

Dec. 22, 1959

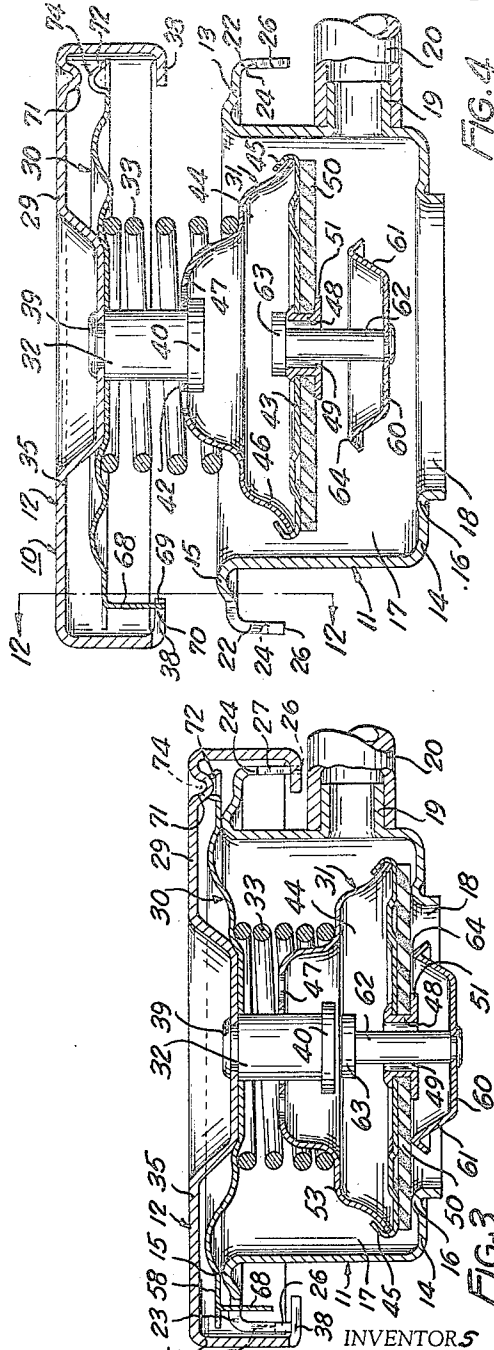
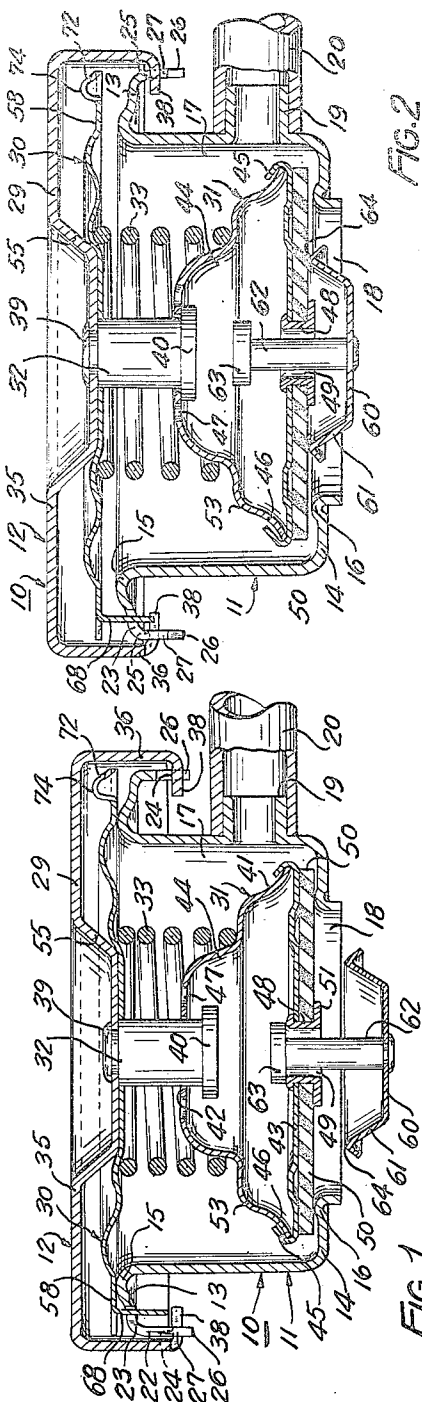
G. R. PIPES ET AL

