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J. E. ESHBAUGH
RADIATOR SEALING VALVE

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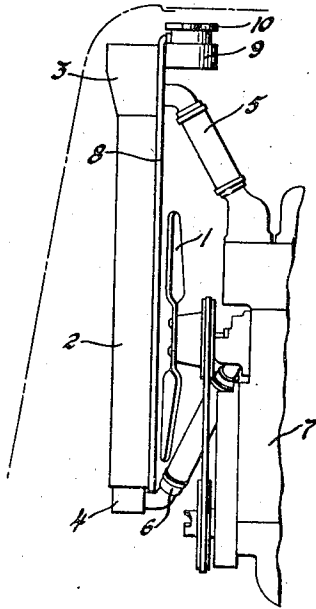


Fig. 1

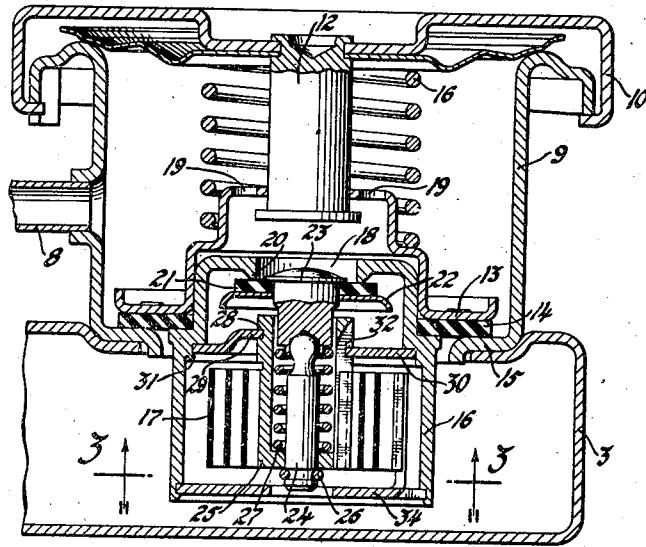


Fig. 2

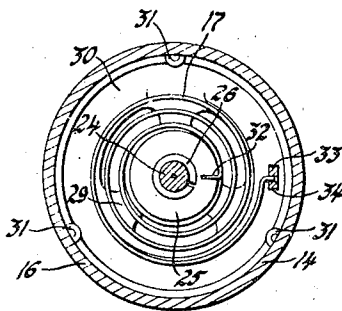


Fig. 3

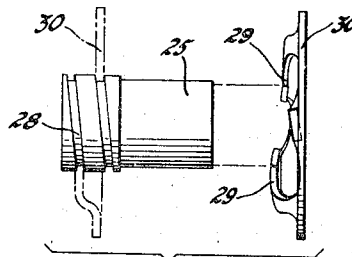


Fig. 4

Inventor
Jesse E. Eshbaugh
By *Blackmar, Spencer & Flint*
Attorneys

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RADIATOR SEALING VALVE

Jesse E. Eshbaugh, Flint, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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2 Claims. (Cl. 236—92)

1 Most automobiles are driven by liquid cooled engines and the conventional cooling system includes a jacketed cylinder block connected by a rubber hose with a light weight radiator having thin walled tubes for quick heat transfer from liquid flowing through the tubes to an air stream flowing against the outside of the tubes.

For less loss by evaporation of hot liquid and increased heat dissipation with a relatively small quantity of cooling liquid and a small size radiator unit, the recent practice has been to incorporate in the radiator filler cap a vent closure so that the system is sealed and the expansion of system contents, as the operating temperature rises, produces an internal system operating pressure. As the pressure goes up and reduces liquid boiling tendency, the liquid absorbs more heat in the engine jacket for greater dissipation in the radiator. On the other hand greater strain is placed on the radiator and its hose connections and to prevent bursting, the range of system pressure is controlled by a pressure relief valve and a vacuum relief valve for opening the vent. As ordinarily constructed both valves are normally seated at all times except for the infrequent momentary intervals of excess pressure relief whereas the primary advantages of a sealed system are obtained only at times of high system operating temperatures. At the lower cooling liquid temperature internal system pressure serves no useful purpose but maintains continued strain on the more delicate or weaker parts of the system and, therefore, promotes leakage and breakdown.

It is an object of the present invention to eliminate unnecessary stress on the cooling system while retaining the advantages of pressure operation to relieve or reduce radiator fatigue. It is proposed that the system vent, instead of being normally closed, be open at all times except when the motor is hot and better cooling efficiency is needed. To this end the vacuum relief valve is controlled by a thermostat which is directly responsive to internal system pressure and closes the vent only after a predetermined system temperature is exceeded. Otherwise the valves control system operating pressure as heretofore and relieve excess high and low internal pressures.

In the accompanying drawing Figure 1 is a side elevation of the front part of a water cooled engine and its associated radiator; Figure 2 is an enlarged sectional view of the radiator filler cap and valve assembly; Figure 3 is a transverse view taken on line 3—3 of Figure 2 and Figure 4 shows

2 in detail the relation of a part of the valve operating mechanism.

