Sept. 3, 1963 E. R. BOWDEN 3,102,660

SAFETY RADIATOR CAP WITH LIFT-TYPE LATCH

Filed Oct. 26, 1960 4 Sheets-Sheet 1

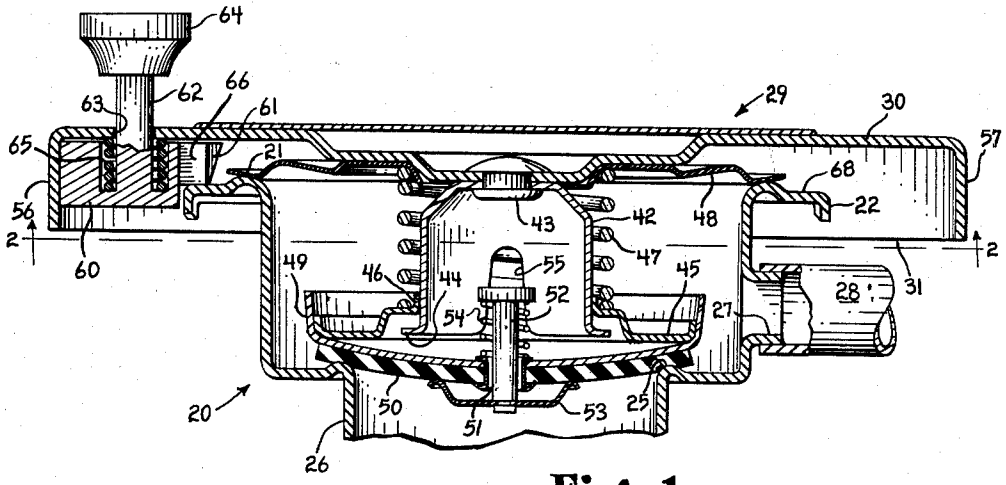

Fig. 1.

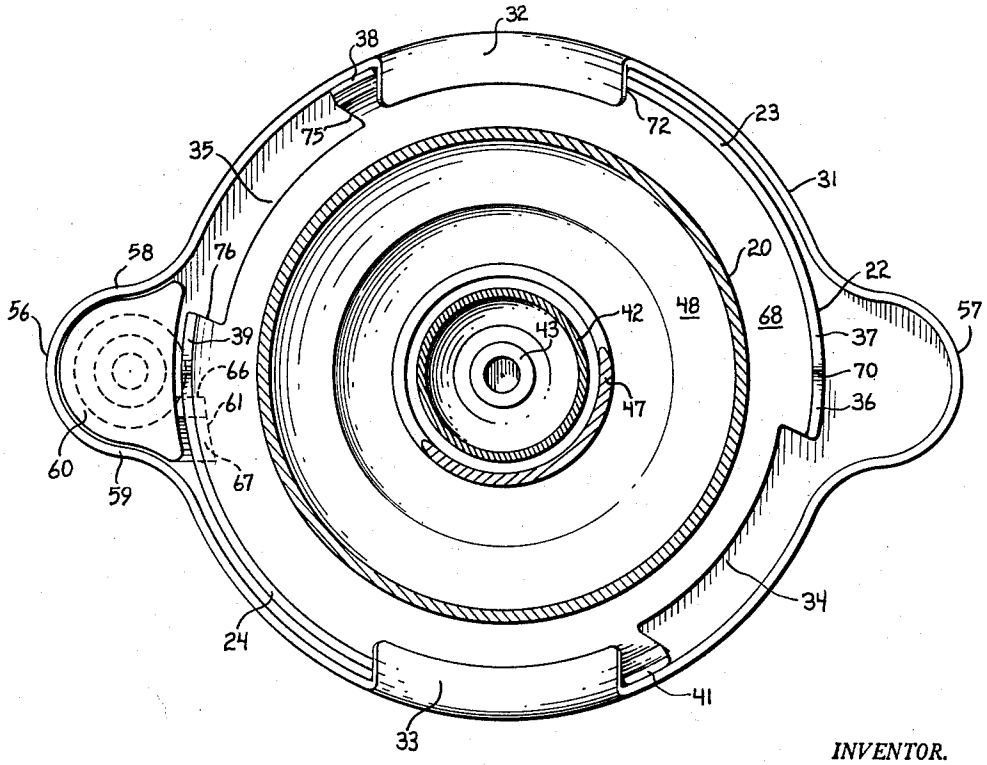

Fig. 2.

