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AUTOMOTIVE COOLING SYSTEM FLUSHING METHOD

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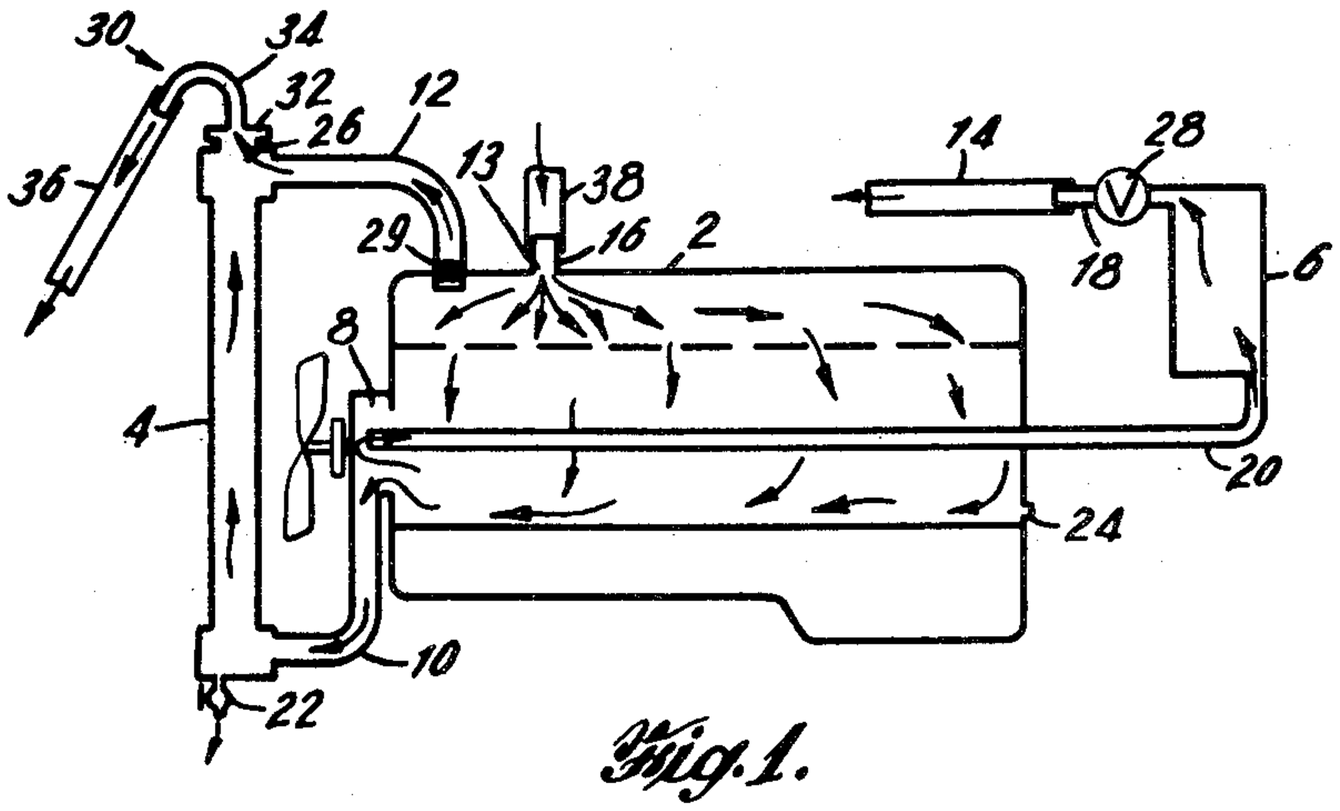

Fig. 1.

