June 14, 1966 J. W. WALSH 3,255,740

ENGINE COOLANT DEAERATION SYSTEM

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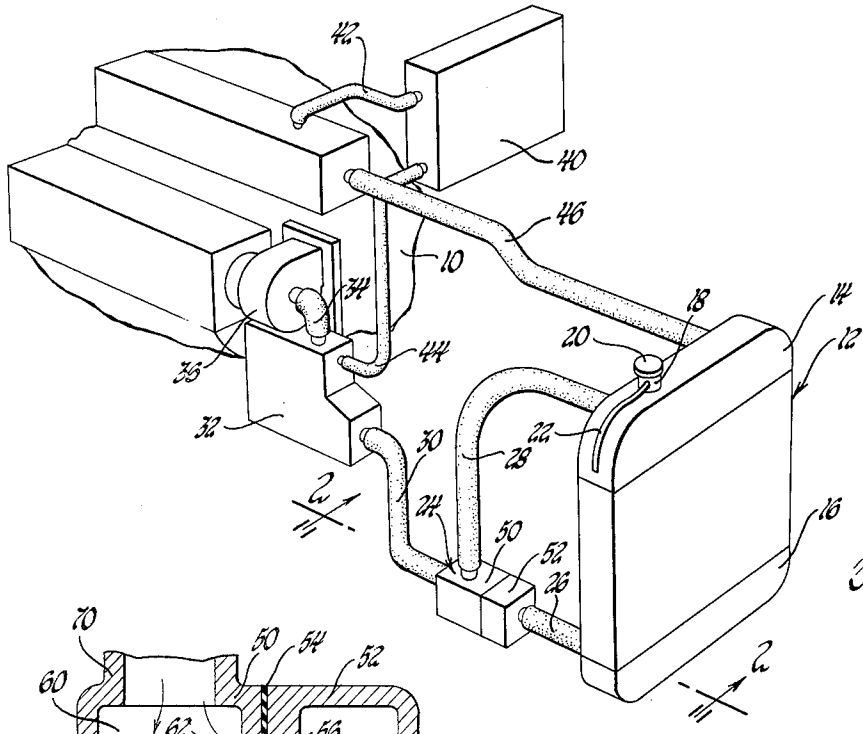


Fig. 1

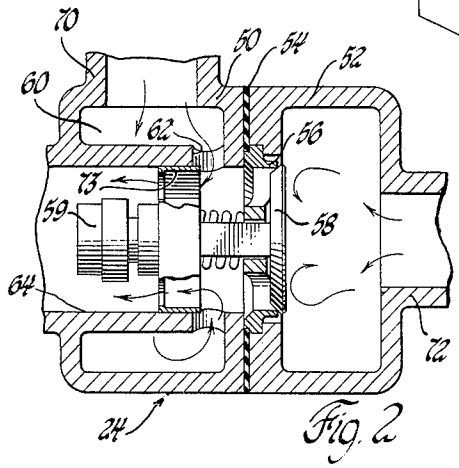


Fig. 2

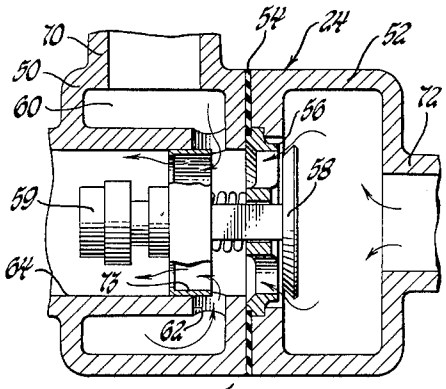


Fig. 3

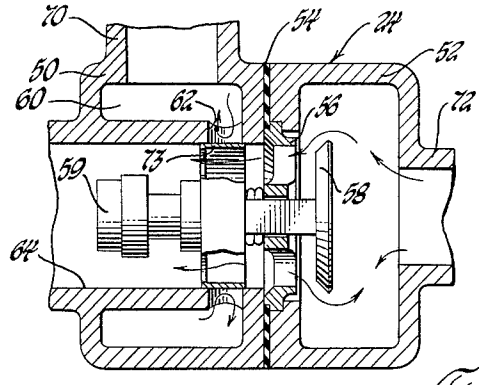


Fig. 4

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ENGINE COOLANT DEAERATION SYSTEM

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This invention relates to engine cooling systems and more particularly to systems for cooling internal combustion engines by means of a circulatory 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 obvious 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 latters' 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 is shown in FIGURE 1 as 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 cap is disclosed in the United States Patent 3,047,235 granted July 31, 1962 in the name of J. Eshbaugh and J. McDougal. A themostat 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 slidingly 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 end of the conduit **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 passages **62**. A suitable thermostatic valve is disclosed in the United States Patent 2,899,026, Hitch et al. or in United States Patent 2,988,068, Waydak.

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 joinder 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 where 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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