April 6, 1937. F. H. KANE ET AL 2,076,031

RADIATOR

Filed Jan. 19, 1935

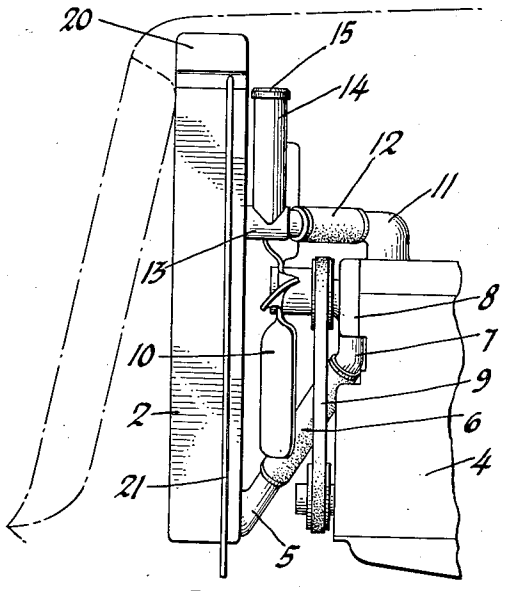


Fig. 1

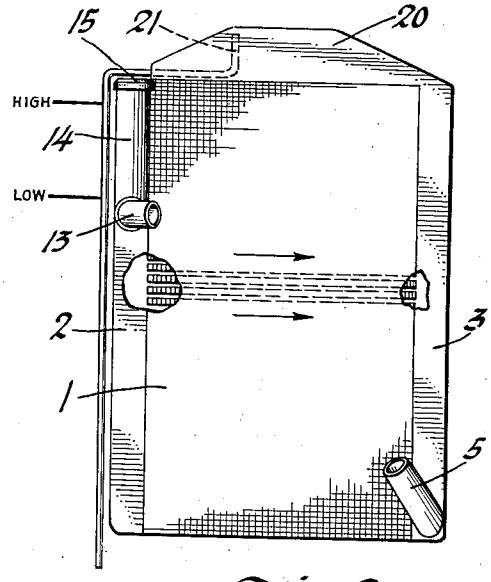


Fig. 2

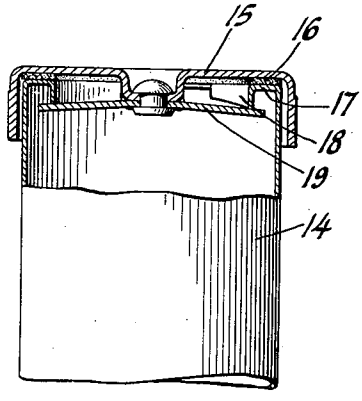


Fig. 3

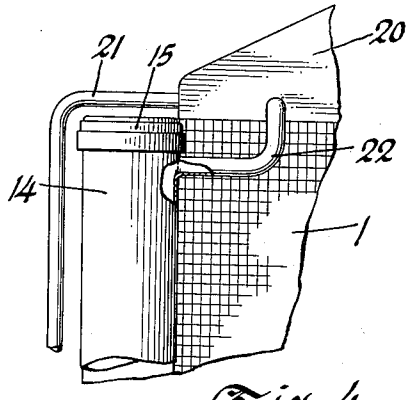


Fig. 4

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RADIATOR

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3 Claims. (Cl. 123—174)

For the last few years the radiator used as a part of the engine cooling system on the Pontiac automobile has been of the cross flow type. This radiator has inlet and outlet headers on opposite vertical sides of a heat radiating core comprising a series of vertically spaced horizontal tubes and only the outlet header is vented. An engine driven pump draws water or other cooling liquid from the bottom of the outlet header and sends it through the engine jacket where heat is absorbed, the heated fluid discharging into the inlet header at a point intermediate the top and bottom thereof for distribution among the several tubes of the core through which it flows in thin streams, giving up its heat and returning to the outlet header for recirculation.

One of the advantages of the system is that the rate of heat dissipation is dependent somewhat on the amount of cooling medium contained in the system. That is to say, the system may be filled to capacity and operated on a large body of water during summer or under conditions that render the heating problem more acute, but on the other hand it may be operated on a volume of heat exchanging medium substantially less than system capacity when cooling is relatively easy, as for example, during cold winter weather. When operated at the low level only a part of the cooling core contains liquid and the empty uppermost tubes are free to condense the vapors passing off in the unvented inlet tank. Inasmuch as such vapors must traverse the core before reaching the vented outlet tank they are condensed and retained in the system and practically no loss occurs through the overflow. This is of special importance in connection with the use of anti-freeze solutions because it conserves the supply, eliminates objectionable vapor odors and enables the car owner to use with complete satisfaction the more volatile but cheaper grades of anti-freeze, as well as a lesser amount thereof.

As heretofore constructed a lateral projection of the outlet header extends across the top of the core out of the direct path of circulation and affords an expansion tank in which the vent or overflow pipe, as well as the filler spout, conveniently are located. A pet cock usually associated with the inlet fitting to the inlet tank indicates the proper low liquid level. In other words, for low level operation, the cooling liquid is poured into the filler spout until it reaches and runs out of the open pet cock. Because the filler spout associated with the expansion tank is so far removed from the actual liquid level determined by the pet cock, it is impossible to insert a hydrometer in the cooling system and reach the liquid for testing its anti-freeze qualities. Should the car owner find it necessary to ascertain the condition of the anti-freeze solution, he must go to the trouble and inconvenience of opening a drain, which usually is more or less inaccessible and necessitates the use of a tool, and catching in a suitable receptacle, some of the liquid running out of the drain. To eliminate this difficulty and permit easy access to the liquid at all times, regardless of low or high level in the system, is one of the objects of the present invention.

