Nov. 6, 1962 R. J. HUMBERT 3,062,400

SAFETY VALVED PRESSURE CAPS

Filed May 3, 1960

FIG. 1

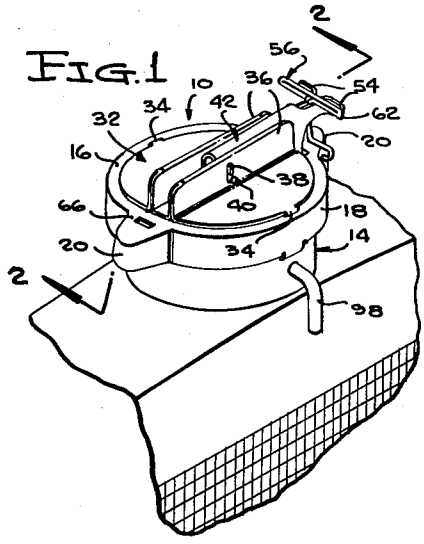


FIG. 4

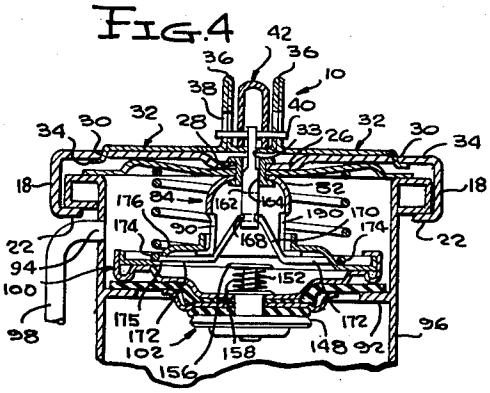


FIG. 5

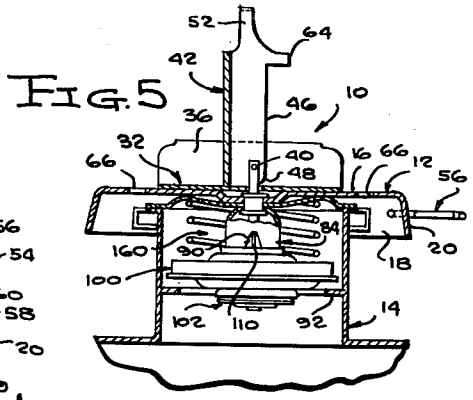


FIG. 2

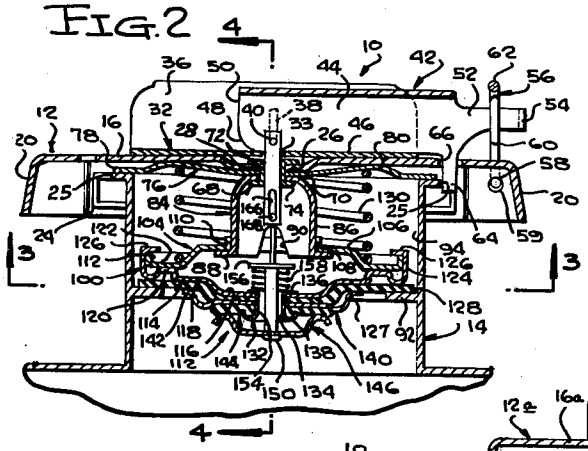


FIG. 6

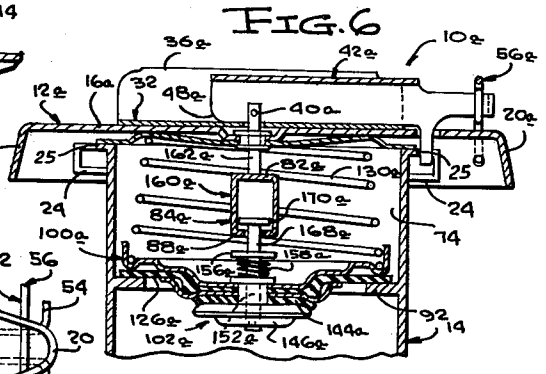
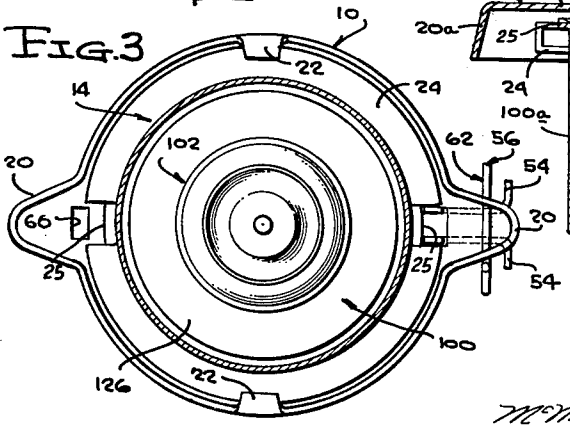


FIG. 3



INVENTOR.
REUBEN J. HUMBERT
BY

McMorrow, Berman & Davidson
ATTORNEYS

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SAFETY VALVED PRESSURE CAPS

Reuben J. Humbert, Box 563, Coos Bay, Oreg.

