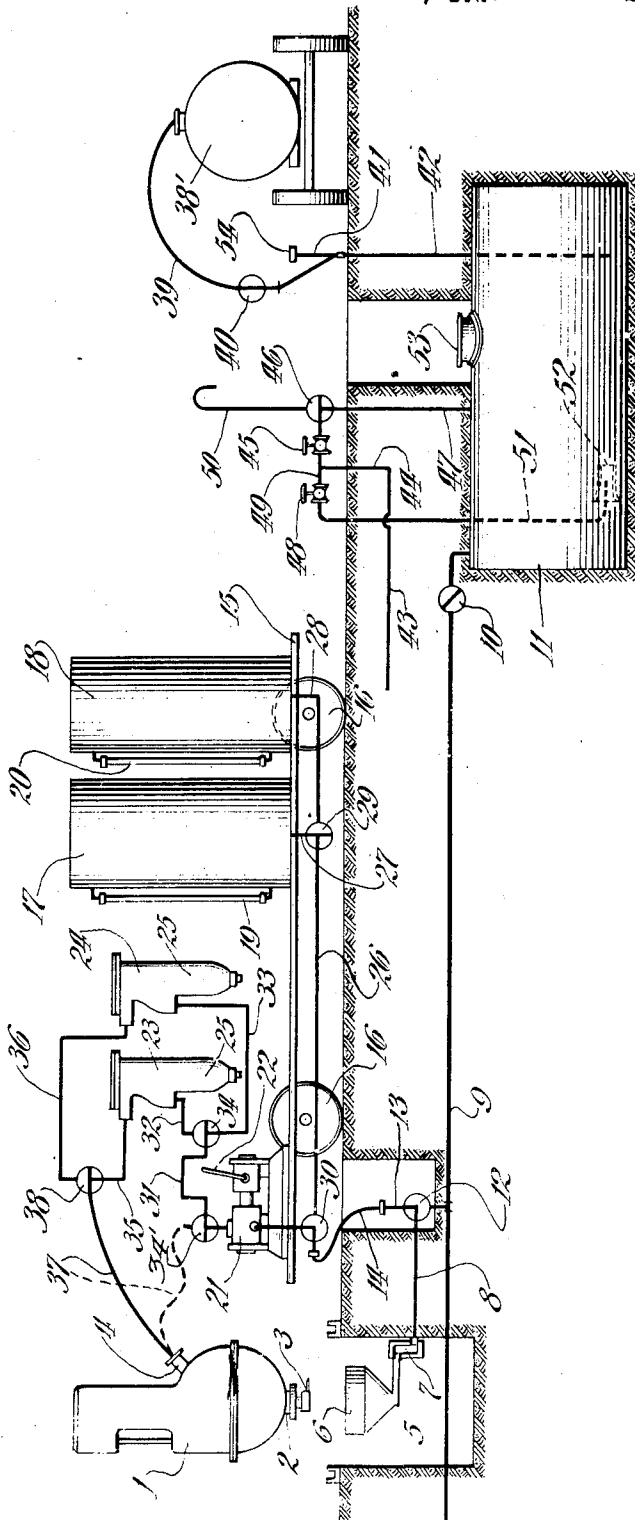
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APPARATUS FOR CLEANING LUBRICANT CASES OF ENGINES

Filed Feb. 4, 1927

2 Sheets-Sheet 1

Fig. 1.



