

March 26, 1940.

C. S. BAILEY

2,195,266

PRESSURE CAP

Filed Feb. 24, 1939

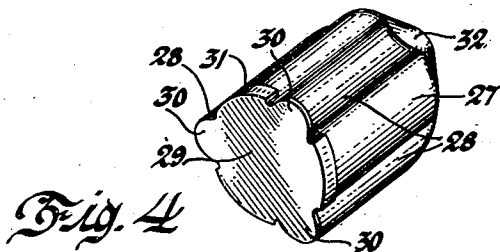
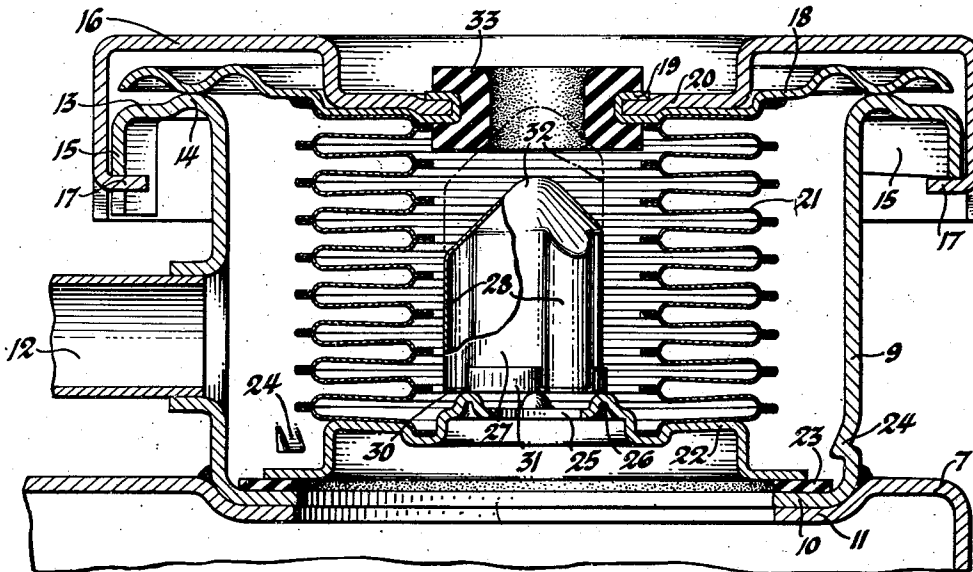
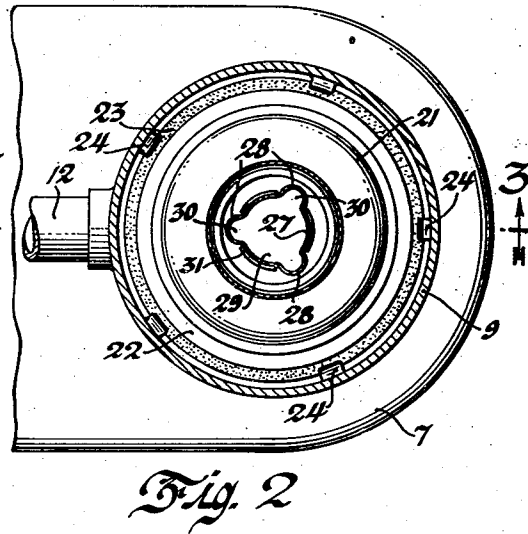
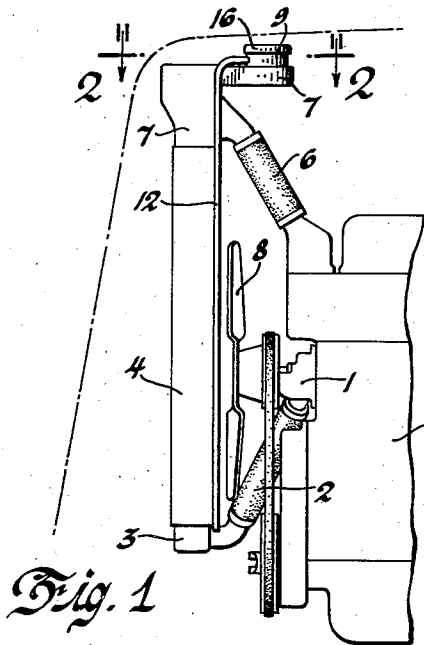