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1 Claim. (Cl. 220—44)

This invention relates to novel safety valved pressure caps for such as automobile radiator filler pipes.

The primary object of the invention is the provision of safer, more efficient and reliable pressure caps of the kind indicated, which include means for automatically releasing above normal radiator pressures into the overflow pipes of radiator filler pipes in addition to manual means for releasing normal radiator pressure, preliminary to removing the caps from filler pipes.

Another object of the invention is to provide pressure caps of the character indicated above which are composed of easily assembled parts.

Other important objects and advantageous features of the invention will be apparent from the following description and the accompanying drawings, wherein, for purposes of illustration only, a specific form of the invention is set forth in detail.

In the drawings:

FIGURE 1 is a fragmentary perspective view showing a cap of the invention applied to and closing the filler neck or pipe of an automobile radiator;

FIGURE 2 is an enlarged fragmentary vertical transverse section taken on the line 2—2 of FIGURE 1, showing the manual pressure release means and the automatic pressure release means closed;

FIGURE 3 is a horizontal section taken on the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary vertical transverse section taken on the line 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary vertical section and elevation showing the manual pressure release means in open position; and,

FIGURE 6 is a fragmentary section, like FIGURE 2, of another form of the invention.

Referring in detail to the drawings, wherein like and related numerals designate like and related parts throughout the several views, and first to FIGURES 1 to 5, the safety cap therein shown, and generally designated 10, comprises an inverted circular pan-shaped closure cap 12 which is substantially larger in diameter than a radiator filler pipe or neck 14 which is to be closed. The closure cap 12 comprises a flat web 16 having a depending downwardly flaring sidewall 18 on its periphery. At diametrically opposed points the sidewall 18 has hollow downwardly opening extensions 20. Sidewall 18 is also provided with radially inwardly extending lugs 22 at its lower end to securably and removably engage beneath an outstanding rim 24 on the filler pipe at the upper end thereof, in a generally conventional manner. The rim 24 is provided with spaced notches 25.

The web 16 of the closure cap 12 is formed with a central depressed portion 26 having a central opening 28 therein, and with diametrically opposed chordal slots 30 spaced outwardly from the depressed portion 26, the slots being located ninety degrees from the extensions 20.

Engaged concentrically on the upper side of the closure cap web 16 is a flat lever mounting disc 32, smaller in diameter than the closure cap, provided with a central opening 33, and having diametrically opposed depending tongues 34 on its peripheral edge, which are downwardly engaged through the web slots 30 and securably engaged with the underside of the web 16, as shown in FIGURE 4. Preferably integral with the disc 32 and located ninety degrees from the tongues 34, is a pair of upstanding parallel ribs 36 which extend across the disc 32 and are preferably formed by folding and compressing the material of the disc. At points intermediate their ends, the ribs 36 are formed with registered vertically elongated pivot slots 38, through which extend related ends of a pivot pin 40 which is journalled through an end of a release lever 42 which is located between and extends along the ribs 36.

The release lever 42 is preferably of inverted channel form, affording parallel spaced sidewalls 44 having straight lower edges 46 which have arcuate cam portions 48 at the forward ends 50 of these sidewalls. The pivot pin 40 is journalled through the sidewalls 44 at a location rear to the forward ends 50 and near the lower edges 46, as seen in FIGURE 2, so that the lever 42 has overcenter locking action which holds the lever in depressed position, as shown in FIGURES 1 and 2. On the rear ends of the lever sidewalls 44 are reduced width longitudinal extensions 52 which terminate in opposed laterally outwardly directed ears 54, the extensions 52 and the ears 54 together constituting a receiver for a lever locking latch 56.

The lever latch 56 preferably is a wire form having a loop 58 on its lower end which is journalled through one of the closure cap extensions 20, as indicated at 59, an upstanding double shank 60, and a cross head 62 on the upper end of the shank 60, the latch 56 being swingable to engage the shank 60 between the receiver extensions 52, with the cross head 62 bearing upon the upper edges of the extensions 52, so as to hold the lever 42 down in its depressed position. Locking fingers 64 depend from the lower edges 46 of the lever sidewalls 44 at the rear end of the lever and engage in either of two slots 66 formed in the parts of the closure cap web 16, which form the top walls of the hollow extensions 20 and the adjacent notch 25 in the rim 24, as shown in FIGURE 2, so that rotation of the cap 10 relative to the radiator filling pipe is prevented, unless and until the lever 42 be elevated to disengage the fingers 64 from the locking slot engaged thereby. This safety feature positively prevents removal of the cap 10, before the radiator pressure has been released by operation of the lever, so that injury otherwise resulting from steam and water gushing out of the filler pipe, upon removal of the cap, is prevented.

