Jan. 16, 1940. J. BOEZI ET AL 2,187,413

APPARATUS FOR CLEANING AND FLUSHING RADIATORS AND THE LIKE

Filed July 1, 1935 2 Sheets-Sheet 1

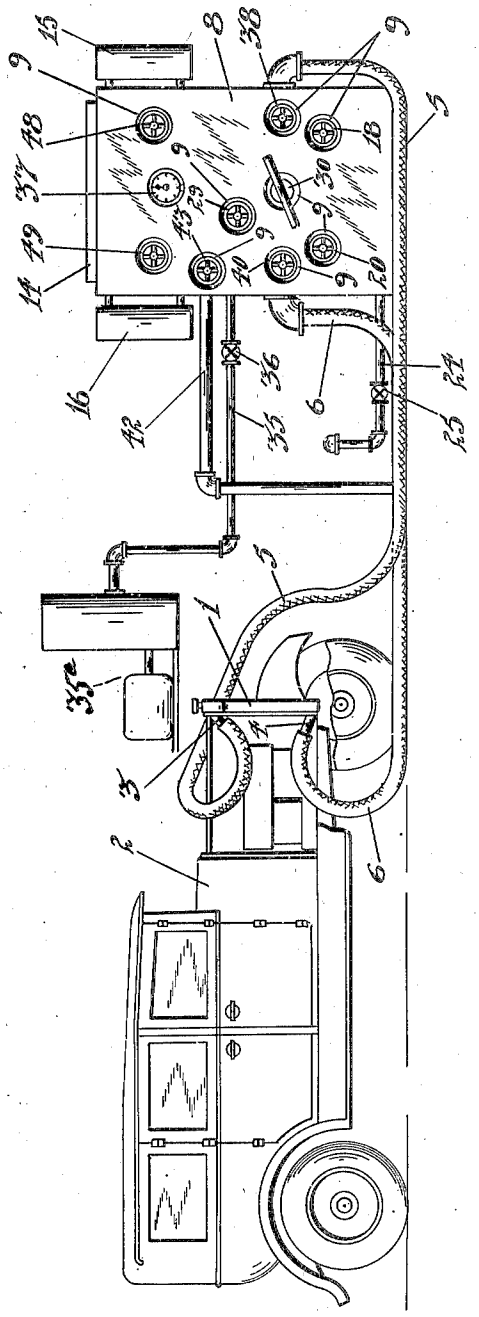


Fig. 1.