Fig. 3

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UNITED STATES PATENT OFFICE

2,195,266

PRESSURE CAP

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Application February 24, 1939, Serial No. 258,120

5 Claims. (Cl. 220—44)

This invention relates to engine cooling systems and more particularly to an improved pressure relief valve cap assembly for closing the vented filler spout of a cooling system. An object of the invention is to simplify structural design and manufacture and enable more economical production of pressure cap assemblies as well as to provide a device for better control of internal system pressure.

Additional objects will become apparent from the following detail description when taken with the accompanying drawing wherein Figure 1 is a fragmentary view illustrating a conventional engine cooling system; Figure 2 is a section of the filler spout taken on line 2—2 of Figure 1; Figure 3 is an enlarged detail sectional view of the filler spout and cap assembly and is taken on line 3—3 of Figure 2 and Figure 4 is a perspective view of the vacuum relief valve.

For cooling the engine of an automobile the customary practice is to provide an engine driven pump 1 which draws water or other cooling liquid through a hose 2 from the bottom tank or header 3 of the radiator core 4 and forces the water through the cooling jacket of the engine 5 and back to the radiator core 4 through the hose connection 6 and radiator top tank 7. Heat absorbed in the water jacket of the engine is transferred to an air stream drawn through the radiator 4 by an engine driven fan 8. The system is filled with cooling water by means of a spout 9 having at its inner end an internal flange 10 soldered or otherwise secured in a depressed seat 11 at the rim of an opening in the top tank 7. The spout is vented through an overflow pipe 12 leading laterally therefrom and downwardly beside the radiator for discharge near the bottom thereof. The spout is shown as having the usual outturned flange 13 at its outer end in which is formed an annular sealing ridge 14 and a pair of oppositely disposed skirt portions 15 are carried by the annular flange 13 and provide at their lower edges a pair of camming abutments constituting a part of a bayonet connection for a removable filler cap.

For closing the overflow vent 12 from the cooling system there may be substituted for the usual spout closure cap, an assembly which includes a pressure relief valve carried by a cap to extend into the spout for seating engagement on the internal spout flange 10. In the structure illustrated, the cap 16 has a pair of intumed tongues 17 struck from the skirt of the cap for sliding engagement with the cam edges of the dependent spout portions 15 for detachably securing the cap

to the spout. A spring diaphragm 18 of hard brass is secured either fixedly or rotatably according to choice, on the underside of the cap, by having its inner edge reversely bent as at 19 about the rim of an opening in a central depression 20 of the cap. At its periphery the diaphragm 18 is provided with circular corrugations for increasing the flexibility thereof and one of these corrugations is engageable with the annular ridge 14 on the spout to effect a seal at the outer end of the spout. The arrangement of the parts is such that in the applied position the spring diaphragm is stressed and maintains a seal by reason of its natural elasticity.

Soldered or otherwise secured on the underside of the diaphragm 18 is an endmost disc of a hollow flexible bellows 21, the opposite endmost disc of which has secured thereon a stamped metal plate 22 whose peripheral edge is adapted to engage a gasket 23 resting on the intumed flange 10. Displacement of the gasket 23 is prevented by indentations 24 formed in the wall of the spout 9. Centrally of the plate 22 is an apertured dome portion 25 extending into the lower end of the hollow bellows 21 and having three or more circumferentially spaced raised pimples or tits 26 for supporting in spaced relation with the dome 25 a buoyant valve 27. The float valve 27 is in the nature of a hollow thin walled stamping having a series of circumferentially spaced and radially projecting guide ribs 28 which may have sliding contact with the inner edges of the bellows discs to maintain the valve at an upright position. The bottom wall of the valve consists of a disc 29 having outwardly extending ears 30 fitting the bottom of the several ribs 28 together with upstanding attachment flanges 31 which are soldered or otherwise secured to the wall of the cupped stamping 27 constituting the main body of the valve. The upper end or nose 32 of the valve body is of conical shape so that it is self-centering on its seat at the vent opening through the cap 16. This valve seat is shown as consisting of an annular ring 33 of elastic deformable material such as rubber or neoprene with a peripheral groove to fit the rim of the opening through the cap. Its deformable character assists in providing a tight seal when the valve is buoyed upwardly into engagement therewith.