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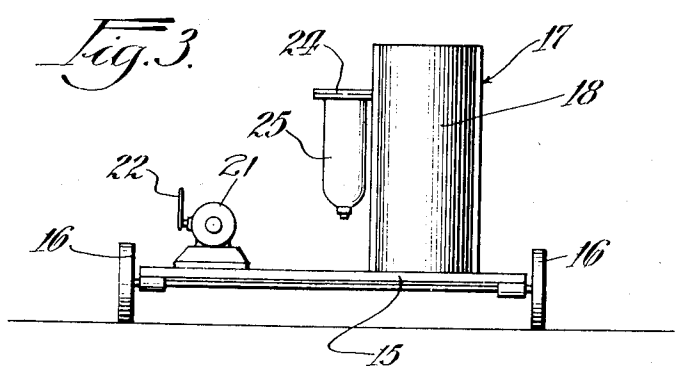
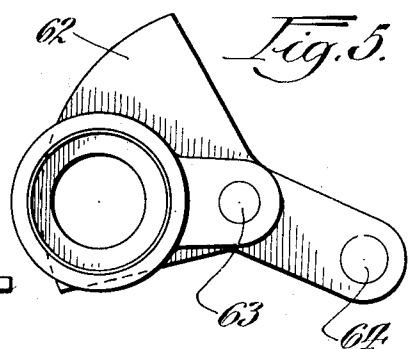
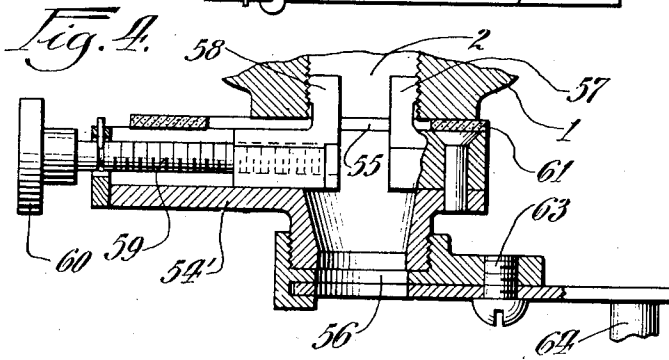
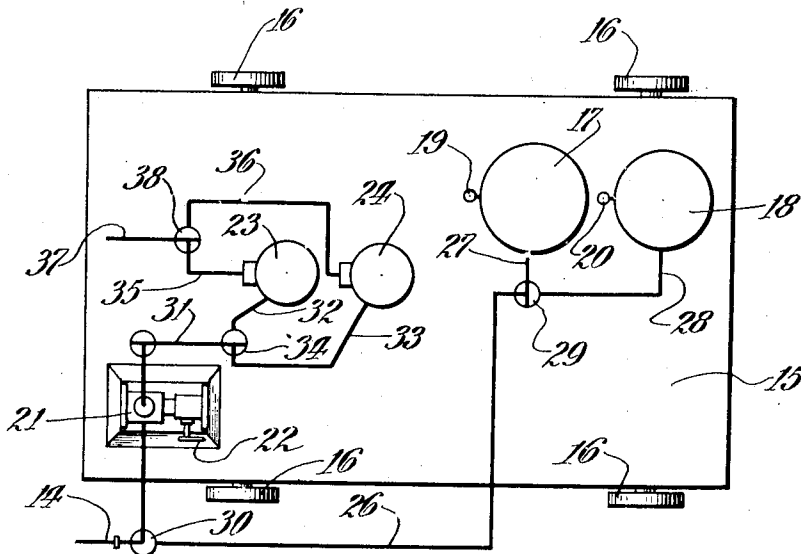
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APPARATUS FOR CLEANING LUBRICANT CASES OF ENGINES

Filed Feb. 4, 1927

2 Sheets-Sheet 2

Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CLEANING LUBRICANT CASES OF ENGINES.

Application filed February 4, 1927. Serial No. 165,854.

This invention relates to improvements in process and apparatus for cleaning lubricant cases of engines, and is more particularly adapted to cleaning crank cases and the transmission and differential cases of motor vehicles, such as automobiles, motor trucks, and the like. However, the invention is also adapted for use in cleaning lubricant cases of engines generally, as, for example, motors on trolley cars, Diesel engines, boats, airplane engines, or the like.

The objects and advantages of the invention will hereinafter more clearly appear from the following description, but, broadly speaking, the purpose is to effectively and simply clean the case containing the lubricant together with the mechanism enclosed in such case. To this end, the process and apparatus is carried out and operated, first by preferably draining off the dirty oil or lubricant, and then forcibly circulating a flushing oil through the case and around the mechanism contained therein.

The apparatus is not only relatively compact and simple of manufacture, being devoid of any mechanism or parts liable to get out of order, but is especially characterized by the facility with which it can be brought into communication with, and detached from, the crank case of the automobile or other part that is to be speedily cleaned. In addition to this feature, the cleaning is carried out much more effectively than in the methods and in the apparatus now generally in use.

As a feature of the invention, I provide the apparatus with means for filtering the flushing oil as it is circulated through the member that is being cleaned.