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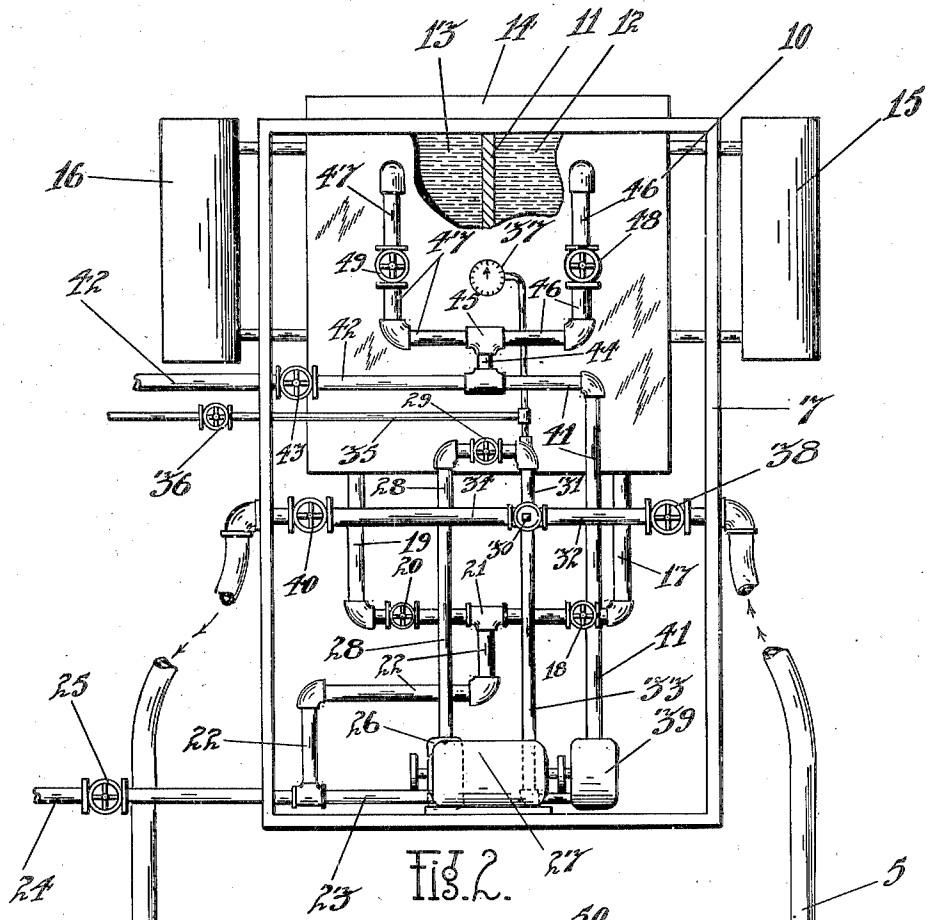
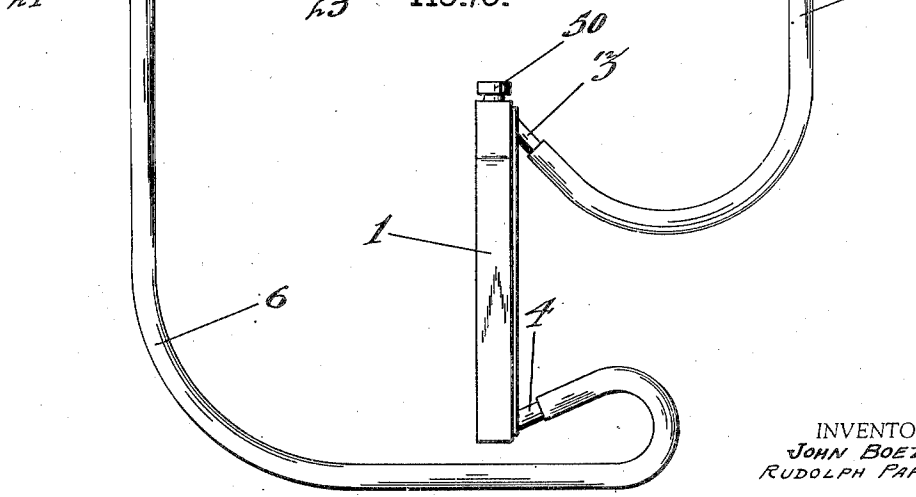


Fig. 2.



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2,187,413

APPARATUS FOR CLEANING AND FLUSHING RADIATORS AND THE LIKE

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8 Claims. (Cl. 141—1)

Our invention relates to an apparatus for cleaning and flushing radiators and the like and has for its primary object the provision of a means whereby the cleaning, blowing, and flushing of a chamber or passage may be accomplished with expediency, with a minimum of time and labor and with economy.

Although our invention is particularly adaptable to and will be described in connection with the cleaning of automobile radiators and cooling systems, it will be clear from the description and drawings that the same is adaptable for other articles as well and we do not limit ourselves, therefore, to this particular use.

In practice prior to this invention, the adequate and complete cleaning of an automobile radiator required that it be removed from the vehicle so that it could be placed in a tank and moved around to accommodate the various steps of treatment in the washing and flushing operations. This required considerable time and involved the labor and expense of removing and re-installing the radiator as well as the handling thereof during the cleaning operations.

By our invention, we have provided an apparatus by means of which a radiator and motor block can be completely and effectively cleaned without removing the same from the vehicle and by means of which cleaning solutions may be circulated through the radiator, removed therefrom without waste, and also by which different solutions can be run through the radiator with or without air pressure and agitation, without changing connections and by the simple expedient of manipulating certain valves.