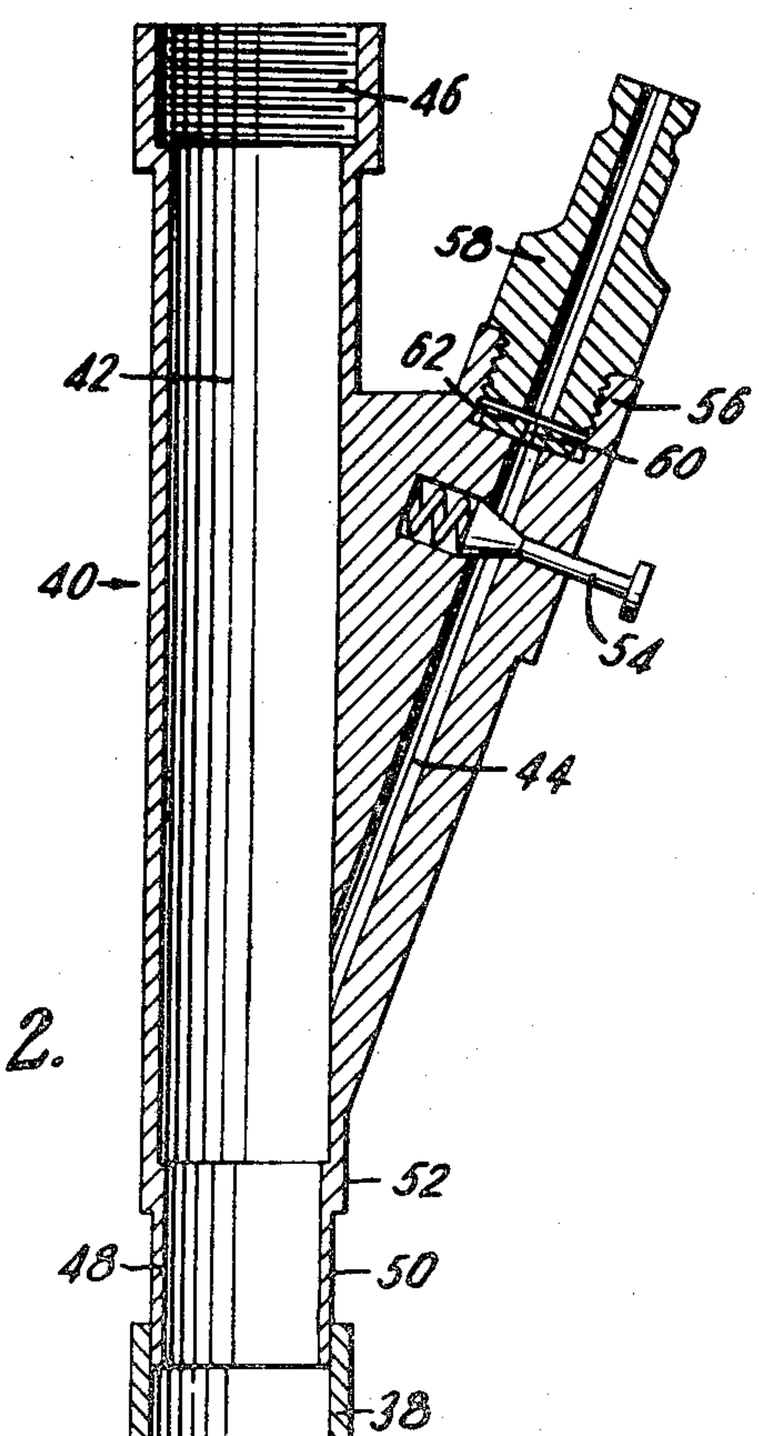

Fig. 2.

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AUTOMOTIVE COOLING SYSTEM FLUSHING METHOD

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The present application is a continuation-in-part of application Serial Number 136,336, filed September 6, 1961, now abandoned.

The invention relates to a novel method for flushing the cooling systems of automobiles.

The cooling system of conventional automobiles comprises a radiator, an engine having flow paths therein, a water pump, and several hoses and conduits connecting these parts. The water pump, which can be considered as a part of the engine, is usually attached to the lower front of the engine and communicates with the flow paths therein. In general, a lower radiator hose connects the water pump and the bottom of the radiator, and an upper radiator hose connects the upper end of the engine flow paths and the top of the radiator, thereby effecting a complete flow circuit through the engine and the radiator. A thermostat is usually placed in the top of the engine near the upper radiator hose to block water circulation when the engine is operating below desired temperatures.

A heater is also included in the cooling system of most automobiles, and is generally located near or in the interior of the automobile. The heater is connected to the other parts of the cooling system by a heater-supply hose slipped tightly over a nipple fitted in a heater-supply aperture on the top of the engine and over a nipple on the heater, and by a heater-return conduit connected to the heater and emptying into the water pump through an aperture therein.