In the drawings,

Fig. 1 is a more or less diagrammatic view showing the complete method of cleaning the lubricant case, in this instance, the crank case of a motor;

Fig. 2 is a diagrammatic top plan view of the cleaning apparatus proper;

Fig. 3 is a view partly in side elevation and partly in vertical section of the same;

Figs. 4 and 5 are detailed views of the plug which may be used to reduce the flow from the cases of certain types of motors.

Referring to the drawings, more particularly Fig. 1, 1 designates the motor of the engine to be cleaned, having a drain hole 2,

which may be closed by the adjustable and removable plug 3 hereinafter more fully described. 4 illustrates the feed inlet for the crank case. Below the motor, preferably in a pit 5, is mounted a drip pan 6, which may be mounted on a swinging joint 7 through which the pan is adapted to receive the dirty oil as it drains out of the motor.

The dirty oil flows from the drip pan 6 through the line 8 into the drain header 9 and then through check valve 10 into the dirty oil storage tank 11. This storage tank 11 may be located underground as shown, or it may be placed above the ground as desired. After the oil has been drained out of the crank case, the cock 12 in line 8 is turned so as to cut the line 8 from the header 9 and connect it to the pipe 13. To this pipe 13 may be detachably secured flexible hose connection 14, preferably mounted on a suitable truck 15 (Fig. 2) having wheels 16. In the present instance, the device is equipped with a tank 17 for receiving new flushing oil and forming in effect a storage tank for such new flushing oil. On the truck may be also supported a distillate storage tank 18, which is adapted to receive new distillate so that such distillate may be used in initially cleaning out, for example, the differential or transmission case of a motor car. These tanks may be provided with suitable gauges 19 and 20 (Fig. 1), and a pump 21 is provided, operated by handle 22. I have shown a hand-operated pump because it is desirable that the pump be operated at different speeds with different types of motor cars, but an electrically or motor driven pump may be used, but in such case should be so arranged that it can be operated at variable speeds.

I also provide filters 23 and 24, each of which may be provided with a removable mesh bag 25, which bags are adapted to permit the cleaning oil to pass through, but catch and hold the foreign substances. The pump is connected through lines 26 and the branches 27 and 28 to the two tanks 17 and 18, respectively. A three-way cock 29 is provided whereby either tank may be cut into or both cut out of the system. Similarly, a three-way cock 30 is provided for closing line 26, opening it to one or the other of the tanks, or for connecting it to the suction line 14 of the pump. The discharge line 31 is connected

by branches 32 and 33 to the filters 23 and 24, a three-way cock 34 being provided whereby either filter may be cut into the system, or both cut out. From the filter branches 35 and 36 which connect to the flexible hose 37, which in turn may be adjustably connected to the feed inlet of the crank case, a three-way cock 38 is provided for closing the connection to the hose 37 or for cutting in either one or the other of the two filters. I have shown two filters in the present instance; one may be used in cleaning the flushing oil from the crank case, and the other in cleaning the flushing oil from the differential or transmission. The latter two cases are likely to be much dirtier than the crank case, and in addition use a grease instead of lubricant, and it may be desirable to use separate filters in such instance.

When it is desired to remove dirty oil from storage tank 11, as for example, to a tank truck 38, I may connect the latter with a flexible hose 39 having shut-off cock 40 to Y fitting 41, leading to pipe 42 into the tank 11 near the lower end thereof. The oil from storage may be forced up through pipe 42 by means of air compressors (not shown), in the following manner: Air is introduced through the line 43 and branch 44 through the cocks 45 and 46, and through line 47 into the top of the tank 11. At this time the valve 48 in branch line 49 is closed and the cock 46 also closed off from the vent pipe 50.

After the tank has been cleaned as far as possible of this oil content, there still may remain some sediment in the bottom which it will be necessary to agitate and loosen up before it can be removed. To this end the branch 49 is connected to pipe 51 terminating in nozzle 52, as shown. To agitate the oil, the cock 46 is open to the vent 50 to vent the tank. The air control valve 48 is then opened to the line 51 while the valve 45 is closed and air forced in through the nozzle 52, to agitate the oil and sediment in the bottom of the tank 11. After this the air valve 48 is closed and the cock 45 turned to connect to the pipe 47 and the cock 46 also regulated so that the air will be forced into the top of the tank, as first described, so as to blow out the remaining oil and sediment. A clean-out manhole 53 is preferably provided on the top of tank 11. 54 designates a connection to manual or power operated suction pump should air pressure not be available.