A further object is to provide, as a simple and inexpensive expedient in a cross flow cooling system, a standpipe or inspection chamber incorporated as an integral part of the pipe connection fitting to the inlet tank and which allows easy access to the liquid for checking the strength of the solution as well as liquid level, and which additionally serves as a filler spout concealed beneath the engine hood.

Additional advantages will become apparent from an inspection of the accompanying drawing showing a preferred but not necessarily the only embodiment of the invention, and wherein Figure 1 is a side elevation of the radiator and front portion of an engine to be cooled; Figure 2 is a view with parts broken away and looking toward the rear face of the radiator core; Figure 3 is a detail sectional view showing the filler spout and closure cap therefor, and Figure 4 is an elevation of a fragment of a radiator core with an inspection chamber, and illustrates a slight modification.

Referring to the drawing, the numeral 1 indicates a cross flow radiator core between an inlet tank or header 2 and an outlet tank or header 3, each of which communicates with all of the water tubes of the core. Each header is provided with a fitting for connection with the water jacket of the engine 4, that leading from the outlet header 3 being indicated at 5 and extending upwardly from the bottom of the header for connection by a hose 6 with the inlet fitting 7 of the water pump 8. The water pump is driven by a belt 9 from the engine crankshaft which also drives the fan 10 for drawing air through the radiator core to extract heat therefrom. Cooled water from the outlet header is forced by the pump through the engine jacket, absorbing heat therein and leaving through the outlet 11 which is connected by the hose 12 with the fitting 13 associated with the inlet tank at a point substantially below the top of the tank.

Formed as a part of the fitting 13 is the standpipe or inspection chamber 14, extending upwardly behind the radiator and its shell and beneath the engine hood, and terminating at a point adjacent the top of the core, where it is sealed by the closure cap 15.

This closure cap may be of any suitable construction, but for the purpose of illustration is shown in Figure 3 as being of the conventional bayonet locking type. It carries a sealing gasket 16 resting on an inturned flange 17 of the spout and which flange terminates in a dependent camming lip 18 engaged by a cross bar 19 carried by the cover 15.

Extending across the top of the core is an expansion tank 20 which opens into and forms a continuation of the outlet header 3. From this tank leads an overflow or vent pipe 21 which constitutes the only vent to the system. It is apparent, therefore, that the system is vented on the cold water side which reduces loss from the system of steam and liquid vapors.

In the drawing there has been indicated in Figure 2 the high and low levels at either of which the system may be run. In other words, when maximum heat transfer is desirable the system is completely filled, which brings the level to the high indicated line. With the air tight cap in position on the filler spout, any water or expansion will be accommodated in the outlet header extension 20. For cold weather operation on a smaller body of liquid and incidentally on a smaller quantity of anti-freeze, the solution is poured into the filler spout until the low mark is reached. In either case the lower portion of the radiator, together with the engine jacket and jacket connections, are filled with the liquid. Height of the liquid can be easily ascertained on removal of the readily accessible closure cap 15 which also permits insertion of a hydrometer into the standpipe to a point below the liquid level for checking the strength of the solution.

As is usual with the system running at substantially less than full capacity, the water entering the inlet tank, because of gravity, flows through the lowermost tubes while any steam vapors rising upwardly and tending to leave the system must first pass through the uppermost tubes before reaching the outlet vent, but in their passage through the tubes they are condensed and fall downwardly in the headers to rejoin the body of liquid.

The inspection chamber may or may not be vented, but in the event a vent is desired, in order to avoid the entrapment of air or steam, it will be preferable to connect the chamber with the expansion tank. A simple expedient for this purpose is illustrated in Figure 4, where a short length conduit 22 connects the top of the chamber 14 with the expansion tank 20 at a point below the opening of the overflow pipe 21. If more convenient, the vent from the inspection chamber can be made through the inlet header and core.

We claim:

1. In an engine radiator having a cross flow cooling core with inlet and outlet headers on opposite sides thereof, an expansion tank associated with the outlet header, means to vent said expansion tank, a filler spout communicating with the inlet tank below the normal liquid level in the core and extending upwardly therefrom, closure means sealing said spout and vent means connecting the upper portion of said spout with said expansion tank.

2. An engine cooling liquid circulating system including a heat radiating core having a series of cross flow tubes, inlet and outlet headers extending along opposite sides of the core with both headers in open communication with all of said tubes, an expansion tank overlying the top of the core and in open communication with the outlet header only, means near the top of the expansion tank to vent the system, a filling and inspection spout associated with one of said headers and located below the position of the vent opening in the upper part of the expansion tank and a sealing closure for said spout.

3. In an engine cooling system, an engine cooling jacket, a radiator having inlet and outlet headers, means serially connecting the jacket and radiator in a cooling liquid circuit, a filling and inspection spout associated with a radiator header, at a height which determines maximum filling level of the system liquid, a removable sealing closure for the spout and a vented expansion tank associated with the radiator outlet header and located outside the cooling circuit and on a level above the top of the spout for storing liquid rejected from the cooling circuit.

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