

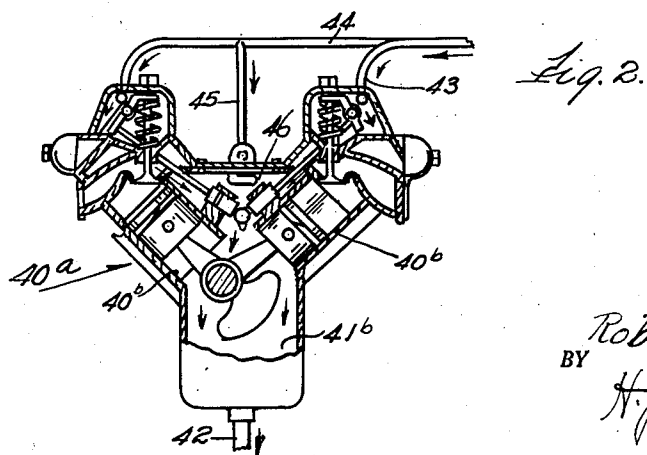
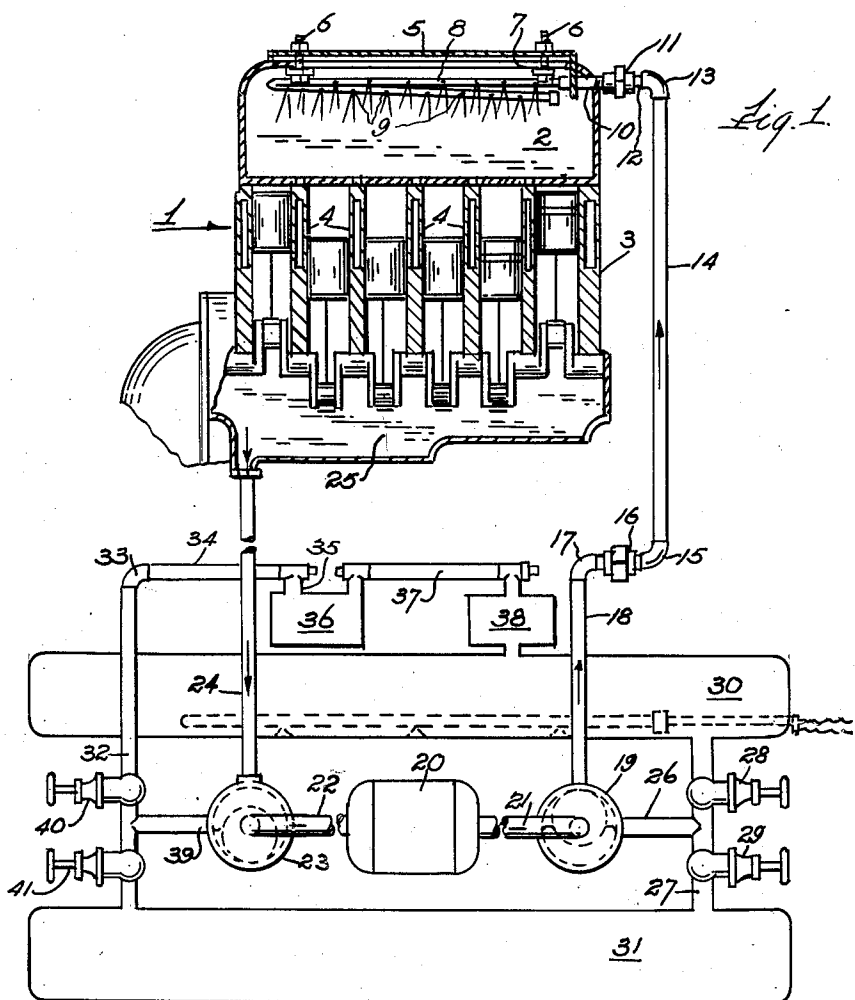
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APPARATUS FOR CONDITIONING MOTORS

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APPARATUS FOR CONDITIONING MOTORS

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This invention relates to conditioning and cleansing means for motors and more particularly to de-sludging apparatus for this purpose. One object is to provide a readily assembled device that is easily and quickly applied to internal combustion engines for the removal of sludge and dirt and for the cleansing of screens, bearings, pistons, valves, rings etc. without dismantling the engine, without taking it out of service or "hospitalizing" it during the instant process, and without passing the cleansing or rinsing material through the carburetor, thus making it unnecessary to vaporize the material.