Secured in the central opening 28 in the depressed portion 26 of the closure cap web 16 is a tubular metal grommet 68 comprising a vertical tube 70 fitting the opening 28, an upper lateral annular flange 72, bearing upon the upper side of the depressed portion 26, and a lower lateral annular flange 74. Circumposed on the tube 70 below the web 16 is a resilient concave-convex tension disc 76, of a diameter to bear, at its peripheral edge 78, upon the top of the filler pipe bead 24. The concave upper side of the tension disc 76 engages the underside of the depressed portion 26 of the web 16 and has a concentric convex annular portion 80 which is concentrically spaced from the portion 26 and which bears against the underside of the web 16.

Circumposed on the grommet tube 70 between the tension disc 76 and the lower grommet flange 74, and compressed thereby against the underside of the disc 76, is the hemispherical top wall 82 of a bell-shaped housing 84, having a cylindrical sidewall 86 on whose lower edge is a lateral annular flange 88. Formed in the sidewall 86 and through the flange 88, are vertically elongated V-shaped, diametrically opposed notches 90, which serve as radiator pressure release ports, for releasing air, steam, and water under pressure from the radiator filler pipe, from below an internal annular seat 92 in the pipe to an overflow port 94 in the filler pipe sidewall 96 above the seat 92, to which an overflow pipe 98 is connected, while a main valve assembly 100 is seated on the seat 92,

and an automatic pressure release valve assembly **102** is open.

The main valve assembly **100** comprises an upper rigid pan **104** having an upset central portion **106** formed with a central opening **108** fitting and receiving the housing **84** above and bearing downwardly upon the housing stop flange **88**, the upper pan **104** having an upstanding annular stabilizing flange **110** around its opening **108** which is slidably telescoped on the housing **84**. The pan **104** has an upstanding peripheral flange **112**. The main valve assembly **100** further comprises a rigid lower pan **114** which has a depressed central portion **116** surrounded by a flat outer portion **118** in which is formed an upstanding annular rib **120** which bears against the underside of the outer portion **122** of the upper pan **104**. The lower pan has an upstanding peripheral annular flange **124** which is telescoped on the peripheral flange **112** of the upper pan **104**, and assembling lugs **126**, spaced around and formed in the lower pan flange **124**, are bent over and onto the upper edge of the upper pan flange **112**, as shown in FIGURES 2 and 4. Suitably secured to and conforming to the underside of the lower pan **114** is a flexible and compressible disc gasket **127**, which, in the depressed closed position of the main valve assembly **100**, bears sealingly at its peripheral edge **128**, upon the filler pipe seat **92**, as shown in FIGURES 2 and 4. A relatively large diameter helical expanding spring **130** spacedly surrounds the housing **84** and is compressed between the tension disc **76** and the upper pan **104**, so as to yieldably urge the main valve assembly **100** downwardly to closing and sealing engagement with the filler pipe seat **92**.

Securing the lower pan **114**, and the gasket **127** compressed together is another or lower grommet **132** having a vertical tube **134** extending through the centers of the lower pan **114** and the gasket **127**, an upper lateral flange **136** bearing upon the upper side of the pan **114**, and a lower lateral flange **138** on the lower end of the tube **134**. A rigid concave-convex gasket supporting disc **140**, smaller in diameter than the gasket **127**, is circumposed on the tube **134** and bears against the underside of the central part of the gasket and has an upset annular outer portion **142** which bears against the underside of the outer part of the gasket, as seen in FIGURES 2 and 4. Circumposed on the grommet tube **134** and engaged with the underside of the central part of the supporting disc **140** is a flat flexible and compressible sealing disc **144** which serves as the pressure sealing seat for the automatic valve assembly **102**, and which is held up in place by the lower grommet flange **138**.

The automatic valve assembly **102** comprises a rigid pan-shaped valve **146**, smaller in diameter than the supporting disc **140**, and about the diameter of the sealing or seat disc **144**, which has an upstanding convexly rounded peripheral bead **148** to bear against the underside of the seat disc **144**, in the closed condition of the automatic valve assembly. Fixed centrally to the valve **146**, as indicated at **150**, is an upstanding stem **152**, which is smaller in diameter than and rises spacedly through the bore **154** of the lower grommet **132**, and has an enlarged diameter head **156** on its upper end. The head **156** is located between and is spaced from the upper and lower pans **104** and **114** of the main valve assembly **100**, and a helical expansion spring **158** is circumposed on the stem **152** and is compressed between the head **156** and the upper end of the grommet **132**, so as to yieldably elevate the valve **146** into closing engagement with the seat disc **144**.