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SAFETY RADIATOR CAP WITH LIFT-TYPE LATCH

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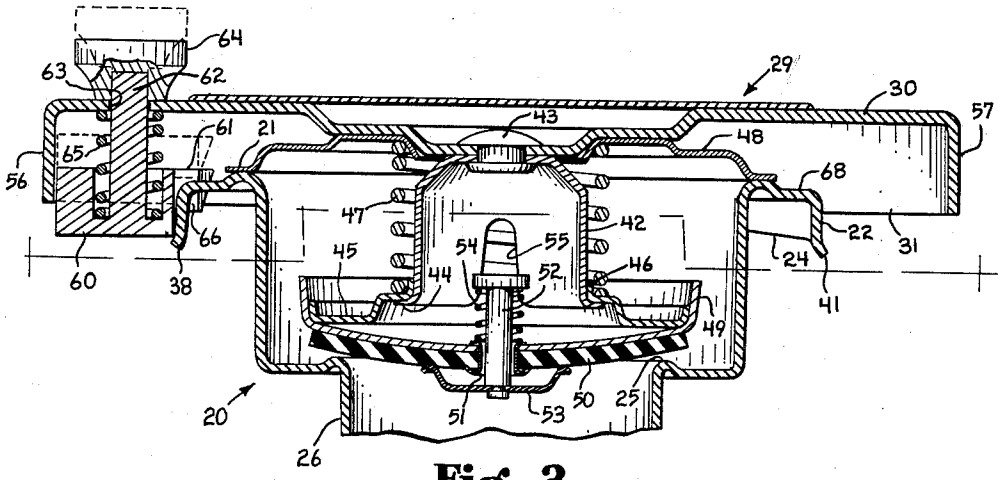

Fig. 3.

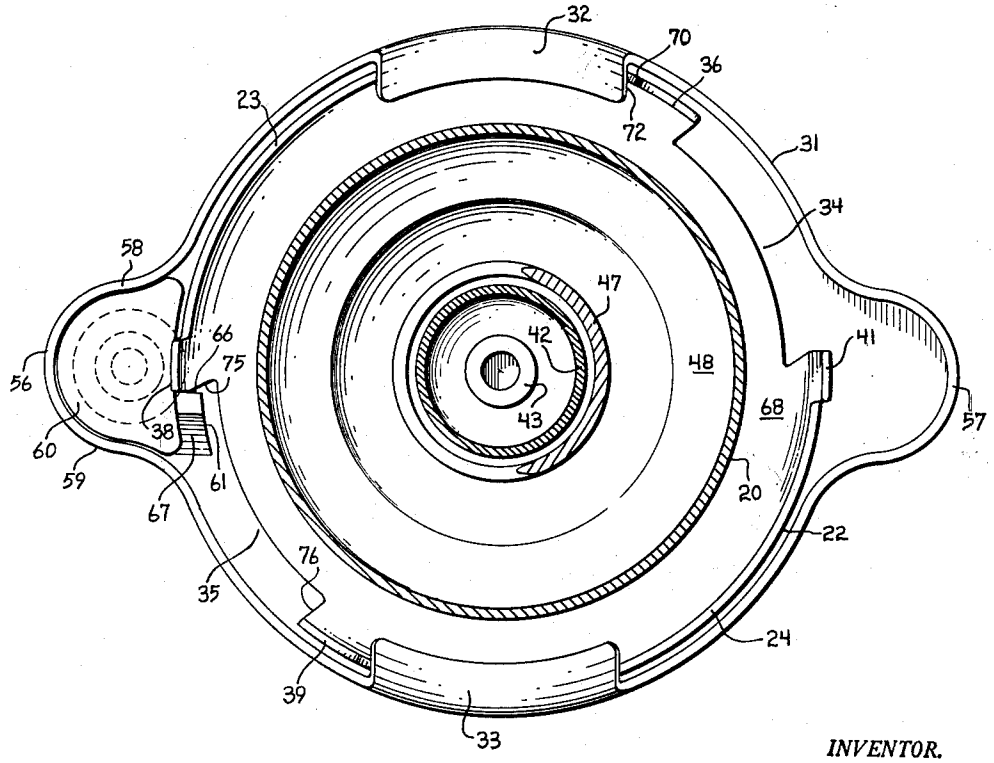

Fig. 4.

