This invention relates to engine cooling systems and more particularly to systems for cooling internal combustion engines by means of a circulating liquid.

Internal combustion engines and particularly diesel engines are susceptible to the entry of combustion gases into the cooling systems causing the water or coolant pumps to become air locked. The entrainment of air or combustion gases in a coolant in other ways detracts from the desired efficiency of a given engine cooling system and it is essential that an improved effective and simple way for removing gases from engine coolants is desirable while retaining control of engine temperatures. The difficulty is much more serious with diesel engines as distinguished from other engines. The attempted solution in that case has been the customary one—nevertheless—to add bleed holes in the thermostat but this expediency causes loss of coolant temperature control so that radiator shutters are needed to keep coolant leakage flowing in the radiator from becoming too cold under certain ambient conditions. Under low ambient temperature conditions, the conventional cooling systems tend to over-cool engines causing a loss in the latter's efficiency.

An object of the present invention is to provide an engine coolant deaeration system in which one tank of a radiator is enabled to serve as a deaeration tank as engine temperature control is automatically maintained under a wide range of ambient temperature conditions and with avoidance of any carefully sized or balanced deaeration lines or baffles.

To this end a feature of the present invention is an engine coolant deaeration system in which one tank of a radiator at all times serves to provide a zone for the removal of air or gases from a coolant regardless of whether or not the radiator core is bypassed by a thermostatic valve.

This and other important features of the invention will now be described in detail in the specification and then pointed out more particularly in the appended claims.

In the drawings:

FIGURE 1 is a diagramatic view, in perspective, of a portion of a V-8 engine jacket associated with a radiator heater, a two-way thermostatic valve, an oil cooler and a water pump.

FIGURE 2 is an enlarged sectional view looking in the direction of the arrows 2-2 through the thermostatic valve of FIGURE 1.

FIGURE 3 is a view similar to that of FIGURE 2 but with a main valve and a bypass valve each partially opened; and

FIGURE 4 is a view similar to that of FIGURES 2 and 3 but with the main valve fully opened and the bypass valve closed.

The portion 10 of a V-8 engine jacket shown in FIGURE 1 is associated with a conventional radiator 12 which comprises a top or deaeration tank 14 and a bottom or second tank 16. The tank 14 is provided with a conventional filler neck 18 having a pressure cap 20 and a vent line 22. A suitable filler neck and pressure cup is disclosed in the United States Patent 3,047,235 granted July 31, 1962 in the name of J. Esbaugh and J. McDougall. A thermostatic valve 24 is shown at the junction of three conduits 26, 28, and 30 and this valve is also connected by the latter to the inlet side of an air cooler 32. The coolant outlet side of the latter is connected by means of an elbow 34 to the coolant pump 36. The discharge side of the pump 36 is connected to the engine jacket 10. A heater core 40 for heating the passenger compartment of the vehicle is connected to the engine jacket 10 by a conduit 42 and to the inlet side of the pump by a conduit 44. This heater core or the oil cooler 32 forms no part of the present invention but each is shown in a preferred arrangement with the particular embodiment of the cooling system illustrated. The discharge of the jacket 10 is connected by a conduit 46 to the deaeration or upper tank 14 of the radiator 12.

The thermostatic valve 24 comprises two casing parts 50 and 52 between which is interposed a gasket 54. This gasket surrounds an inserted annular valve seat 56 which is tightly held in the part 52 of the valve and a spider portion of which slidily holds a plunger of a main valve 58. The latter is movable to closed and opened positions with relation to the annular seat member 56 and a pellet motor casing 59 is firmly held in fixed relation to the seat member by means not shown. The casing part 50 of the valve 24 defines an annular inlet chamber 60 connected by radial passages 62 to a central passage 64 and the latter is in alignment with the main valve 58. The annular chamber 60 is connected to a neck 70 which in turn is adapted to be connected by a suitable coupling to one of the conduits 28. The upstream side of the main valve 58 is connected by a neck 72 to the conduit 26 leading from the bottom tank 16. Further details regarding the valve 24 are not given here as they form no part of the present invention. It suffices to say, however, that heat opens the main valve 58 and closes a bypass or secondary valve 73 controlling the passage 75.