For elevating or lifting the main valve assembly **100** off the filler pipe seat **92**, as a safety assuring preliminary to removing the cap **10** from the filler pipe **14**, a lifting assembly, generally designated **160**, is provided, which is independent of the automatic valve assembly **102**. The assembly **160** comprises a vertical slide shaft **162**, working in the bore **164** of the upper grommet **68** and journalled, at its upper end, on the pivot pin **40**, between the sidewalls **44** of the releasing lever **42**. At the lower end of the shaft **162** is a vertically elongated closed slot **166**, through which is slidably engaged the bight portion **168** of an inverted V-shaped yoke **170** which rises through the open lower end of the bell-shaped housing **84** and works in the slots **90**, as shown in FIGURES 2 and 4, and has lateral horizontal legs **172** which bear against the underside of the lifter flange **88** and are securably hooked at their ends, as indicated at **174**, through diametrically opposed openings **175** provided in the skirt **176** of the central portion **106** of the upper main valve assembly pan **104**, as seen in FIGURE 4.

To lift the main valve assembly **100** off the filler pipe seat **92**, the latch **56** is swung out of engagement with the receiver on the outer or rear end of the manual releasing lever **42**, and the lever **42** pivoted upwardly, so as to engage its cams **48** with the upper surface of the mounting disc **32**, so that the shaft **162** is cammed or pulled upwardly and lifts the main valve assembly **100**, by means of the yoke **170**, off the filler pipe seat **92**, and thereby provides for escape of pressure components from the filler pipe **14**, below the seat **92**, around the main valve assembly **100** to the overflow pipe port **94**. Elevation of the lever **42** releases the locking finger **64** from the cap extension slot **66**, so that the cap **10** is then free to be rotatably removed from the filler pipe, in the usual way, without danger from unreleased high pressure components gushing from the opened filler pipe.

In the form of the invention shown in FIGURE 6 of the drawings, and general designated **10*a***, only the lift assembly **160*a*** is different from the structure of the above described cap **10**, and for the absence of an upper pan in the main valve assembly.

The lift assembly **160*a*** of FIGURE 6 has an axial extension **168*a*** rising from the head **156*a*** of the stem **152*a*** of the automatic release valve assembly **102*a***, having an enlarged head **170*a*** on its upper end. Substituting for the housing **84** is a vertical cylindrical yoke **84*a*** on whose upper end **82*a*** is fixed the upstanding lift shaft **162*a***. An inturned flange **88*a*** on the lower end of the cylinder **84*a*** is engaged beneath the extension head **170*a***.

As shown in FIGURE 6, the flange **88*a*** is, when the main valve assembly **100*a*** and the automatic valve assembly **102*a*** are in closed positions, sufficiently spaced below the head **170*a*** that the automatic valve **146*a*** has freedom to open by subsiding away from its seat disc **144*a***. Otherwise, the operations of the valve assemblies are the same as described in connection with the device of FIGURES 1 to 5.

While there have been shown and described herein preferred forms of the invention, it is to be understood that the invention is not necessarily confied thereto, and that any change or changes in the structure of and in the relative arrangements of components thereof are contemplated as being within the scope of the invention as defined by the claims appended hereto.

What is claimed is:

In combination, a pressure outlet pipe having an open end and an internal annular seat and a pressure release port between said open end and said seat, an outstanding rim extending about the open end of said pipe, there being circumferentially spaced notches in said rim, a closure cap closing the open end of said pipe and having on its perimeter lugs which removably engage the periphery of said rim, said cap being provided with spaced slots adjacent the periphery and circumferentially-spaced a substantial distance from the lugs, a spring-closed main annular valve assembly within said pipe and normally resting upon said pipe seat, closing spring means compressed between the closure cap and said main valve assembly, and a lift assembly comprising a shaft connected at one end to the main valve assembly and extending through the closure cap, and lever means externally mounted on the closure cap and operatively connected to said lift shaft, said main valve assembly having a central port there-

through providing communication in the outlet pipe to opposite sides of the pipe seat and to the pipe-pressure release port, and an automatic pressure-release valve assembly comprising a seat on the side of the main valve assembly remote from the open end of the outlet pipe and surrounding said central port, and a spring-closed pressure-operated valve mounted on the main valve assembly and normally closing said central port, said lever means comprising a cam lever externally of said closure cap and having one end pivotally connected to said shaft, a latch receiver extending from the other end of the lever, a latch pivoted on the closure cap and releasably engaging the receiver to hold the lever in position for retaining the main valve assembly in closing position, and locking finger means depending from said lever inwardly of and adjacent said receiver and extending through one of said

slots in said cap and engaging a notch in said rim to thereby prevent rotation of the cap relative to the filler cap for releasing said rotary securing means.

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