2,918,191

CLOSURE DEVICE

Filed Nov. 27, 1957

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

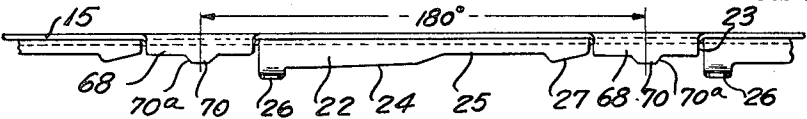


FIG. 5

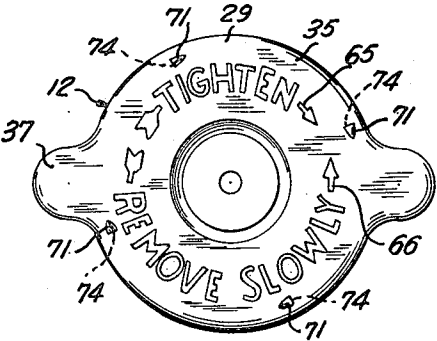


FIG. 6

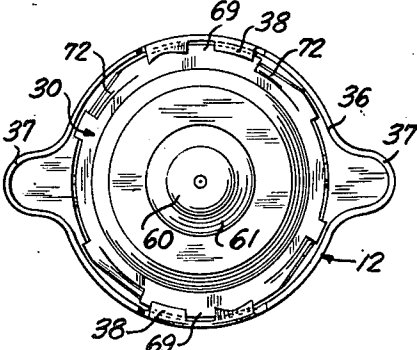


FIG. 7

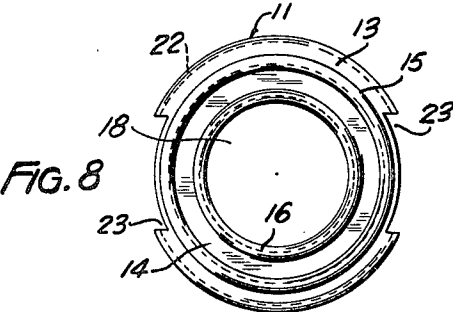


FIG. 8

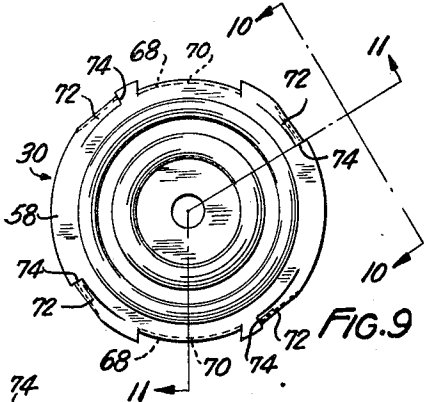


FIG. 9

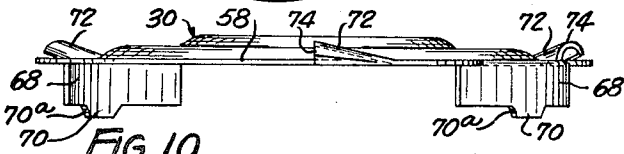


FIG. 10

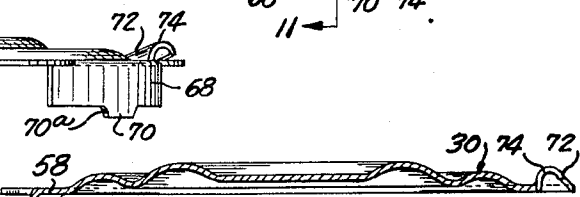


FIG. 11

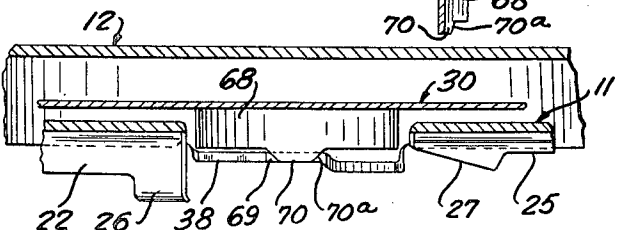


FIG. 12

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2,918,191

CLOSURE DEVICE

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Application November 27, 1957, Serial No. 699,290