A further object is to provide conditioning and cleansing means that may be applied, operated and thereafter dismantled without calling for the services of skilled mechanics, that is automatic in operation, simple in structure, speedy in use and inexpensive to manufacture.

A still further object is to provide conditioning and cleansing means for motors that is useful in servicing different types of motors, viz. V-types, overhead valve types, in-head valve types, in-line types, diesel engines or motors, etc.

More specifically the invention provides means for "bathing" the motor with a liquid solvent under pressure to remove the sludge; removing the cleansing mixture or compound without diluting or otherwise impairing the crankcase lubricant or even temporarily impairing the efficiency of the motor; the cleansing operation requiring very little time, and that is inexpensive in use.

More particularly, it is an object of the invention to provide means by which the motor may be rapidly and conveniently subjected to a cleaning operation in all of its principal operating mechanisms without substantial dismantling of operative parts of the motor. Also, to provide such means which can be conveniently used to thoroughly clean the motor of a vehicle which is driven into the service station, and which cleaning operation may then be conducted in a short time, and while the driver or occupant of the vehicle awaits completion of the operation.

In connection with the foregoing it is a further object of the invention to remove the crank case oil from the crank case through connection applied to the sump or drain opening as a preliminary operation, and to send such crank case oil to storage in a special receptacle, to be held in such receptacle without contamination by the cleansing agent or liquid during the cleaning operation. The equipment to be hereinafter disclosed is such that, having thus removed the crank case oil and sent it to storage, the cleaning operation proper may be conducted and carried on as long as needed to produce an effective cleaning job. Having completed such effective cleaning job the equipment hereinafter disclosed is such that the crank case oil may next be restored, if desired, to the crank case for further use, and substantially without contamination from the cleaning liquid which was used during the cleaning operation. If desired, however, new crank case oil may be supplied to the motor after the cleaning operation has been completed, either as a sub-

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stitute for the previously drained crank case oil or as a supplement thereto.

In connection with the foregoing operation it is here noted that many, if not the great majority, of the internal combustion motors presently in use for vehicle propulsion, are so designed and built that cleansing or lubricating liquid introduced at the top of the cylinder block or blocks, and applied to the external surfaces of the cylinder head or heads, and to the valve stems, springs, rocker arms, cam shaft, and other moving parts, can flow down and be collected in the crank case. It is thus evident that if the cleaning operation were to be conducted prior to removal of the oil from the crank case the cleaning liquid and the crank case oil would become commingled. Since the cleaning operation involves a spraying of the cleaning liquid onto and around the moving parts at or on the heads of the cylinder blocks, and under heavy hydraulic pressure, it is evident that the so-sprayed cleaning liquid will carry the dirt, grime, grit, and other materials removed from the cylinder heads and moving parts, down into the crank case. If the crank case oil had not been previously removed it is evident that such fouling materials would be thus introduced into the crank case oil with consequent fouling thereof.

It is also noted that any cleaning liquid which will effectively clean the cylinder heads and moving parts must have a strong cleaning quality or agency. Such a liquid could not properly be mixed with the crank case oil without destroying the value of such oil as a motor lubricant.

Now the operation of withdrawing the crank case oil from the crank case and sending it to storage for retention during and until completion of the cleaning operation, or for a flushing operation directly after such cleaning operation, does not require the development of a high discharge pressure by the pump used for such withdrawal operation. This operation is essentially a suction of the crank case oil from the crank case and low pressure delivery of such oil to storage. On the contrary, the cleaning operation produced by use of the cleaning agent by a strong spray requires the development of a relatively high hydrostatic pressure on the delivery side of the pump used for such cleaning operation. At the same time the pump used for such cleaning operation need develop only a slight suction (if any) to take the cleaning liquid from its supply tank. Thus the two operations of first removing the crank case oil and sending it to storage, and second, delivering the cleaning liquid to the spray nozzles for producing an effective cleaning function, are of very different characteristics. Accordingly, I have provided two pumps for these two operations so that each pump may be of specifications best adapted to meet the requirements of the main function which it performs. These pumps I designate as the "drain pump" and the "spray pump," respectively.