Our invention constitutes a compact unit which may be either stationary or portable and which provides by means of mere valve control means for performing all of the necessary operations in order to completely clean a radiator or the like.

One particular feature of our invention deserving special mention is the use of a circulating system including two pumps, one being effective to force the cleaning solution into and through the radiator and the other being arranged to draw the same therefrom.

Other objects and advantages will be apparent as the description proceeds, reference now being had to the figures of the accompanying drawings forming a part of this application and wherein like reference numerals indicate like parts.

In the drawings:

Figure 1 is a front view of our improved apparatus illustrated in operative relation to the radiator of a vehicle.

Figure 2 is a detail view of the unit assembly with the front panel of the casing of the apparatus removed to show the arrangement of valves and conduits, certain parts being broken away for clearness of illustration.

The reference character 1 indicates characteristically the radiator of an automobile 2, such radiator being provided with the usual inlet 3 and outlet 4, constituting part of the circulating system from the radiator to the motor. When it is desired to clean a radiator with our invention, the same need not be removed from the vehicle but merely the hose connections between the inlet and outlet passages 3 and 4 removed and a hose 5 attached to the inlet 3 and a hose 6 attached to the outlet 4 whereby flexible pipe connections are thus provided between the radiator and our cleaning apparatus.

The cleaning apparatus may be and preferably is enclosed within a casing or housing 7 provided with a suitable panel front cover 8 having suitable openings 9 therethrough to permit easy access to the various valve controlling devices.

Suitably mounted within the casing 7 is a tank 10 which may be divided by a partition 11 whereby two compartments 12 and 13 are provided and adapted to receive the desired cleaning solutions used in connection with cutting the grease, oil, dirt, scale, and other foreign substances from within the radiator 1. Any suitable cover means 14 may be provided for the tank 10.

There is also provided for each of the receptacles 12 and 13, heaters 15 and 16 respectively, the same being of any desired or conventional type and having suitable connections with the adjacent tank compartment whereby the solutions therein may be brought to the desired temperatures.

Leading from and communicating with the bottom of tank receptacle 12 is a pipe 17, the passage through which is controlled by a valve 18. Similarly leading from and communicating with the bottom of the tank receptacle 13 is a pipe 19, the passage through which is controlled by a valve 20. These pipes 17 and 19, beyond the valves 18 and 20, are joined by and communicate with a common coupling 21 leading from which is a pipe connection 22 communicating with a pipe 23 which communicates at one end with a pipe 24 constituting a water supply line under the control of valve 25, and communicating at its opposite end with a pump 26 of any desired design and type and driven in any suitable manner

from an electric motor or other source of power 27.

The pipe 28 leads from the pump 26 to a control valve 29 and thence to a fourway control valve 30 with which pipes 31, 32, 33, and 34 communicate. The pipe 31 communicates with the pipe 28 through the valve 29. Also communicating with the pipe 31 is a compressed air line 35 connected with a suitable source of compressed air 35a under control of the valve 36, an air pressure gauge 37 also being provided in this line. The pipe 32 communicates with the hose 5 through control valve 38. The pipe 33 communicates with a second pump 39 also suitably driven by the motor 27. The pipe 34 communicates with the hose 6 through the control valve 40.

Leading from the pump 39 is a pipe 41 which communicates with a drain pipe 42 under the control of a valve 43. This pipe 41 also communicates through pipe 44 and coupling 45 with pipes 46 and 47. Pipe 46 communicates with the tank receptacle 12 adjacent its upper end and is provided with control valve 48. Pipe 47 communicates with the tank receptacle 13 adjacent its upper end and is provided with control valve 49.

It will be understood, of course, that the various pipes and passage connections herein described, and the flexible hose members 5 and 6 may be of any desired size or length, as well as arrangement, the form shown being typical and illustrative of a very convenient centralized unit assembly which has proven very efficient in operation.

The operation of our invention will now be described.