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SAFETY RADIATOR CAP WITH LIFT-TYPE LATCH

Filed Oct. 26, 1960 4 Sheets-Sheet 3

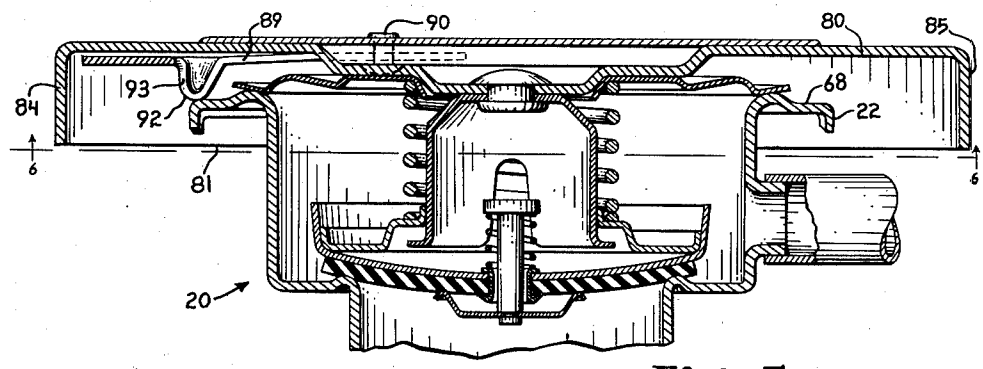

Fig. 5.

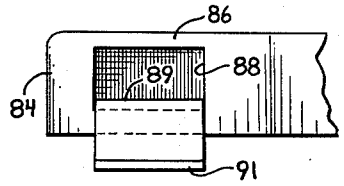

Fig. 7.

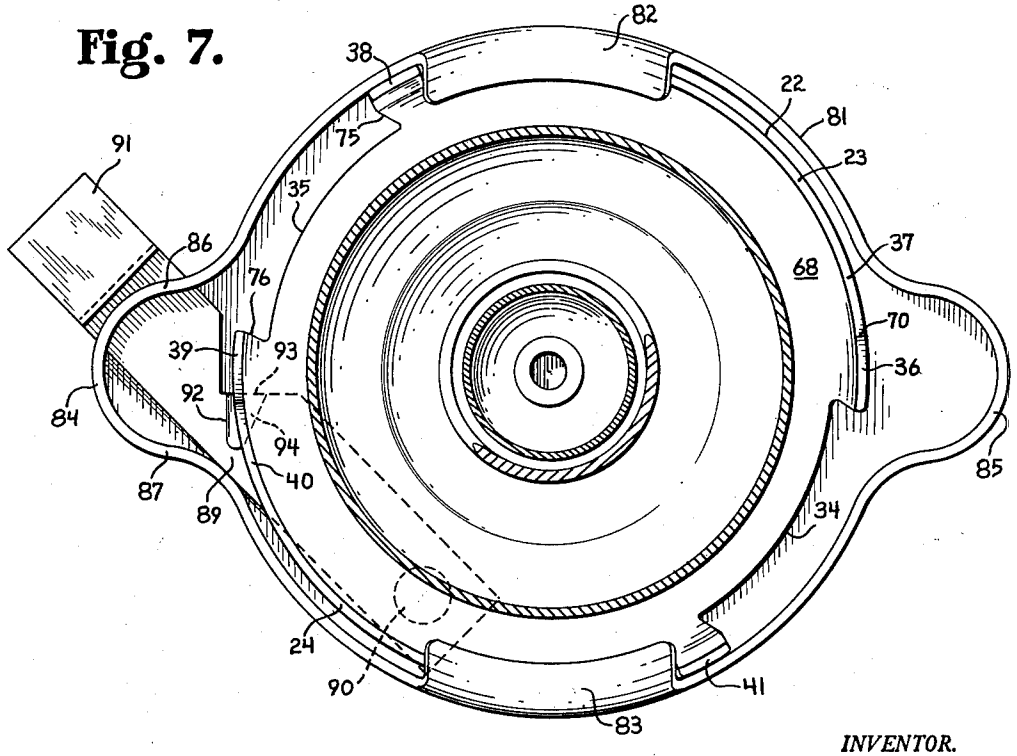

Fig. 6.

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SAFETY RADIATOR CAP WITH LIFT-TYPE LATCH

Filed Oct. 26, 1960 4 Sheets-Sheet 4

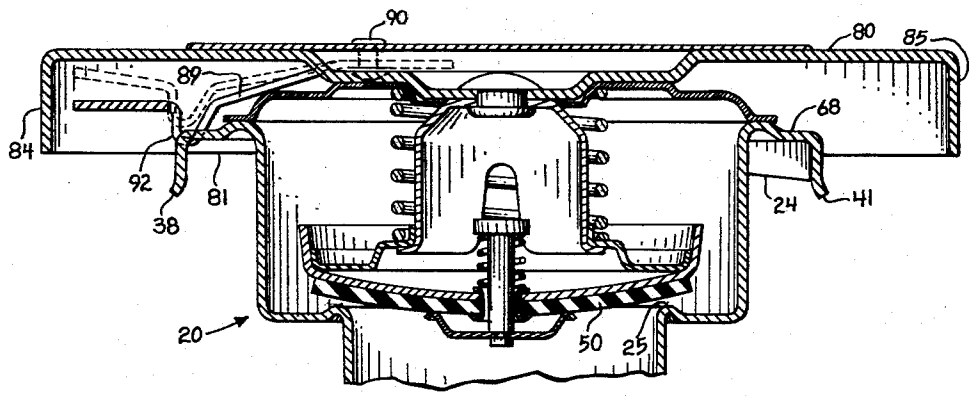

Fig. 8.