I have provided a single motor and driving connections from the shaft of such motor to the rotors of both of the pumps. I have also provided an intake or suction connection to the intake of the "drain pump," which connection may be attached to the sump or drain of the crank case. The delivery of such "drain pump" is then connected to both the storage tank for the crank case oil and to the cleaning liquid tank (preferably through suitable filters). Valves are provided in said last connections so that the liquid being withdrawn from the crank case by the "drain pump" may be sent to either the crank case oil storage tank or the cleaning liquid tank, according to the operation then in progress. I have provided intake connections from both the storage tank for the crank case oil and the cleaning liquid tank to the intake of the "spray pump," together with valves in said

connections so that such pump may draw liquid from either the storage tank for the crank case oil or the cleaning liquid tank as desired. The delivery of such "spray pump" may then be connected to the spray nozzle or nozzles for the high pressure cleaning operation.

It is noted that the "drain pump" should be delivering cleaning liquid to the cleaning liquid tank (generally through the filters, if provided) during the time that the "spray pump" is delivering liquid under heavy pressure to the spray cleaning nozzles. Also that the "drain pump" should be delivering crank case oil to the crank case oil storage tank during the draining of such crank case, but that during such draining of the crank case it may or may not be desired to deliver liquid to the spray nozzles. If no delivery of liquid to the spray nozzles is to be effected at such time both of the valves leading to the intake of the "spray pump" may be closed so that such pump will then be operating without supply to its intake and with no delivery of liquid, being merely an evacuation operation. This will generally be the desired operation during the preliminary operation of draining the oil from the crank case, since no recirculation of such oil will be desired at such time. However, it will frequently be desired to re-circulate the crank case oil without supply of the cleaning liquid, after the cleaning operation has been completed, and for the purpose of flushing out the slight amount of cleaning liquid left on the surfaces which it has contacted. Such flushing operation may be effected by opening the valve between the crank case oil tank and the intake of the "spray pump," the valve between the delivery connection of the "drain pump" and the crank case oil tank being open, and the valve between the delivery connection of such "drain pump" and the cleaning liquid tank being closed.

Having drained the oil from the crank case the valves may be re-adjusted so that the delivery connection of the "drain pump" will be connected to the cleaning liquid tank and so that the inlet to the "spray pump" will be connected to the cleaning liquid tank. Under these conditions the cleaning liquid will be continuously delivered under high pressure to the spray nozzle or nozzles, effectively cleaning the motor cylinder block heads and moving parts, flowing down to the crank case, cleaning the moving parts therein, and being drained from such crank case and sent to the cleaning liquid storage tank or the filters leading thereto. This cleaning operation may be continued as long as desired.

At conclusion of the cleaning operation outlined above the valves may be again adjusted so as to shut off the supply of further cleaning liquid to the nozzles while still allowing the "drain pump" to draw liquid from the crank case and send it to the cleaning liquid tank until all of the cleaning liquid shall have drained down from the higher portions of the motor and into the crank case, and shall have been removed from said crank case and sent to the cleaning liquid tank. Then the valve leading from the "drain pump" to the cleaning liquid tank may be closed and the valve leading from the crank case oil storage tank to the inlet to the "spray pump" inlet may be opened. Thereupon oil will be drawn from the said storage tank by the "spray pump" and delivered under heavy pressure to the spray nozzle or nozzles, effectively flushing off the cleaning liquid previously left on all of the parts of the cylinder block head location. Such flushing oil and removed cleaning liquid will then drain down into the crank case where any cleaning liquid remaining therein will be taken up and delivered from the crank case to the inlet of the "drain pump." Thence it may be sent to the storage tank for crank case oil.

If the crank case oil is now excessively diluted by cleaning liquid or is excessively fouled (as generally it will be so excessively diluted or fouled), the valve leading to the "spray pump" intake may be closed, the "drain pump" may then be run to completely drain the crank case, and the "drain pump" intake may be disconnected

from the crank case sump which will then be plugged in the conventional manner. Then the proper quantity of fresh oil may be introduced into the crank case.

It is a prime object of my present invention to provide the instrumentalities to enable each and all of the foregoing operations to be performed in very simple and convenient manner. It is a further object of the invention to bring said instrumentalities together into a unitary device which can be readily moved from place to place as needed, and which can be readily connected to the proper parts of the motor, expeditiously and conveniently and without the need of using special tools therefor.