Assuming first that the operator has disconnected the short hose connections between the members 3 and 4 of the radiator 1 and has connected the hose members 5 and 6 thereto instead, and assuming that the radiator has been drained in the conventional manner, the first operation is to circulate through the radiator a suitable solution, for instance, from the tank receptacle 12, for the purpose of cutting the grease, and oil, from the interior of the radiator. The solution in the tank receptacle 12 having been heated to the desired temperature by the heater 15, the operator first opens valves 18 and 48, valves 20 and 49 being closed, so that the solution in tank receptacle 13 will not circulate. Valve 25 in the water line is also closed and likewise valve 36 in the air line. Valves 38 and 40 controlling the passage through the hose members 5 and 6 are opened as is also valve 29 between pump 26 and the four-way valve 30.

The motor 27 is now started and with it the pumps 26 and 39.

The solution from tank receptacle 12 now flows through pipe 17, through the open valve 18, to the coupling 21, thence through the pipes 22 and 23 to the pump 26 where it is forced through the pipe 28, valve 29 and pipe 31 to the four-way valve 30 which has been adjusted to permit the flow through the pipe 34, open valve 40, hose 6, radiator connection 4, into the radiator 1 through which it is forced out through the connection 3 and hose 5 to pipe 32 through the open valve 38, thence again through the four-way valve 30 which in this setting, directs the flow through the pipe 33 to the pump 39 which forces it through the pipes 41 and 44, coupling 45, pipe 46, and open valve 48 back into the tank receptacle 12. Thus there is provided a complete circulation of the cleaning solution from the tank receptacle 12 through the radiator and back into the tank 12 without waste. This circulation is continued until the oil and grease or other foreign substances which this particular solution is designed to cut loose, are entirely loosened.

When this has been completed, the next operation is to return the solution remaining in the radiator and pipes to the tank receptacle 12 and thus evacuate the radiator 1. To do this the operator merely closes the valve 18, adjusts the four-way valve 30 to reverse the flow therethrough, that is so position valve 30 that fluid entering the same from pipe 31 is emitted therefrom through pipe 32, such fluid, due to the closure of valve 18, comprising only the fluid remaining in the pipes 22, 23, 28 and 31 between valve 18 and valve 30, and continues the pumping as before. Therefore by the above mentioned reversal of valve 30 fluid entering valve 30 from pipe 34 is emitted from the same through pipe 33 and the reverse circulation therefore is from the bottom of the radiator 1 through the connection 4, hose 6, valve 40, pipe 34, valve 30 and pipe 33, by the pump 39 and through pipes 41, 44 and 46 back into the top of the tank receptacle 12. This operation is continued until all the solution has been pumped back into the tank. This solution can be thus used over again a number of times which is a real factor of economy.

The next operation is to flush out the radiator with water so as to remove the grease and dirt which has been cut loose by the solution.

In performing this operation, the valve 48 is now closed and the valve 18 left closed. This cuts off the tank receptacle 12 from the circulatory system.

Valve 43 in the drain pipe 42 is now opened. The valve 25 in the water line 24 is also opened and the four-way valve is re-set as first described. The operation now is that the pump 26 draws water in through the pipe 23, forces it upwardly through pipe 28, valve 29, pipe 31, four-way valve 30, pipe 34, valve 40, hose 6, and connection 4 into the bottom of the radiator 1, thence outwardly through the connection 3 at the top of the radiator, hose 5, valve 38, pipe 32, four-way valve 30, pipe 33, and into the pump 39 which forces it upwardly through pipe 41 and to the drain pipe 42 through the open valve 43. This flushing operation is continued until the water has carried out the dirt, grease, etc., which was previously cut loose by the solution from tank receptacle 12. During this flushing operation, and after it has proceeded for a time, the valve 36, in the air line 35 is opened, admitting compressed air into the pipe 31, this air passing with the water therein to the four-way valve 30, thence through pipe 34, valve 40, and hose 6 to the radiator and on through the rest of the circulatory system, just described. This air in addition to adding impetus to the flow of the water through the system, serves to agitate the same and has a loosening effect within the radiator which greatly facilitates the cleaning and flushing operation.