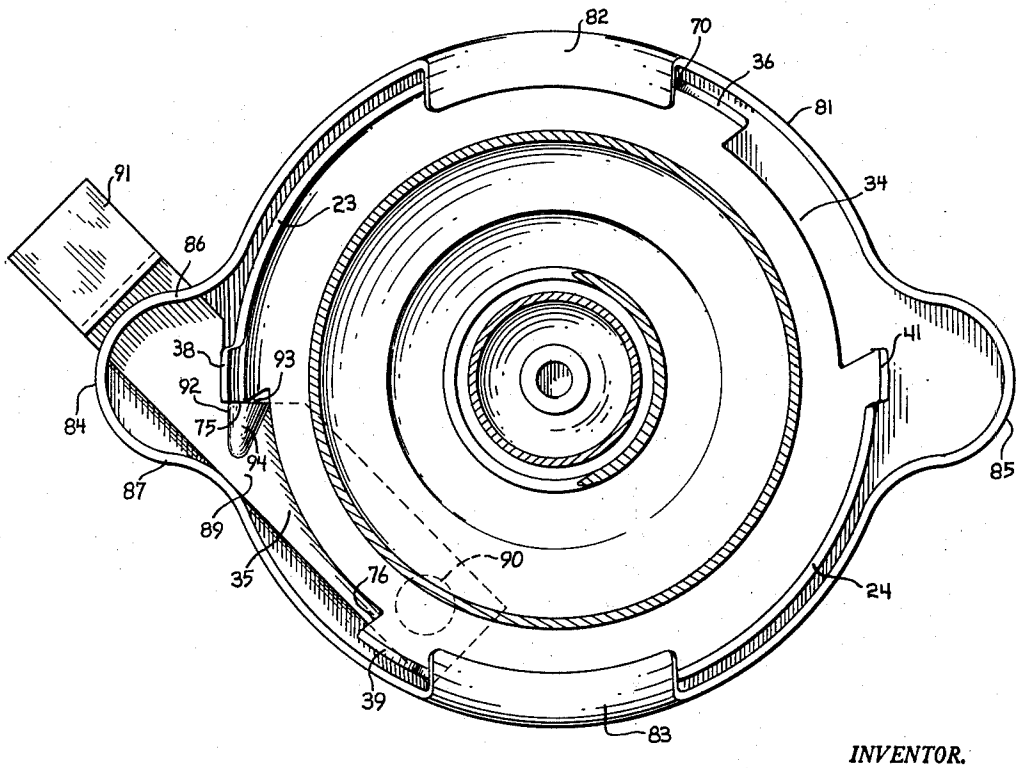

Fig. 9.

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3,102,660
SAFETY RADIATOR CAP WITH LIFT-TYPE LATCH

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6 Claims. (Cl. 220—40)

The present invention relates to a closure cap, primarily intended for use on the filler neck of the cooling system of a conventional automobile engine, said cap involving novel structure which is affirmatively effective to guard against a long-recognized hazard.

For many years, such cooling systems were conventionally designed to operate at atmospheric pressures; but even in those days, it sometimes happened, for one reason or another that the collant in the system would attain a boiling temperature, thus producing a super-atmospheric pressure in the system. When, under those conditions, a vehicle operator or an attendant inattentively removed the closure cap from the filler neck of such a system, steam and scalding water would frequently spew forth, sometimes drenching and seriously injuring anyone in the immediate vicinity.

Today, most such systems are designed to operate under superatmospheric pressures of various values between about two pounds and about twenty pounds per square inch; and in such systems, of course, the probability of injury upon sudden removal of a closure cap is greatly increased.

For many years, the industry has sought a satisfactory cure for this hazard, but without substantial success. It is conventional now to construct the cooperating elements of the retainer means between the filler neck and the closure cap with an intermediate land or obstruction which, interposing a slight resistance to removal-rotation just before the cap is fully released from the neck, tends to remind an individual to delay complete removal of the cap so as to give the system time within which to vent its pressure to the atmosphere; but accidents of the above described type continue to occur though, perhaps, with less frequency.