A further feature of the invention relates to the provision of a unitary motor head enclosure or unit or cover which can be temporarily substituted for the "bonnet" or enclosure which is conventionally placed on to the cylinder block to enclose and house the moving parts such as the valve stems, the rocker arms, and other elements. This substitute head or cover is provided with an elongated spray nozzle of nozzles to direct the cleaning liquid effectively against the parts to be cleaned by the spraying operation. After the cleaning operation has been completed this substitute head may be readily removed and the conventional and permanent bonnet or head restored to its position on the cylinder block and secured in place thereon.

A further feature of the invention relates to the provision of an arrangement such that the successive changes from drainage of the crank case oil to temporary storage, then delivery of the cleaning liquid to the spray nozzles under heavy pressure for the cleaning operation, with re-circulation of such cleaning liquid for such interval of time as may be needed to effect desired cleaning of the motor, then restoration of the cleaning liquid to storage, and finally, circulation of the previously drained and stored crank case oil for such an interval of time as may be needed to effectively flush out the cleaning liquid which shall have remained on the surfaces of various elements and parts of the motor, may all be rapidly effected so that the overall time needed to carry through the cleaning operation may be reduced to a minimum. This result is secured by the provision of the various valves by which the successive operations are made possible, and are controlled. All of these valves are grouped close together so that they may be successively operated with maximum convenience.

Other objects and advantages of the invention will become apparent from the following description of what I at present consider a preferred embodiment thereof, as defined in the claims and illustrated in the accompanying drawings, wherein:

Fig. 1 is a view partly in vertical section and partly diagrammatic of a valve-in-line motor illustrating the application of the instant de-sludging mechanism, and,

Fig. 2 is a vertical sectional view of a conventional V-type motor showing pipe connection leading to the de-sludging apparatus.

Referring now to Fig. 1 of the drawings, the reference numeral 1 denotes the motor, in this case an "in line" type six cylinder motor. To apply the instant device I remove the motor bonnet and apply my adapter head or cover 2 to the motor block 3 in which the cylinders are located, said head 2 having a cap 5 secured in position by bolts 6, said head 2 having an opening 7 closed by said cap, said head provided with the pipe 8 extending longitudinally thereof near the top, said pipe bent into approximately a V-shape and formed with a plurality of perforations 9 disposed downwardly, one end of said pipe removably secured to the link 10 carried by the wall of cap 5, said link at its outer end connected by coupling 11 to a short pipe 12 and elbow 13 to the conduit 14 disposed vertically downwardly and at its lower end connected by the elbow 15, coupling 16 and union 17 to the pipe 18 leading into the liquid pressure or spray pump 19 connected to the electric motor 20 by the shaft

21, said motor connected also by shaft 22 to the suction or drain pump 23 which may be connected by the conduit 24 to the crankcase 25 of the motor.

Leading from the spray pump 19 is a pipe 26 connected to the line 27 provided with the valves 28, 29, upon opposite sides of the pipe 26, said line 27 connecting the solvent or cleaning liquid storage tank 30 to the rinse or crankcase oil tank 31 which is connected by pipe 32, elbow 33, pipe 34 and connection 35 to the filter 36 joined by connection 37 to the filter 38 connected directly to the aforesaid solvent storage tank 30.

Referring again to said drain pump 23 the same is connected by conduit 39 to the said pipe 32 which is provided upon opposites of conduit 39 with the control valves 40, 41, the latter being located between conduit 39 and the said crank case oil tank 31.

Referring now to Fig. 2 a V-type motor 40a is shown having a plurality of cylinders 40b in the crankcase 41b from which a conduit 42 leads to the spray pump 19 while a pipe 43 leads into the motor upon one side while a pipe 44 leads from the pump to the V upon the side opposite to cylinders 40b, and a branch 45 leads from the pipe 44 into the valley 46 of the motor. A suitable adapter (not shown) is provided for the V-type motor that is similar in application and purpose to the adapter for the motor of Fig. 1 except that it is shaped to conform to the shape of the motor of Fig. 2.