Under certain circumstances such as if the radiator is clogged and carries an excess amount of foreign matter which is difficult to force through the hose 5 and pump 39, to the drain pipe, the valve 38 may be closed and the conventional radiator cap or closure 50 removed and the operation just described continued. In this case, the air and water forced into the radiator 1 at the bottom, will simply blow out at the top

instead of passing through the hose and pump 39 to the drain pipe.

It is optional as to the type of solution which may be provided in the tank receptacle 13 whereby one may be used while the other is being heated or replenished or it may be a different type of solution such as may cut scale and other substances from the radiator which were not affected by the solution from tank receptacle 12. It is obvious that if the solution in tank receptacle 13 is to be used instead of that in 12, the valves 46 and 18 controlling the outlet and inlet of receptacle 12 are closed and the valves 49 and 20 controlling the inlet and outlet of receptacle 13 are opened. The circulation of the solution from the receptacle tank 13 is identical with that described for the other tank and need not be repeated. The common couplings 21 and 45 make this obvious.

Under certain circumstances and in some instances it may be desirable to merely fill the radiator 1 with a cleaning or cutting solution and agitate the same therein without circulating it therethrough. Our apparatus readily lends itself to this operation as follows: The valve 38 is closed or the hose 5 is disconnected from the radiator at the connection 3, as desired. The water line is closed by the valve 25. The motor is stopped, the valve 40 is opened, and the four-way valve 30 is adjusted to direct air from the air line 35 through the pipe 31, thence through the pipe 34, open valve 40, hose 6, into the bottom of the radiator. The radiator is filled with the desired solution through the conventional orifice at the top thereof and the air is admitted through valve 36 in the desired pressure and amount. The air passes into the bottom of the radiator and up into and through the solution therein, agitating it for the desired length of time. When this operation has been completed, the solution can be drained from the radiator by opening the valves 38 and 43, and starting the motors and pumps, whereupon the solution is drawn through the hose 5, valve 38, pipe 32, four-way valve 30, pipe 33, pump 39, pipe 41, and out through drainage pipe 42, through the valve 43. If desired at this time the water valve control 25 may be also opened and the radiator flushed out at the same time and in the manner previously described. It will be understood, of course, that during such drainage operation, the cap 50 on the top of the radiator should be closed to preclude splashing of the cleaning fluid onto the hood.

It will be understood, of course, that changes may be made in details of construction, arrangement of parts, and operation. We do not limit ourselves, therefore, to the exact form herein shown and described other than by the appended claims.

We claim:

1. A cleaning apparatus for hollow articles comprising two tanks adapted to contain different cleaning liquids, a pressure pump and a suction pump, pipes connecting said tanks, pumps and the opposite ends of the hollow article to be cleaned, valves in said pipes selectively to provide independent circulating systems in either direction through said hollow article from either tank as desired, and selectively to connect the discharge side of one of said pumps with either tank as desired by the manipulation of said valves, and an independent source of liquid adapted to be connected to the intake side of one pump to be circulated through said hollow article.

2. A cleaning apparatus for hollow articles comprising two tanks adapted to contain different cleaning liquids, two pumps, pipes connecting said tanks, pumps and the opposite ends of the hollow article to be cleaned, valves in said pipes selectively to provide independent circulating systems in either direction through said hollow article from either tank as desired, and selectively to connect the discharge side of one of said pumps with either tank as desired by the manipulation of said valves, and means whereby said one pump may be disconnected at will from said tanks and one of said liquids may be forced directly out of the hollow article without being returned to either of said tanks.

3. A cleaning apparatus for hollow articles comprising two tanks adapted to contain different cleaning liquids, two pumps, pipes connecting said tanks, pumps and the opposite ends of the hollow article to be cleaned, valves in said pipe selectively to provide independent circulating systems through said hollow article from either tank, as desired, and selectively to connect the discharge side of one of said pumps with either tank, a source of compressed air, and means for connecting said source with one of said pipes connecting one of said pumps with said hollow article.