According to the present invention, I provide positive latch means carried by the closure cap and effective affirmatively to arrest movement of the cap in a direction to release it from the filler neck, at an intermediate position in which the interior of the cooling system is open to the atmosphere through the conventional vent port with which the filler neck is provided, but in which the mouth of the filler neck is still closed by the cap to prevent egress of hot liquid or of any substantial amount of scalding vapor which might injure the individual who is manipulating the cap. The novel structure is so constructed and arranged as to require positive action by that individual, in addition to mere rotation of the cap, before the cap can be released from its closing engagement with the mouth of the filler neck.

The primary object of the present invention, then, is to provide a safety cap embodying shiftable latch means of the character above indicated which will guard even the most inattentive manipulator against injury by liquid or vapor spewing from a system which has been operating under superatmospheric pressure.

A further object of the invention is to provide, in such a cap, latch means which is resiliently biased to its motion-arresting position, but including manually manipulable means readily accessible to an operator whereby the latch may be retracted, by affirmative action, to permit removal of the cap.

A still further object of the invention is to provide such

a structure in which the latch means is provided with a cam surface so constructed and arranged that the cap may be applied to a conventional filler neck and may be fully seated thereon without manual manipulation of the latch means by the operator.

Still another object of the present invention is to provide latch means of the character described which is supported from the cap and arranged for substantially axial movement with respect thereto between its motion-arresting position and its release position.

Still further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the forms illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific constructions illustrated and described, so long as the scope of the appended claims is not violated.

FIG. 1 is a vertical section through the distal portion of a conventional filler neck with a cap embodying one form of the present invention in fully seated position thereon;

FIG. 2 is a horizontal section taken substantially on the line 2—2 of FIG. 1;

FIG. 3 is a section similar to FIG. 1 but showing the cap in intermediate, arrested position on the filler neck;

FIG. 4 is a horizontal section taken substantially on the line 4—4 of FIG. 3;

FIG. 5 is a section similar to FIG. 1 but showing a modified form of my invention;

FIG. 6 is a horizontal section taken substantially on the line 6—6 of FIG. 5;

FIG. 7 is a fragmental side elevation of a portion of the cap of FIG. 5, illustrating a detail of construction;

FIG. 8 is a section similar to FIG. 5 but showing the cap in intermediate, arrested position; and

FIG. 9 is a horizontal section similar to FIG. 6 but showing the parts in the positions of FIG. 8.

Referring more particularly to the form of invention illustrated in FIGS. 1 to 4, it will be seen that I have shown the distal fragment of a conventional filler neck 20 having an upwardly opening mouth surrounded by a seat 21 and provided with a downturned, peripherally extending lip 22 which is formed, at its distal edge, with symmetrically arranged cam surfaces 23 and 24 inclining, in the direction of applying rotation of a filler cap, downwardly toward the level of the conventional pressure valve seat 25. The section 26 of the filler neck indicates any means whereby said filler neck is mounted upon, and communicates with the interior of, the conventional cooling system for an internal combustion engine.

In accordance with conventional practice, the filler neck 20 is provided with a vent port 27 disposed between the seats 21 and 25, and a conduit 28 conventionally leads from said port to any suitable point at which said conduit is in open communication with the atmosphere.

The reference numeral 29 indicates generally a pressure closure cap which, except in the particulars later to be described, conforms generally to the construction of currently conventional pressure closure caps. Said cap comprises a cap body 30 provided with a downturned, perimetral flange 31 whose distal edge carries, at diametrically opposed regions, a pair of retainer fingers 32 and 33 which, as will be seen, are offset from the plane of the cap body 30 and extend substantially radially with respect thereto.

In accordance with conventional practice, the lip 22 of the filler neck 20 is formed with diametrically opposed notches 34 and 35 through which the fingers 32 and 33 are enterable, whereupon turning movement of the cap

in a clockwise direction as viewed from above (a counterclockwise direction as viewed in FIGS. 2 and 4) will move said fingers 32 and 33 into cooperative engagement with the cam surfaces 23 and 24. Hereinafter, such turning movement of the cap relative to the filler neck will be referred to as "forward movement," while turning movement of the cap in a direction to return the fingers into registry with the notches 34 and 35 will be referred to as "rearward movement."