I have heretofore referred to an adjustable plug which it is desirable to use in certain types of motor cars. In the case of some cars the drain opening from the crank case is so large that it permits the oil to flow out too fast into the drip pan when I am circulating the flushing oil. It is, therefore, necessary or desirable to limit the size of such opening, but in as simple and expedient a manner as possible. To this end, the plug consists of a casing 54 which is provided with inlet open-

ing 55 and outlet opening 56. The inlet opening is provided with a pair of lugs 57 and 58, the latter being adjustably carried by the screw 59 having a handhold 60; preferably a washer 61 is also provided. To insert the plug in the discharge pipe from the crank casing, the lugs are inserted into the opening and then spread by operating the screw 59 so as to get frictional contact between the lugs and the inner wall of this discharge pipe. These lugs may be provided with teeth as shown, to facilitate such frictional contact. The outlet opening 56 is controlled by means of segmental shaped gate 62 pivoted to the casing as shown at 63, and provided with operating handle 64. The arrangement is such that by moving the gate the size of the opening can be controlled or shut off.

It is to be understood that in some cases the discharge opening from the crank case or other case being cleaned is sufficiently small so that this plug may not have to be used, but where it is too large it forms a very efficient means for controlling such discharge and also permitting more pressure to be brought on the fluid in the crank case which fluid can obviously be introduced into the crank case under pressure faster than withdrawn.

In carrying out the process and for the purpose of illustration, I will describe the cleaning of the crank case of a motor car. The car is driven over a suitable rack so that the discharge of the crank case is above the drip pan 6. The discharge is opened and dirty oil permitted to drain by gravity into the drip pan and thence through the connection hereinafter described, to storage tank 11. After the oil is drained out, the storage tank is cut off from the drip pan, and flexible hose 14 cut into line 8 by suitably operating the valves hereinbefore described. The pump is then operated and new flushing oil, as, for example, a light lubricating stock, is pumped through the line 37 into the crank case, the oil passing first through one of the filters which is being used for the cleaning of the flushing oil for crank cases. With the types of crank cases now generally in use on motor vehicles, from one to two gallons of flushing oil will be sufficient. The oil is then circulated by suitably operating the pump as follows: from the pump, through the corresponding filter, crank case, drip pan, and back to the suction side of the pump. As the flushing oil is thus circulated it has to pass through the filter which catches and collects the dirt, sediment or other foreign matter which is being flushed out of the crank case. The flushing oil is circulated a sufficient number of times to effectively clean the crank case. In a hand pump now in use, the pump can handle approximately five gallons a minute. Therefore, by operating such pump a period of five minutes, an equal of 25 gallons of flushing oil will be circulated

through the crank case, and this, it has been found, is generally sufficient to effectively clean the case.

In the illustration referred to, the original charge of flushing oil was two gallons. Preferably while this flushing operation is taking place and the oil being circulated as described, the engine of the motor car is kept running. When the operator has determined that the crank case is cleaned, the flushing oil which was being used is delivered to the dirty oil storage tank 11 by suitably operating the valves heretofore described. The crank case of the motor is now cleaned and detachable plug (if in use) removed, and the crank case is ready to receive a fresh supply of lubricant.

I have described the use of the device and process in connection with cleaning the crank case of a motor car. When it is desired to clean the differential or transmission, the operation is carried out in specifically the same manner, except that preferably after the transmission or differential is drained, distillate may be circulated by the pump through such casing to cut the heavy grease and foreign particles and in such case the filter which is used for the distillate is cut into the system, and the other one cut out. After this distillate has been sufficiently circulated it may be led off to storage tank 11. Ordinarily the circulation of the distillate will be sufficient to clean such transmission or differential. This distillate may be kerosene distillate; also other distillates may be used, if desired. There may be certain cases in which the motorist or operator may want to have the differential or transmission additionally flushed with lubricant oil, which can be done by cutting out the distillate filter and discharge storage tank and by cutting into the system the other filter and the lubricant storage tank.

I have described the process and apparatus in connection with motor vehicles, but, as heretofore stated, casings of other mechanism may be cleaned in a similar manner.