In operation the mechanism shown in Fig. 1 includes the two tanks 30, 31 which are mounted upon a truck (not shown), together with the adapter and connections so that the device is entirely portable, operable by one attendant and mainly automatic in action. With this apparatus it is not necessary to vaporize the de-sludging and cleansing material before it can be used but this material is introduced and used in liquid form from start to finish, this being due to the fact that the material is not passed through the carburetor. In order to use the instant motor cleaner it is first necessary to draw the old oil from the crankcase and then connect the return line to the tank 30, connect the adapter cap to the head 2, connect pipe 24 to the crankcase and fill the crankcase with the cleaning fluid through the filler plug. Now open valve 28 in pipe 27 leading from the storage tank 30 which allows solvent to enter the pump 19 through pipe 26, open valve 40 in pipe 32 and start the motor 20 to operate pump 19 and force cleaning liquid through pipes 18 and 14, through pipe 8 and out through perforations 9 into the head 2 from which it drains through the engine into the crankcase and is drawn out through the pipe 24 into pump 23 and from which it is forced out through pipe 39, valve 40, pipes 32 and 34 into the filter 36 and out through pipe 37 into filter 38 and back into the tank 30.

Valves 41 and 29 are closed when the foregoing is taking place. Now to rinse the motor close valves 28 and 40 and start motor 20 which draws oil from tank 31 through valve 29, pipe 26 and pump 19, through pipes 18, 14 and into pipe 8 from which such oil is sprayed through perforations 9 into the head of the engine from which the liquid drains into the crankcase and is drawn out through pipe 24, pump 23, pipe 39, valve 41 into the tank 31. Repeat as may be necessary for thoroughness. For V-type motor the process is the same.

Conventional constructions of internal combustion engines include openings and passages extending down from the space within the hood or bonnet 2 to the crank case. Such openings and passages frequently include clearances around the push rods which extend up from the cam shaft (in or connected to the crank case space) to the valve rocker arms which are located above the cylinder block or blocks and within the space enclosed by the hood or bonnet 2. Said openings and passages

communicate with the space within the bonnet 2 through openings and passages in the floor of such space. Thus the cleaning fluid from the spray nozzles or openings 9 may freely flow down into the crank case as already referred to.

What is claimed is:

1. Means to clean moving operative parts of an internal combustion engine, which engine is provided with such moving parts adjacent to the heads of the cylinders and external to said cylinders, and which engine is provided with a crank case in its lower portion and enclosing the crank shaft and connecting parts and other moving parts of the engine, said crank case being provided with a drain opening and removable means to close said drain opening, and which engine includes passages extending down from the space around the moving parts which are adjacent to the heads of the cylinders into communication with said crank case, said cleaning means including a bonnet of size and contour to overlie and enclose the moving parts which are adjacent to the cylinder heads in liquid sealing fashion, a manifold in said bonnet, a plurality of spray nozzles within said bonnet and in fluid connection with said manifold and provided with spray orifices adapted to deliver cleaning liquid towards said moving parts which are adjacent to the cylinder heads, said cleaning means including a cleaning liquid tank, a crank case oil storage tank, a drain pump having an inlet connection and a delivery connection, a spray pump having an inlet connection and a delivery connection, a liquid supply conduit in connection with the inlet connection to the drain pump and removably connectable to the drain opening of the crank case, a pressure liquid delivery conduit in connection with the delivery connection of the spray pump and removably connectable to the manifold in the cylinder head bonnet, liquid delivery conduits extending from the delivery connection of the drain pump to the cleaning liquid tank and to the crank case oil storage tank, a valve in each of said conduits effective to control delivery of liquid from the drain pump to either of said tanks selectively, liquid supply conduits extending from the two tanks to the inlet connection of the spray pump, a valve in each of said conduits effective to control supply of liquid from either of said tanks to the inlet connection of the spray pump selectively, and means to drive both of the pumps.

2. Means as defined in claim 1, wherein the means to drive both of the pumps comprises a motor and driving connections from such motor to the rotors of both pumps.

3. Means as defined in claim 2, wherein the rotors of both of the pumps and the output shaft of the motor are all in alignment, and wherein the rotors of the two pumps are connected to the two ends of the output shaft of the motor.

4. Means as defined in claim 1, together with means to supportably connect the manifold to the bonnet, and wherein said bonnet and manifold comprise a unitary structure.

5. Means as defined in claim 4, wherein the bonnet is removably connected to the heads of the cylinders.

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