11 Claims. (Cl. 220—40)

This invention relates to closure devices for pressure-type engine cooling systems and, more particularly, to closure devices of the kind having a safe-removal closure cap by which a preliminary venting of the pressure of the system is accomplished to prevent personal injury due to a too-sudden release of heated vapor or steam.

This application is related, as to subject matter, to original application Serial No. 641,553 filed February 21, 1957, and is a continuation-in-part thereof.

The original application identified above discloses and claims a closure device embodying such a safe-removal type of cap having interlock means effective between the cap body and an inner transverse member or diaphragm means for interrupting the rotation of the cap body relative to such inner member or diaphragm means. The cap body and diaphragm means are disclosed therein as having attaching lugs and holding lugs respectively, of which the attaching lugs are movable through access openings of a filler neck for locking cooperation with cam-type locking elements and safety stops of the neck and the holding lugs are engageable in the access openings for preventing rotation of the diaphragm means relative to the neck.

In the aforesaid original application it was recognized that although safety stops had theretofore been provided on the filler neck, a too-sudden removal of the cap from the neck was still possible when the cap was manually held in an axially shifted position with the attaching lugs thereof in a clearing relation to the safety stops, while the cap was being rotated in the unlocking or disengaging direction. The interlock means was accordingly provided to prevent such a too-sudden removal of the cap and accomplished two functions; namely, it provided a means for interrupting the disengaging rotary movement of the cap body relative to the diaphragm means, and it provided a means for normally locating the holding lugs of the diaphragm means in an aligned relation with the attaching lugs of the cap body for simultaneous entry into the access openings of the neck when the cap is applied thereto.

The present invention provides, as one of its objects, a safe-removal type of cap and a closure device of the kind referred to above in which novel interlock means is provided between the cap body and an inner transverse member or diaphragm means therein.

As another object thereof, this invention provides such a safe-removal type of cap and closure device in which the novel interlock means between the cap body and diaphragm means comprises cooperating elements on the attaching and holding lugs respectively of the cap body and diaphragm means, the cooperating elements preferably being a recess in the attaching lugs and a projection or free end portion on the holding lugs which is normally engaged in the recess but is disengageable therefrom in response to rotation of the cap body relative to the diaphragm means.

Still another object is to provide such a safe-removal type of cap and closure device in which the projection

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or free end portion of the holding lugs has a cam profile to facilitate the disengagement of the same from the recess of the attaching lugs.

It is also an object of this invention to provide a cap and closure device of the character above indicated in which the cooperating interlock elements of the attaching and holding lugs of the cap body and diaphragm means are employed in combination with other interlock means effective between the cap body and diaphragm means for interrupting the unlocking rotation of the cap body relative to the diaphragm means and neck.

Additionally, this invention provides a cap and neck combination of the type in which the neck has inner and outer seats engaged by inner and outer portions of the cap, and in which two interlock features are embodied in the cap and are effective between the rotatable cap body and nonrotatable diaphragm thereof for releasably holding the lugs of the cap body and diaphragm in an aligned relation and for interrupting the unlocking rotation of the cap body relative to the diaphragm.