As shown, the distal edge of the lip 22 is formed with a slight downward projection 36 at the forward end of the notch 34, and with a shallow region 37, having a peripheral extent substantially equal to that of the finger 32, immediately forward with respect to said extension 36 and between said extension and the cam surface 23. This is the "land" or "obstruction" arrangement of conventional practice as described above, and is shown primarily for the purpose of indicating the applicability of the cap of the present invention to filler necks currently in wide use in the automobile industry. The forward end of the cam surface 23 is guarded by a longer downward projection 38 so arranged that, when the cap 29 attains full seating on the filler neck 20, the leading end of the finger 32 will be engaged and arrested by said projection 38.

A projection 39, a land 40 and a projection 41 are diametrically opposed, respectively to the projection 36, the land 37 and the projection 38 for similar cooperation with the finger 33.

A hollow dome or bell 42 is centrally suspended from the cap body 30 by means of a rivet 43 and is formed, at its lower end, with an outturned flange 44. A pan 45 is formed with a collar flange 46 which is loosely slidably mounted upon the dome 42. A spring 47 is confined between the collar flange 46 and a diaphragm 48 resiliently to resist movement of the pan 45 toward the cap body 30 and to urge the collar flange 46 into engagement with the dome flange 44. Said spring also supports the diaphragm 48 in position for engagement of the periphery of said diaphragm with the seat 21 surrounding the mouth of the filler neck 20.

A valve carrier 49 is fixed to the pan 45 and supports, on its lower face, a compressible gasket 50. The parts are so proportioned and arranged that, when the cap 29 is fully seated on the filler neck 20, the flange 44 is spaced below the collar flange 46 whereby the spring 47 resiliently presses the gasket 50 into sealing engagement with the pressure valve seat 25.

In the form of cap illustrated, the gasket 50 and valve carrier 49 are penetrated by a hollow rivet 51 in which is loosely guided the stem 52 of a vacuum-release valve 53 which is normally held in sealing contact with the gasket 50 by means of a spring 54. The interior of the dome 42 is in open communication with the vent port 27 through one or more slots 55.

The structure as thus far described is well known in the art.

The downturned flange 31 of the cap 29 is, in the illustrated embodiment of the invention, formed to provide a pair of diametrically opposed, radially projecting ears 56 and 57, the structure being such that, as is most clearly illustrated in FIGS. 2 and 4, the ear 56 includes a spaced pair of substantially radially arranged, vertical walls 58 and 59 providing a guideway.

Guided within said ear 56 for limited reciprocation relative to the cap body 30 upon a line substantially parallel with the axis of said body is a latch element 60 formed to provide a toe 61 so arranged as to extend to a position radially inward with respect to the circle defined by the lip 22. Said latch element is provided with a stem 62 which penetrates an opening 63 in the cap body 30 and carries, at its distal end, a knob 64 accessible for manipulation from outside the cap body and acting, as well, as a stop to limit movement of the latch element away from the cap body under the influence of a spring 65 which is sleeved on said stem 62 and confined between the latch element 60 and the lower surface of the cap body 30. As is perhaps most clearly illustrated in FIG. 4, the rearward face 66 of the toe 61 is substantially vertical, while the forward face 67 thereof is inclined or cammed forwardly and upwardly.

Thus, when the latch element 60 is in its lowermost position, as shown in FIGS. 3 and 4, while the cap is in position on a filler neck 20, the toe 61 traverses the plane of the horizontal flange 68 from which the lip 22 depends; while, when said latch element is in its uppermost position, said toe is disposed wholly above said plane.

It will now be seen that, when the fingers 32 and 33 are entered through the notches 34 and 35, respectively, the innermost end of the latch toe 61 will bear upon the upper surface of the flange 68 adjacent the shallow end of the cam surface 23. As the cap is now turned in a forward direction, the finger 32 will move past the extension 36, and as the trailing end 72 of the finger 32 passes the forward end 70 of the extension 36, the latch toe 61 will move past the rearward end 75 of the notch 35 and the latch toe will be moved downwardly by the spring 65 to drop into the notch 35. Now, as forward movement of the cap is continued, the finger 32 will ride down the cam surface 23 and, before the forward end of the finger 32 comes into engagement with the projection 38, the camming surface 67 of the latch toe will engage the forward end 76 of the notch 35, whereby the latch element will be shifted upwardly to the position of FIG. 1 as the finger 32 comes into engagement with the projection 38.