When the main valve 58 of the thermostat 24 is at full closed position, as shown in FIGURE 2, the total coolant flow is from the radiator top tank 14 and through the conduit 28 to the annular chamber 60 and then by way of radial ports 62 to the chamber 64 and the line 30 back to the engine jacket. As the main valve is closed, there is no flow of coolant through the radiator core and although at this time the engine is cold, any gases forming in the coolant are promptly deaerated from the upper tank 14 by way of the pressure cap 20 and the vent 22. The tank 14 provides adequate opportunity for entrained gas to separate and baffles are not necessary.

As the engine becomes warm and the thermostat 24 operates to control the engine temperature, the main valve 58 partially opens and the bypass valve 73 partially closes as shown in FIGURE 3. A controlled engine or system temperature then exists wherein some coolant flows through the radiator core and the remainder flows through bypass line 28 with deaeration being effected in the tank 14 from the complete flow.

When the bypass valve 73 is fully closed as shown in FIGURE 4, the main valve 58 will be fully opened and all the coolant flows through the radiator core and the conduit 26 giving the maximum cooling effect. Under this heated engine condition as during the controlled flow condition, the top tank 14 is effective to remove any entrapped gases from the coolant with no supplementary tanks being needed.

It should be noted that the bypass conduit 28 is preferably connected as low as possible to the top tank 14 and at a distance from the connection of the conduit 46. This separation of the points of joiner of conduits 46 and 28 to the top tank 14 permits adequate separation of the gas from the coolant. The fittings for the heater core 40 are located in lower places in the system in which small coolant flow turbulence occurs.
I claim:

1. An engine coolant deaeration system comprising an engine jacket, a radiator with a top tank and a bottom tank, a pump, a two-way thermostatic valve, first conduit means connecting said bottom tank to said valve, pump and jacket in series and in that order, second conduit means connecting said jacket, top tank and valve in series and in that order, the points of joinder of said second conduit means to said top tank being spaced to facilitate separation of gas, and the valve being such as to make said first conduit means effective when said jacket is heated and to make said second conduit means effective when said jacket is not heated.

2. An engine coolant deaeration system comprising an engine jacket, a radiator with a deaeration tank connected to a second tank by a core, a pump, a two-way thermostatic valve, first conduit means connecting said tank to said valve, pump and jacket in series and in that order, second conduit means connecting said jacket, deaeration tank and valve in series and in that order, and the valve being such as to effect flow through the radiator and said first conduit means when said jacket is heated and to effect flow through the second conduit means around said core to said pump when said jacket is not heated.

3. An engine coolant deaeration system comprising an engine jacket, a radiator with a deaeration tank connected to a second tank by a core, a pump, a two-way thermostatic valve, a vent on said deaeration tank, first conduit means cooperating in connecting said second tank to one way of said valve, said pump and said jacket in series, second conduit means cooperating in connecting said jacket, deaeration tank and the other way of said valve in series, and the system being such that any flow under any condition in said system is through said deaeration tank.

4. An engine coolant deaeration system comprising an engine jacket, a radiator with an upper tank and a lower tank connected by a core, a pump, a two-way thermostatic valve, a vent on said upper tank, first conduit means cooperating in connecting said lower tank to one way of said valve, said pump and said jacket in series, second conduit means cooperating in connecting said jacket, upper tank and the other way of said valve in series, and the arrangement being such that all flow through said thermostatic valve is from said upper tank.

5. An engine coolant deaeration system as set forth in claim 4, said thermostatic valve including a main valve controlling the flow through said core and a bypass valve controlling the flow around said core to said pump.

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