It is well known that automotive cooling systems must be flushed periodically to remove rust, acidic materials, and various other contaminants originating during engine operation. If such a system is not properly flushed, the contaminants may cause corrosion of the metallic parts present, foaming of the coolant, and clogging of the flow paths. Moreover, when such a system is flushed, it is desirable to remove all of the old, contaminated coolant before filling the system with fresh coolant, since any remaining contaminated coolant obviously adversely affects the fresh material. Unfortunately the removal of all of the old coolant can be quite difficult.

In a fully assembled automobile in operating condition, there are generally three openings which are provided for communication with the cooling system. One of these is a radiator filling hole on top of the radiator; another is a radiator drain cock on the bottom of the radiator; and the other is a drain plug, or in older cars a drain cock, on the bottom of the engine. Obviously, these three relatively small openings cannot permit rapid introduction and removal of flushing water, which is required for effective flushing. Moreover, the drain plug on the bottom of the engine can be reached only from underneath the car in most instances, and is generally inaccessible.

The most effective flushing procedure known to date involves disconnecting the upper radiator house, which connects the radiator and the engine, from the radiator followed by the introduction of fresh water into the engine through this hose. The fresh water and old coolant will be forced out of the system chiefly through the radiator filling hole. This procedure provides good cleaning if the thermostat in the engine near the top radiator hose is first removed. Otherwise, the thermostat will

close upon contact with the relatively cool fresh water, and water circulation will be substantially blocked. This is unfortunate since removal of the thermostat is usually difficult and time-consuming. As a result, in actual practice ineffective short-cuts have been taken which fail to remove all of the hold, harmful coolant and other harmful materials.

It is an object of the invention, therefore, to provide a novel, convenient, and effective method of flushing an automotive coolant system, which does not require the removal of the thermostat or the engine drain plug.

Broadly stated, the invention achieves the above objects by a method which comprises disconnecting the heater supply hose from the heater supply aperture on the top of the engine, introducing flushing fluid into the cooling system through the heater-supply aperture on top of the engine from whence it flows through the cooling system and exits therefrom through the radiator filling hole and the heater supply hose. More specifically, the method of the invention comprises introducing tap water into the cooling system through the heater-supply aperture and intermittently injecting air along with the tap water.

In the drawing:

FIG. 1 is a schematic view of a conventional automotive cooling system and the liquid flow therethrough in accordance with the invention; and

FIG. 2 is a sectional view of a suitable apparatus for carrying out the method of the invention.

Referring now to the drawing, and particularly FIG. 1, the conventional automotive cooling system schematically shown there comprises an engine 2 having flow paths therein for a coolant, a radiator 4, a heater 6, and a water pump 8 attached to the engine 2. The radiator 4 is connected to the water pump 8 by a lower radiator hose 10, and to the engine 2 by an upper radiator hose 12. A heater-supply aperture 13 is provided at the top of the engine 2, and a heater-supply hose 14, which in normal operation fits on the heater-supply nipple 16 provided in the aperture 13 and on the heater nipple 18 on the heater 6, is shown disconnected from the heater-supply nipple 16. A heater-return conduit 20 provides a flow connection between the heater 6 and the water pump 8.

A drain cock 22 is provided at the bottom of the radiator 4, and a drain plug 24 is provided near the bottom of the engine 2. The radiator 4 has a radiator filling hole 26 at the top which is usually covered by a radiator cap (not shown). A heater valve 28 regulates the liquid flow through the heater 6, and is usually controlled from the instrument board in the interior of the automobile. In some cars, however, the valve 28 requires for its operation a vacuum supplied by the engine 2. A thermostat 29 fits in the engine 2 near the upper radiator hose 12, and regulates circulation between the engine 2 and the radiator 4.

Also shown in the schematic view is a fluid-deflecting assembly 30. This is not a part of the cooling system, but such an assembly deflects away from the engine 2 any liquid emerging from the radiator filling hole 26 during flushing. The construction of the deflecting assembly 30 is obviously not critical, but a preferred embodiment consists of a standard radiator cap 32 having a hole in its top and a U-shaped nipple 34 attached over the hole, and a hose 36 fitted on the nipple 34.