As the cap is turned in a rearward direction from the position of FIG. 2, the latch toe 61 will drop off the flange 68 and into the notch 35 before the flange 44 has engaged the collar flange 46 to lift the gasket 50 off the seat 25, but as the rearward movement continues, the vertical face 66 of the latch toe 61 comes into positive abutment with the end 75 of the notch 35 substantially concurrently with the registry of the trailing end 72 of the finger 32 with the forward end 70 of the extension 36. Such engagement of the latch face 66 with the notch end 75 positively arrests rearward movement of the cap in a position in which the gasket 50 is off the seat 25, as shown in FIG. 3, and the interior of the cooling system is in open communication with the vent port 27. Further rearward movement of the cap to bring the fingers 32 and 33 into registry with the notches 34 and 35 is positively prevented until the manipulator has affirmatively shifted the latch element 60 upwardly, against the tendency of the spring 65, to move the latch toe 61 to a position wholly above the plane of the flange 68.

In FIGS. 6 to 9, I have illustrated a modified form of latch mechanism in the same general environment shown in FIGS. 1 to 4. The cap and its valving parts, and the filler neck shown in FIGS. 5 to 9 are identical with those illustrated in FIGS. 1 to 4 and described above; but a different form of latch means is carried by the cap of the modified form.

The cap 80 is provided with a downturned, perimetral flange 81 which, at diametrically opposed points at its peripheral edge, carries retainer fingers 82 and 83, radially inturned and offset from the plane of the cap body for cooperation with the lip 22 of the filler neck 20. The flange 81 is formed to provide oppositely radially projecting ears 84 and 85, substantially midway between the fingers 82 and 83; and the ear 84 includes substantially radial side walls 86 and 87. The wall 86 is provided with a vertically elongated slot 88 for a purpose which will appear.

A leaf spring 89 has one end anchored, as by the rivet 90, upon the inner surface of the cap body 80 and extends, in chordal relation to the cap body, beyond the ear wall 86, the distal end 91 of said spring projecting through the slot 88 and preferably being offset downwardly beyond said ear wall, as shown.

Intermediate its ends, the spring **89** is formed to provide a depending toe **92** the rearward face **93** of which is substantially vertical and the forward face **94** of which is inclined forwardly and upwardly to define a camming surface. The toe **92** is so positioned, in the length of the spring **89**, as to traverse the circle defined by the lip **22** when the cap is in place on the filler neck **20**. The spring **89** is so proportioned and designed that its distal end tends to move downwardly to engage the bottom wall of the slot **88**; but, by manipulation of the projecting end **91** of said spring, the spring may be flexed into the position of FIG. 5. When the spring end is in its lowermost position, the toe **92** also traverses the plane of the flange **68** of the filler neck **20**.

When the fingers **82** and **83** of the cap are projected through the notches **34** and **35** in the lip **22** and the cap is turned forwardly, the fingers **82** and **83** ride under the projections **36** and **39**, and the lowermost tip of the toe **92** bears against the surface of the flange **68**. As the cap is further turned forwardly, the fingers **82** and **83** begin to ride down the cam surfaces **23** and **24**, thereby flexing the spring **89** until the toe drops off the rearward end **75** of the notch **35** and into said notch. Just before the fingers **82** and **83** reach their fully seated positions illustrated in FIG. 6, the cammed face **94** of the toe **92** engages the forward end **76** of the notch **35** and, as the cap progresses to the position of FIG. 6, the toe rides up onto the flange **68**, thus flexing the spring into the position of FIGS. 5 and 6.

Now, when the cap is turned rearwardly for removal from the filler neck, the toe **92** drops off the forward end **76** of the notch **35** and into said notch. When the fingers **82** and **83** reach the lands **37** and **40**, the rearward face **93** of the toe **92** will engage the rearward end **75** of the notch **35**, thereby positively arresting further rearward movement of the cap relative to the filler neck, while the fingers **82** and **83** are still firmly engaged with the lip **22**. In this condition of the parts, as illustrated in FIGS. 8 and 9, the valve **50** is off the seat **25** so that the interior of the cooling system is in open communication with the atmosphere through the vent port **27**. The cap cannot be removed from the filler neck, however, until the distal end **91** of the spring **89** is manually lifted to flex the spring and raise the toe **92** wholly above the level of the flange **68**. In this form of the invention, the manipulable spring end is readily engageable by the thumb or a finger of the hand with which the operator is turning the cap.

I claim as my invention:

1. A safety radiator cap comprising a discoid, generally planar cap body provided with retainer means constructed and arranged for engagement, upon turning movement, with a conventional radiator filler neck lip to retain said cap upon such a neck, and latch means carried by said cap body adjacent the perimeter thereof at a point peripherally spaced approximately 90° from the peripheral midpoint of said retainer means and mounted for movement toward and away from said cap body generally in a line perpendicular to the plane of said cap body, said latch means being resiliently biased against movement toward said cap body, whereby, when said cap is fully engaged with such a filler neck, it may be turned in a disengaging direction to a limited extent, whereupon, before disengagement of said retainer means, such turning movement will be positively arrested until said latch means is manually shifted against its resilient bias.

