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COOLING SYSTEM PRESSURE CONTROL DEVICE

Filed March 25, 1939

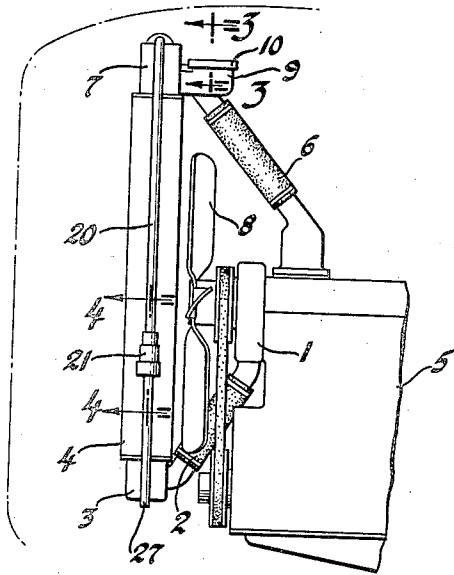


Fig. 1

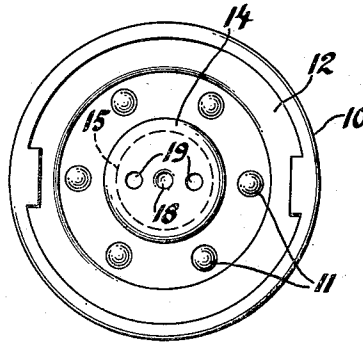


Fig. 2

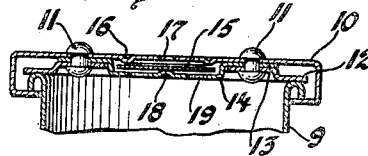


Fig. 3

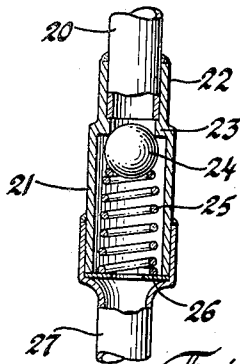


Fig. 4

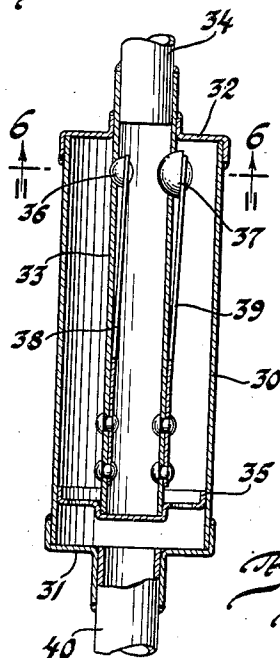


Fig. 5

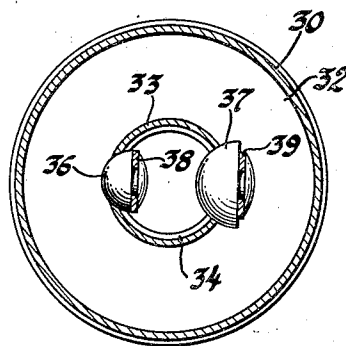


Fig. 6

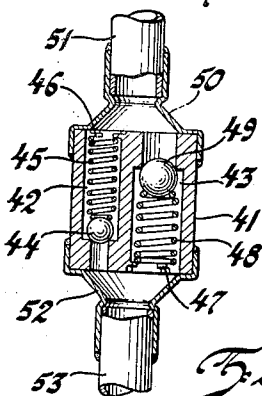


Fig. 7

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UNITED STATES PATENT OFFICE

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COOLING SYSTEM PRESSURE CONTROL
DEVICE

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2 Claims. (Cl. 277-61)

This invention relates to cooling systems for internal combustion engines and contemplates the provision of improved valving whereby the system is closed for operation under pressure incident to heat expansion of the cooling liquid.

In the attached drawing Figure 1 is a side elevation of an engine cooling system showing one embodiment of the invention; Figure 2 is a bottom plan view of the spout closure cap; Figure 3 is a sectional view of the cap assembly taken on line 3-3 of Figure 1; Figure 4 is a detail section taken on line 4-4 of Figure 1 and illustrating one form of pressure relief valve; Figure 5 is a sectional view of a two-way valve embodiment; Figure 6 is a section taken on line 6-6 of Figure 5 and Figure 7 shows a modified two-way valve in section.

The conventional engine cooling system to which the present invention is applied includes an engine driven pump 1 which draws water or other cooling liquid through a connection 2 from the outlet tank 3 at the bottom of the radiator core 4 and circulates the liquid through the jacket of the engine block 5 for return flow through the outlet connection 6 to the top tank 7 of the radiator core. Heat absorbed in the engine jacket is transferred in the radiator core 4 to an air stream flowing through the core under the influence of an engine driven fan 8. As is usual the top tank of the radiator is provided with a filler spout 9 to be closed by a removable cap 10.