Frequently, the crank cases of automobiles contain sulphurous or other acids from the explosions in the cylinders, which, if left in the crank case, eat away the bearings. The methods of cleaning crank cases of the prior art do not effectively remove such acids. By my process and apparatus, the flushing oil comes into such intimate contact with all parts of the crank case and the moving parts therein as to be able to remove, by absorption or washing, all such acids. This flushing oil being new, clean oil has a maximum absorption efficiency for such acids.

In some cases it may be found desirable to by-pass either or both of the filters 23 and 24 and maintain a cyclic circulation of flushing liquid between the lubricant containing case, the connection therebetween and the pump,

and the connection from the pump to the lubricant containing case, particularly when washing or flushing the transmission and differential casings. In such event, the hose 37 is detachably connected directly to the top of the three-way valve 34', as illustrated in dotted lines at the left of Fig. 1.

By the term "lubricant container" as used in the claims I intend this to be defined as the element illustrated in the drawings and designated 1, i. e. a power unit containing moving parts adapted to be lubricated by lubricant contained in the casing. I disclaim the use of the term "lubricant container" in this application merely as a storage tank for lubricant.

I claim as my invention:

1. An apparatus, comprising in combination, a lubricant container, a pump, connections for the inlet and discharge of said pump adapted to have communication with the inlet and discharge of such lubricant container, a filter interposed in such connections whereby cleaning oil is caused to have a cyclic circulation through the lubricant container, pump and filter, a storage receptacle containing cleaning oil, connections between the latter and said pump, and a second storage receptacle isolated from said cyclic circulatory system to which used lubricant and cleaning oil may be passed.

2. An apparatus, comprising in combination, a lubricant container, a pump, connections for the inlet and discharge of said pump adapted to have communication with the inlet and discharge of such lubricant container, a filter interposed in such connections whereby cleaning oil is caused to have a cyclic circulation through the lubricant container, pump and filter, a storage receptacle containing cleaning oil, connections between the latter and said pump, and a second storage receptacle isolated from said cyclic circulatory system to which used lubricant and cleaning oil may be passed, and means, including a valve, for diverting used lubricant directly to said storage receptacle without passing same through the cyclic circulatory system.

3. An apparatus, comprising in combination, a lubricant container, a pump, connections for the inlet and discharge of said pump adapted to have communication with the inlet and discharge of such lubricant container, a filter interposed in such connections whereby cleaning oil is caused to have a cyclic circulation through the lubricant container, pump and filter, a storage receptacle containing cleaning oil, connections between the latter and said pump, and a second storage receptacle isolated from said cyclic circulatory system to which used lubricant and cleaning oil may be passed, means operable to pass the used lubricant or flushing oil either to the cyclic circulatory system or the storage receptacle.

4. An apparatus, comprising in combination, a lubricant container, and a portable cleaning apparatus therefor including a movable support and a cyclic circulatory system 5 mounted thereon including a pump, connections for the inlet and discharge end of said pump adapted to have communication with the inlet and discharge of such lubricant container, a filter interposed in such connections, 10 a storage receptacle containing cleaning oil, connections between the latter and said pump, and a second storage receptacle isolated from said cyclic circulatory system to which used lubricant and cleaning oil may be passed.
- 15 5. An apparatus, comprising in combination, a lubricant container, and a portable cleaning apparatus therefor including a movable support and a cyclic circulatory system mounted thereon including a pump, connections 20 for the inlet and discharge end of said pump adapted to have communication with the inlet and discharge of such lubricant container, a filter interposed in such connections, separate storage receptacles each containing different kinds of cleaning oil, valved connections 25 between the latter and said pump permitting withdrawal from the desired receptacle, and an additional storage receptacle isolated from said cyclic circulatory system to which used lubricant and cleaning oil may be 30 passed.
6. An apparatus comprising in combination a lubricant container, a pump, connections 35 for the inlet and discharge of said pump adapted to have communication with the inlet and discharge of such lubricant container, separate independently operable filters interposed in such connections whereby cleaning oil is caused to have a cyclic circulation 40 through the lubricant container, pump and desired filter, a storage receptacle isolated from said cyclic circulatory system to which used lubricant and cleaning oil may be passed, branches communicating between said pump 45 discharge and each of said filters, and a control valve interposed in the connections between the pump and said filters.

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