2. A closure cap comprising a discoid, generally planar cap body having a downturned, perimetral flange, said flange being formed to define a radially-outwardly projecting ear, an inturned retainer finger adjacent the distal edge of said flange engageable, upon turning movement, with a conventional radiator filler neck lip to retain said cap upon such a neck, the peripheral midpoint of said finger being spaced approximately 90° from the peripheral center of said ear, a latch element received and guided within said ear for limited movement relative to said cap body generally in a line perpendicular to the plane of said cap body, and spring means within said ear engaging said latch element and yieldingly resisting movement of said latch element toward said cap body, whereby, when said cap is fully engaged with such a filler neck, it may be turned in a disengaging direction to a limited extent, whereupon, before disengagement of said retainer means, such turning movement will be positively arrested until said latch means is manually shifted against its resilient bias.

3. A safety radiator closure cap comprising a discoid, generally planar cap body, retainer means carried adjacent the periphery of said cap body and having a portion offset from the plane of said body and extending substantially radially relative to the periphery of said body for engagement, upon turning movement, with a conventional radiator filler neck lip to retain said cap upon such a neck, a leaf spring having one end anchored on said cap body and extending in chordal relation to said cap body beyond the periphery thereof, and a projection fixed relative to said spring intermediate the ends thereof, extending away from said cap body and disposed radially just within the periphery of said cap body and angularly spaced approximately 90° from the peripheral midpoint of said retainer means, the portion of said spring at which said projection is located being movable toward the plane of said cap body by flexure of said spring in response to manipulation of the distal end of said spring, whereby, when said cap is fully engaged with such a filler neck, it may be turned in a disengaging direction to a limited extent, whereupon, before disengagement of said retainer means, such turning movement will be positively arrested until said latch means is manually shifted against its resilient bias.

4. A closure cap comprising a discoid, generally planar cap body having a downturned, perimetral flange formed with a slot therein elongated in a direction perpendicular to the plane of said body, an inturned retainer finger adjacent the distal edge of said flange engageable, upon turning movement, with a conventional radiator filler neck lip to retain said cap upon such a neck, a leaf spring having one end anchored to the inner, planar surface of said body and extending in chordal relation thereto through said slot and beyond said flange, and a projection fixed relative to said spring intermediate the ends thereof, extending inwardly therefrom and located radially just within the circle defined by the major portion of said flange, the distal end of said spring being manipulable to move said spring toward the plane of said body by flexure of said spring, whereby, when said cap is fully engaged with such a filler neck, it may be turned in a disengaging direction to a limited extent, whereupon, before disengagement of said retainer means, such turning movement will be positively arrested until said latch means is manually shifted against its resilient bias.

5. The combination with a filler neck of a fluid system designed to operate under superatmospheric pressure, said filler neck having a mouth, an internal valve seat facing said mouth, a peripherally-extending lip surrounding said mouth and providing a cam surface inclining toward said seat as it progresses peripherally in a forward direction, said lip being interrupted by a notch, and a vent port between said seat and said mouth, of a closure cap for said filler neck comprising a cap body constructed and arranged to close said mouth, a pressure valve suspended from said cap body for limited reciprocation toward and away from said body, spring means confined between said cap body and said valve and yieldably resisting movement of said valve toward said cap body, retainer means carried by said cap body adjacent the periphery thereof and having a portion offset from the plane of said body and extending substantially radially relative to the periphery of said body, said retainer means being enterable through said lip notch and thereupon engageable, by forward turning movement of said cap body, with said lip cam surface, said parts being so constructed and ar-

ranged that, when said retainer means is engaged with that portion of said cam surface nearest the level of said seat, said valve is sealingly engaged with said seat and when said retainer means is engaged with a portion of said cam surface nearer said notch, said valve is supported out of sealing engagement with said seat, and latch means supported on said cap body for axial movement relative thereto between a first position traversing the plane of said lip and a second position wholly above said lip, and spring means yieldably urging said latch means toward said first position, said latch means being so angularly spaced from said retainer means that, as said cap body is turned rearwardly from engagement with that portion of said cam surface nearest the level of said seat, said latch means will engage said lip at the rear edge of said notch

to hold said body against further rearward turning movement, before said retainer means attains registry with said notch.

6. The combination of claim 5 in which the rearward face of said latch means is substantially vertical while the forward face thereof inclines forwardly and in the direction of latch movement toward said second position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,534,286	Maitzen	Dec. 19, 1950
2,968,421	Eshbaugh	Jan. 17, 1961
2,990,971	Enell	July 4, 1961