As seen in Figure 3 the cap 10 in the present instance has secured by rivets 11 on the underside thereof a sealing ring 12 to seat on the outer end of the filler spout 9 and close the system. Also secured by the series of rivets 11 on the underside of the cap is a stamped plate 13 having a centrally depressed portion 14 which affords in cooperation with the cap 10 an enclosing cage for a disc valve 15 preferably formed of spring bronze and which seats at its periphery on an annular depressed rib 16 in the cap 10 surrounding an air entrance port or opening 17. The valve 15 is located on its seat by a central boss or pimple 18 struck upwardly from the cage 14 and normally closes the system by blocking off communication between the port 17 and one or more openings 19 in the cage 14. The proportion of the parts may be such that ordinarily a small clearance will exist between the seat 16 and periphery of the valve 15 to enable breathing and which clearance would be eliminated upon the building up of any substantial pressure inside the system. Such pressure would raise the disc into engagement with its seat. Optionally, how-

ever, the proportion of the parts may be such that the disc is under a slight compression between the pimple 18 and ridge 16. In either event the formation of a vacuum inside the system allows the disc to move away from its seat for the admission of air and a balance of pressures.

In conjunction with the spout closure cap just described the usual overflow pipe 20 leading from the top tank 7 includes a pressure relief valve. As shown in Figure 4 this valve may include a brass tubular body 21 having a reduced end portion 22 to be slipped over the end of the overflow pipe 20 and sweated in place. Seated on the intermediate shoulder 23 of the tube section is a bronze check valve 24 urged toward seating position by a bronze coiled spring 25 held in place by a perforated bronze retainer washer 26 bearing against the end of the tube 21. A copper or brass ferrule 27 is fitted over and sweated to the outer end of the tube 21 and holds in place the retainer washer 26. The ferrule 27 may have a tubular drain extension formed integral therewith or optionally may be slipped over and sweated to a suitable drain tube leading downwardly for discharge below the bottom of the radiator. As will be apparent the ball check valve 24 closes the overflow and in cooperation with the disc valve 15 in the closure cap seals the system from atmosphere for the operation of the system under pressure incident to heat expansion of the cooling liquid. The spring 25, however, is selected to allow unseating of the valve 24 under internal pressure of a predetermined value and thereby vent the system for the elimination of bursting strains due to excess pressure.

The two-way valve arrangement shown in Figure 5 may be used in place of the structure shown in Figure 4 with its inwardly opening valve serving either to supplement or replace the vacuum relief valve incorporated in the closure cap. It includes an outer casing 30 closed by a pair of end walls 31 and 32 with the wall 32 supporting one end of an inner tube 33 projecting downwardly into the casing 30 and having its outer end slipped over and soldered to the overflow tube 34 leading from the radiator top tank. The inner tube 33 which is preferably formed of brass, terminates in a dead end by being fitted into a cupped depression of a transverse wall or spider 35. It also has a pair of spaced openings for communicating the interior of the tube with the interior of the casing 30 and these openings normally are closed by bronze hemispherical valves 36 and 37 riveted, respectively, on the free ends of bronze spring reeds 38 and 39. The lower end

of the reed 38 is riveted or otherwise secured interiorly of the tube while the reed 39 is secured on the exterior of the tube wherefore the valves open inwardly and outwardly, respectively, in relation to the cooling system. The lower end wall 31 of a casing may be slipped over and soldered to the drain tube 40. A convenient method of installing the valve unit in existing system involves cutting the usual overflow tube and inserting in it the valve unit by slipping the end ferrules over the ends of the tubing and soldering in place. In use the system is sealed through the overflow tube by the inwardly and outwardly opening valves 36 and 37. Internal pressure tends to unseat the valve 37 for the relief of excess pressure while the valve 36 is unseated upon the occurrence of subatmospheric pressure within the system.

In the two-way valve arrangement shown in Figure 7 a valve body 41 is provided with a pair of oppositely extending drilled and counterbored openings 42 and 43 leading therethrough. Against the shoulder of the opening 42 is an inwardly opening ball check valve 44 seated by a coil spring 45 held within the opening by stacking or otherwise deforming the metal of the body 41 at the inner end of the opening as shown at 46. A similar deforming at 47 locates within the opening 43 a spring 48 which seats an outwardly opening ball check valve 49. A coupler 50 secured to one end of the valve body may be fitted to the end of the overflow pipe 51 and a similar coupler 52 on the opposite end of the valve body 41 may be fitted to the drainpipe 53. The pressure relief valve 49 in this instance is opened by excess pressure within the system while the inwardly opening valve 44 permits entry of air to prevent the formation of a vacuum when the cooling liquid cools off.

I claim:

1. A pressure control device comprising a pair of concentric tubes nested together in spaced relation to afford a chamber therebetween, an end wall spacing the tubes and closing the chamber at one end, an end coupling extension on the innermost tube, a closure disc for the other end of the inner tube having an outward extension engaging the outer tube for spacing the tubes, a pair of ports in the inner tube wall for communicating the interior of the closed tube with the interior of the surrounding chamber, a spring blade interiorly of the inner tube having one end fixed to the inside of the tube and carrying an inwardly opening valve at its free end to seat over one of said ports and a spring blade interiorly of the chamber having one end fixed to the outside of the tube and carrying an outwardly opening valve at its free end to seat over the other of said ports.

2. For the control of operating pressure in an engine cooling system, a valved cap piece comprising a tube having a system coupling portion at one end and being provided with a pair of ports in the wall thereof, a closure piece fitted to and sealing the opposite end of the tube, a valve element for one of the ports, a spring blade having its free end supporting said valve element interiorly of the tube, means securing the opposite end of the blade to the tube wall on the inside thereof, a second spring blade fixed at one end to the tube wall on the outside thereof and a valve element mounted on the free end of the last mentioned blade and seating over the other of said wall ports.

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