4. A cleaning apparatus for hollow articles comprising two tanks adapted to contain different cleaning liquids, a pressure pump and a suction pump, pipes connecting said tanks, pumps and the opposite ends of the hollow article to be cleaned, and valves including a four-way valve in said pipes selectively to provide independent circulating systems in either direction through said hollow article from either tank as desired, and valve means selectively to connect the discharge side of one of said pumps with either tank or a waste pipe as desired by the manipulation of said valves.

5. A cleaning apparatus for hollow articles comprising, in combination, two tanks each adapted to contain a cleaning fluid, a pressure pump and a suction pump, means including a plurality of valves selectively connecting said tanks with each of said pumps, a pipe extending from said pressure pump to a four-way valve, two pipes extending from said four-way valve to separate openings in said hollow article, a fourth pipe extending from said four-way valve to said suction pump, said valve being so arranged as to permit the flow of fluid from or to said first mentioned pipe to or from either of said pipes leading to said hollow article, the pipe leading to said hollow article not in connection with said first mentioned pipe being connected to said fourth pipe, a source of compressed air, means connecting said source with the connection to one of said pumps, an independent source of liquid connected to the intake side of one of said pumps to be circulated through said hollow article, and means whereby the other of said pumps may be disconnected at will from said tanks, whereby one of said fluids with or without air pressure may be forced out of said hollow article without being returned to either of said tanks, and means whereby the temperature of either or both cleaning fluids in said tanks may be varied at will.

6. A cleaning apparatus for hollow articles comprising, in combination, two tanks each adapted to contain a cleaning fluid, a pressure pump and a suction pump, means including plurality of valves selectively connecting said tanks with said pressure pump, a pipe extending from each of said pumps to a four-way valve, two

pipes extending from said four-way valve to separate openings in said hollow article, a fourth pipe extending from said four-way valve to said suction pump, said valve being so arranged as to permit the flow of fluid to or from said first mentioned pipe to or from either of said pipes leading to said hollow article, the pipe leading to said hollow article not in connection with said first mentioned pipe being connected to said fourth pipe, a source of compressed air, means connecting said source with the connection to one of said pumps, an independent source of liquid connected to the intake side of said pump to be circulated through said hollow article and means whereby the other of said pumps may be disconnected at will from said tanks, whereby one of said fluids, with or without air pressure, may be forced out of said article without being returned to either of said tanks.

7. A cleaning apparatus for hollow articles comprising, in combination, two tanks adapted to contain cleaning fluids, a pressure pump, a suction pump, pipes connecting said tanks with each one of said pumps, a four-way valve, a pipe connecting said valve and each of said pumps, two pipes leading from said valve to separate portions of said hollow article, said valve being arranged to connect either of said last mentioned pipes with either of said pipes connecting said pumps and said four-way valve, whereby the direction of the flow of fluid through said hollow article may be alternated as desired, an independent source of fluid adapted to be connected to the intake side of one pump to be circulated through said hollow article, and means whereby the other pump may be disconnected at will from said tanks, whereby one of said fluids may be forced out of said hollow article without being returned to either of said tanks.

8. A cleaning apparatus for hollow articles comprising, in combination, two tanks adapted to contain cleaning fluid, a pressure pump, a suction pump, pipes connecting said tanks with each one of said pumps, a four-way valve, a pipe connecting said valve and each of said pumps, two pipes leading from said valve to separate portions of said article, said valve being arranged to connect either of said last mentioned pipes with either of said pipes connecting said pumps and said four-way valve whereby the direction of the flow of fluid through said hollow article may be alternated as desired, a source of compressed air, an independent source of fluid adapted to be connected to the intake side of one pump to be circulated through said hollow article, and means whereby the other pump may be disconnected at will from said tanks whereby one of said fluids may be forced with or without air pressure out of said hollow article without being returned to either of said tanks.

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