The usual cooling system includes an engine driven fan 1 to draw air through a radiator core 2 which has top and bottom tanks 3 and 4 connected by hose connections 5 and 6 with the outlet and inlet, respectively, of the cooling jacket of the engine block 7. An overflow pipe 8 vents the cooling system from the filler spout 9 mounted on the top tank 3 and closed by a detachable cap 10.

As seen in Figure 2 the system is sealed from the vent pipe 8 by valve mechanism within the filler spout 9 and formed as a unit assembly with the filler cap 10 for removal therewith. A dependent stud 12 carried by the cap slidably receives the domed central portion of a valve 13 carrying a sealing gasket 14 to seat on an inturned flange 15 at the base of the filler spout 9. The valve 13 normally is held on its seat by a coil spring 16 interposed between the valve and the cap 10.

Press fitted or otherwise secured within the central domed portion of the valve 13 is the upper end of the valve cage or housing 16 whose lower end extends down into the top tank 3 so that if the cooling system is completely full of liquid the lower end of the valve cage 16, together with the coiled bimetal thermostat 17 contained within the cage, will be submerged in the cooling liquid. At its upper end the cage 16 has a central opening 18 in communication with the interior of the filler spout through one or more openings 19 in the top of the valve 13 and the opening 18 is surrounded by an annular raised rib 20 providing a seat for an inwardly opening valve comprising a gasket ring 21, a backing plate 22 and a central stud 23. The lower end of the stud has a socket receiving and being secured on the ball end of a stem 24 which projects through the bottom wall of a rotatable barrel or valve stem guide 25. The lower end of the stem is provided with an annular groove to which is fitted a snap ring retainer 26 arranged for abutment with the bottom wall of the barrel 25 to limit relative outward movement of the valve stem under influence of a coil spring 27 contained within the barrel.

Near its upper end the rotatable barrel has a helical groove or screw thread formation 28 to receive therein circumferentially spaced lips 29 arranged in a helical path and formed in a disk stamping 30 seated at its rim against a shouldered portion of the housing 14 and retained in place by several deformable bosses 31. A barrel 25 is also provided with an axially extending groove 32

into which extends an inturned ear at the central terminal of the thermostat coil 17 and the outer terminal of the coil is anchored by an outwardly extending ear fitted to an upstanding leg 33 pressed out of the cover cap 34 at the bottom of the valve cage 16.

Since it is on the system side of the valves and immediately adjacent the cooling liquid the coil 17 is directly responsive to changes in cooling liquid temperature and its expansion and contraction will impart to the barrel a rotation. By reason of the screw threaded mounting, the barrel, upon rotation, also moves axially toward or away from the valve seat 20 and conditions the valve to be seated under influence of its spring 27 or to be unseated by the abutment of the barrel with the stop 26 on the valve stem. In the sealed position of the parts shown in Figure 2 the system is operating with liquid at a relatively high temperature and under internal pressure for maximum heat transfer. Should the internal pressure tend to rise beyond the predetermined degree the pressure on the underside of the valve will cause the spring 16 to deflect and lift the valve 13 until the excess pressure is relieved. On the other hand, in the event system pressure drops below atmospheric pressure the valve 21 will be sucked down to substantially equalize internal and external pressures. At any time that temperature in the steam space immediately below the valve drops below a predetermined value, whether the system is idle or operative, the response of the thermostat rotates the barrel 25 forcibly to unseat the valve 21 and, therefore, eliminate pressure differences within and outside the system.

Thus the system is relieved of internal pressures at all times except when higher operating temperatures demand increased heat dissipation efficiency. Since low temperature operation does not require a closed system the thermostat serves to keep the vent open for minimum stress on the parts. When water is employed as the coolant the thermostat is selected to act at a temperature of around 190° F. in urging the valve to closed position to afford a completely sealed system above the selected temperature. The vacuum valve being spring supported can be opened by reduction of pressure in the system without necessarily having a corresponding reduction of temperature at the thermostat. This is of advantage in that it makes relief of vacuum

certain under conditions when the thermostat might not cool off as fast as other parts of the cooling system.

I claim:

1. In an engine cooling system having an overflow vent, an outwardly opening pressure relief valve for the system overflow vent, provided with a port therein, an inwardly opening valve for the port, having a dependent stem, a rotary barrel surrounding the stem as a guide therefor, a seating spring between the barrel and valve, a stop carried by the stem to engage the barrel and limit relative outward movement of the valve under the force of its seating spring, a screw threaded mounting for the barrel compelling axial shift of the barrel incident to its rotation and a temperature responsive coil surrounding the guide barrel on the system side of the valve.

2. In an engine cooling system having a fixed valve seat surrounding a system vent opening, an outwardly opening pressure relief valve engaging said seat and having a vent opening therein, an inwardly opening depression relief valve for closing the vent opening in said pressure relief valve, a thermostat on the system side of said valves directly exposed to system temperature, a pair of axially shiftable members joined respectively to the thermostat and said depression relief valve and having between them spring means yieldingly urging them apart and stop abutments on said members to limit their relative travel under spring force.

JESSE E. ESHBAUGH.

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