Shown fitted over the heater-supply nipple 16 is a connecting hose 38, the other end of which fits on the flushing apparatus 40, illustrated in cross-section in FIG. 2. As there shown, the apparatus 40, which can be made of any suitable material such as brass, aluminum, and plastic, comprises a liquid conduit 42 and an air pipe 44 opening into a side of the conduit 42. One end of the conduit 42

has a connection 46 adapted to fit on a flushing liquid-supply hose, suitably a standard garden hose. At the other end of the conduit 42, there is a tubular piece 48 preferably having two different outside diameters 50 and 52, the smaller diameter being nearer the end. The tubular piece 48 is adapted to fit inside the connecting hose 38 mentioned above which fits the heater-supply nipple 16 on the engine 2, as shown in the schematic view. Diameters 50 and 52 are preferably ⅝ inch and ¾ inch respectively since these two sizes correspond to the size of the heater-supply nipple 16, and the hoses which fit thereover, on most cars.

The air pipe 44 has a valve 54 therein, and a connection 56 adapted to fit an air hose at the free end of the pipe 44. Preferably, the air pipe 44 has a quick-connective fitting 58 attached to the connection 56. Also in the pipe 44 is an orifice 60 which limits air flow into the conduit 42. The orifice 60 can be located at any place in the pipe 44, including the fitting 58, as an integral part thereof, but preferably the orifice 60 is provided in the form of a flat plate 62 having the orifice therein and which is held in place between the connection 56 and the fitting 58. Separate plate 62 permits easy cleaning of the orifice 60, and also permits one to change the size of the orifice 60 without completely rebuilding the apparatus. Preferably, the orifice is between about 0.06 and about 0.10 inch in diameter, as will be discussed below.

Referring still to the drawing, an automotive cooling system is flushed in accordance with the invention by removing the radiator cap (not shown) which covers the radiator filling hole 26, placing the deflecting assembly 30 over the hole 26, disconnecting the heater 6 from the heater-supply nipple 16, and introducing a flushing fluid into the cooling system through the heater-supply nipple 16. The flow of the fluid through the cooling system is indicated by the arrows in the drawing. As there shown, the fluid enters the engine 2 from the heater-supply nipple 16, and most of it flows down through the engine 2, out to the water pump 8, through the hose 10, up through the radiator 4, and out the filling hole 26 into the fluid-deflecting assembly 30. Some of the fluid from the heater-supply nipple 16 will flow up through the thermostat 29 and through the upper radiator hose 12 before the relatively low temperature of the fluid closes the thermostat 29. Even after the thermostat 29 closes, however, enough fluid will still flow through the thermostat 29 to clean the relatively small radiator hose 12 effectively, since thermostats are generally provided with small vent holes.

With a heater in the cooling system, as shown in the drawing, part of the flushing fluid will simultaneously flow from the water pump 8, through the heater-return conduit 20, through the heater 6, and out the heater-supply hose 14. The heater valve 28 must be at least partially open and should be fully open to permit rapid flow. Therefore, the heater controls on the instrument board of the automobile are set on "high" for best results. If the valve 28 is operated by a vacuum, the engine 2 is "idled" to supply the vacuum. It will be noticed that all parts of the cooling system are flushed by a flow reverse to normal, which is most effective for cleaning the system.

An important feature of the present invention is that the heater is flushed while at the same time the possibility of damage to the heater, if the heater valve 28 is not fully opened, or if the heater is clogged or closed, is avoided.

Damage to the heater is avoided by virtue of the manner in which flushing fluid is introduced into the cooling system in the present invention. For example, if the flushing fluid, at pressures of up to 80 p.s.i., where introduced at the heater supply hose 14, instead of at 16, the heater would burst or at least be severely damaged if the heater was clogged. Also, if flush water is introduced into heater return hose 20, after disconnecting hose 20 from pump 8, damage to the heater will result if valve 28 is not fully open, or if the heater is clogged. On the other hand, in the present invention, where the flushing fluid is

introduced at 16, the pressure at the heater is always below a value which could cause damage, even if the heater were clogged or the heater valve inadvertently left in a closed position.