Upon the application of the cap to the filler spout the position of the parts will be that shown in Figure 3. In this position while the usual overflow vent pipe 12 will be cut off from the system by reason of the spring bellows 21 seating the valve 22, the system nevertheless will be

open to atmosphere around the valve 27 and through the openings in the cap 16 and domed portion 25 communicating the system with the interior of the bellows 21. This venting enables
 5 any air entrapped in the cooling solution to escape and remains open until such system temperature is reached that either expanded liquid or pressure vapor buoys the valve 27 upwardly against the grommet 33.
 10 As the liquid in the cooling system takes on heat it also expands in volume. If the liquid level rises into the bellows the float valve 27 will be lifted until it is seated over the opening in the cap 16 and any further expansion taking place
 15 will build up an internal pressure which raises the boiling point of the liquid and enables it better to absorb and transfer heat. However, should the pressure exceed the predetermined value of the spring bellows 21 the pressure relief valve
 20 22 will be unseated for the relief of pressure through the overflow 12 until the pressure drop again permits the valve 22 to be seated.

More particularly the expansion within the system takes place as a result of the formation
 25 of steam and the formation of steam is most likely to occur as a result of what is termed after boiling. The presence of vapors under pressure in the system will buoy up the valve 27 into seating position and at the predetermined pressure the pressure relief valve is lifted for a balance of pressures. The predetermined pressure
 30 at which the valve 22 is lifted will be dependent upon the thickness of the bellows disc stock, its elastic character and the number of convolutions contained in the bellows. As the system contents
 35 cool down and contract in volume the float valve 27 will be unseated by its gravity weight and atmospheric pressure and preclude a subatmospheric pressure condition within the system.

40 I claim:

1. In valving for a filler spout or the like, a cap having a valve seat surrounding an aperture therethrough, a pressure relief valve spaced inwardly of the cap and adapted to seat on the inner end of the spout, a spring hollow bellows connected at one end to the cap beyond the rim of said valve seat and connected at the other end to the valve to seal the space between the valve and cap and a gravity opened vent valve con-

tained within and guided by the bellows for engagement with the valve seat at the aperture in the cap.

2. For association with a detachable spout closure cap having a dependent hollow spring bellows for seating a pressure relief valve, a ring of elastic deformable material affording a valve seat at a vent opening in the cap and a floating valve contained within and guided by the bellows to seat on said ring for cooperation with
 5 the first mentioned valve in completing the spout closure.

3. In a valving organization for a vented filler spout having a valve seat at its inner end and a cap engaging part at its outer end, a cap detachably engageable with the outer end of the
 15 spout, a pressure relief valve engageable with said seat to close the inner end of the spout from the spout vent, a hollow spring bellows having its opposite ends secured to the cap and valve, respectively, and serving to seat the valve, and a gravity opened valve enclosed within and guided by the bellows and adapted to be buoyed upwardly to close a vent opening in the cap to condition operation of the bellows seated valve.
 20 25

4. A valve unit for a filler spout, including a cap having a vent opening therein, a hollow bellows secured on the underside of the cap around said opening, a buoyant vent valve enclosed and guided by the bellows to seat over
 30 the opening, a spout engaging pressure relief valve carried by the bellows and having an apertured central portion at the bottom of the bellows to retain the vent valve within the bellows and means associated with said central portion
 35 for supporting said vent valve away from the aperture.

5. Control valving for a pressure system, including a member having a vent port therethrough, a hollow spring bellows secured at one end on the underside of the member beyond the rim of said port, a pressure actuated valve carried on the other end of said spring bellows and adapted to be yieldably seated thereby and a buoyant valve housed within and guided by the
 40 45 bellows to and from its seat over the vent port for action in conjunction with the pressure actuated valve in the control of system pressure.

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