Using the arrangement of the present invention, even if the heater valve is inadvertently left in the closed position, damaging pressures cannot be developed at the heater since the open radiator filling-hole acts to relieve the pressure.

Since water is convenient and inexpensive, it is generally used as the flushing fluid for cleaning cooling systems. Normal city water pressure is between 20 and 80 pounds per square inch, and will deliver about 5 to 25 gallons of water per minute to the cooling system depending on the size and length of the water hose and the water pressure. A water flow in excess of 10 gallons per minute is desirable for most effective cleaning. Moreover, intermittent air injections into the flushing water improved the cleaning action of the method of the invention. It has been found that air flow rates between 1 and 15 standard cubic feet per minute are preferable for both cleaning the cooling system and avoiding excessive air pressures which may burst the hoses and harm the cooling system in general.

An orifice having a 0.06 to 0.10 inch diameter will permit air flow rates of between 1 and 15 standard cubic feet per minute at the air pressures usually available in most service stations, i.e., up to 125 p.s.i. In the apparatus 40, the orifice 60 is expressly provided for avoiding too high pressures in the cooling system.

The apparatus 40 of the invention, when attached to the heater-supply nipple 16 by the hose 38, to a water hose at connection 46, and to an air hose at fitting 58, permits convenient and safe air injections along with the flushing water. The valve 54 controls the frequency of the air injections, and the orifice 60 limits air flow to an acceptable rate.

The above apparatus was used in accordance with the method of the invention to clean a cooling system containing 47% glycol, and within 5 minutes no glycol remained in the system. Moreover, only about a minute was required to ready the cooling system for flushing by the above method. Much more time is required by prior art procedures since the thermostat must be removed to achieve comparable cleaning.

After the cooling system is flushed, it will be full of fresh, clean liquid. At least some of this liquid must be removed if the addition of antifreeze is desirable. Of course, the drain cock 22 on the bottom of the radiator may be opened, either before or after flushing, to drain the radiator, but the removal of a greater volume of liquid may be required for the addition of larger volumes of antifreeze. Removal of the drain plug 24 will drain this extra volume, but as stated before this is generally quite difficult. The most convenient procedure is to inject air into the system while the drain cock 22 is open. About 65 percent of the capacity of the system can be emptied by this procedure. This permits a normal addition of antifreeze to the system without removal of the drain plug 24, and moreover the procedure is quite simple, especially when the apparatus is being used.

The method of the invention obviates the removal of the thermostat and engine drain plug, and therefore minimizes the time and effort required for flushing automotive cooling systems. Moreover, the method disclosed herein provides a clean, uncontaminated cooling system even though the labor involved is reduced.

What is claimed is:

1. A method for flushing an automotive cooling system comprising a radiator having a normally closed filling hole near its top, an engine having flow paths connected with said radiator through an upper radiator hose having a normally closed thermostatic valve and through a lower radiator hose, said engine also having a heater supply aperture near the top portion thereof in communication with said flow paths, a heater connected to said

heater supply aperture through a heater inlet hose, a water pump communicating with said radiator and a heater return hose connected between said heater and said water pump; said method comprising:

(1) opening said radiator filling hole,

(2) disconnecting said heater from said heater supply aperture, and

(3) introducing water under pressure into said cooling system through said heater supply aperture to cause said water to circulate through said engine cooling system and exit by passing through said radiator and out said radiator filling hole, and also by passing through said heater and said heater inlet hose.

2. A method for flushing an automative cooling system comprising a radiator having a normally closed filling hole near its top, an engine having flow paths connected with said radiator through an upper radiator hose having a normally closed thermostatic valve and through a lower radiator hose, said engine also having a heater supply aperture near the top portion thereof in communication with said flow paths, a heater connected to said heater supply aperture through a heater inlet hose, a water pump communicating with said radiator and a

heater return hose connected between said heater and said water pump; said method comprising:

(1) opening said radiator filling hole,

(2) disconnecting said heater from said heater supply aperture, and

(3) introducing water under pressure and pressurized air into said cooling system through said heater supply aperture to cause said water and pressurized air to circulate through said engine cooling system and exit by passing through said radiator and out said radiator filling hole, and also by passing through said heater and said heater inlet hose.

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