Other objects and advantages of this invention will be apparent in the following detailed description and in the accompanying drawings forming a part of this specification and in which,

Fig. 1 is an axial section taken through a closure device embodying the present invention and showing the cap in its locked position on the filler neck;

Fig. 2 is a similar axial section, but showing the cap rotated to its unlocked position on the neck and with parts of the cap in pressure-venting positions;

Fig. 3 is an axial section with the cap in a rotative position similar to Fig. 2, but with the cap body axially depressed and with the safety stop elements of the diaphragm means and cap body in cooperating relation for interrupting the unlocking or disengaging rotation of the cap;

Fig. 4 is an axial section taken through the closure device and showing the cap partially removed from the neck;

Fig. 5 is a side elevation in the form of a development view of the neck and diaphragm, the view showing the access openings and cam and stop elements of the neck and also showing the lugs of the diaphragm engaged in the access openings;

Fig. 6 is a top plan view of the cap;

Fig. 7 is a bottom plan view of the cap removed from the neck and with the cap body rotated approximately 90 degrees relative to the diaphragm for clearer illustration of the structural features;

Fig. 8 is a top plan view of the neck;

Fig. 9 is a top plan view of the diaphragm showing the same in detached relation;

Fig. 10 is a larger scale edge view of the diaphragm taken as indicated by the directional line 10—10 of Fig. 9;

Fig. 11 is a larger scale sectional view taken through the diaphragm on section line 11—11 of Fig. 9; and

Fig. 12 is a larger scale partial vertical section taken as indicated by section line 12—12 of Fig. 4 but with the cap in position on the neck, the view showing the relative positions of the cooperating parts.

As representing a preferred embodiment of this invention, Figs. 1 to 4 inclusive show a closure device 10 comprising a tubular member or filler neck 11 and a closure cap 12 detachably mounted on such filler neck. The closure device 10 can be used on any of various tanks or containers adapted to hold fluid under pressure and is here shown as being of a construction intended for use on the radiator of a pressure-type cooling system for an internal combustion engine.

The filler neck 11 is here shown as comprising a substantially cylindrical member having external and in-

ternal annular flanges 13 and 14 providing axially spaced outer and inner annular seats 15 and 16. The filler neck 11 is adapted to be mounted on the associated radiator or tank with the axial passage 17 thereof communicating with such radiator or tank through the central opening 18 of the internal flange 14. At a point between the annular seats 15 and 16, the side wall of the filler neck is preferably provided with a vent and overflow nipple 19 to which a drain pipe 20 is connected.

As represented in the development view of Fig. 5, the flange 13 of the filler neck 11 is provided with circumferentially spaced depending arcuate cam members 22 and with access openings 23 between the adjacent ends of the cam members. The cam members 22 each carry locking elements comprising an inclined locking cam portion 24 and an adjacent substantially straight or horizontal dwell or pressure release portion 25. The cam members 22 also comprise limit stops 26 located at the high ends of the locking cams 24 and safety stops 27 located between the access openings 23 and the adjacent ends of the dwell portions 25. The purposes of the access openings 23 and the various portions of the cam members 22 will be explained hereinafter.

The closure cap 12 comprises, in general, a cap body 29 and an inner transverse member or diaphragm means associated therewith and here shown as comprising a single resiliently flexible disk-like diaphragm 30. The cap 12 also comprises an inner closure means 31 connected with the cap body 29 by an axial stem 32, and a spring means interposed between the diaphragm 30 and the inner closure means and here shown as being a helical spring 33 coaxially surrounding the stem 32.

The cap body 29 preferably comprises a cup-shaped member having a transverse top wall 35 and a depending marginal flange or skirt 36. The flange 36 and the transverse top wall 35 are here shown as having laterally extending portions forming lever elements 37 on the cap body for assisting an operator in manually grasping the same. The cap body 29 also comprises attaching lugs 38 which are here shown as comprising inturned portions of the marginal flange 36 and which lugs are axially movable through the access openings 23 of the filler neck 11 for cooperation with the cam members 22 in a manner which will appear hereinafter.

The stem 32 provides a centering and mounting means for the diaphragm 30 and for the inner closure means 31 and is mounted on the cap body 29 substantially centrally thereof. The stem 32 has its outer end secured to the transverse wall 35 as by the riveted stem portion 39. At the lower end thereof, the stem 42 is provided with a head 40.

The inner closure means 31 comprises a cup-shaped hollow member 41 having a transverse top wall 42 through which the stem 32 extends and which top wall is engageable with the head 40 for preventing separation of such inner closure means from the cap body 29. The inner closure means 31 also comprises a transverse bottom plate 43 extending across the chamber 44 of the cup shaped member 41 and mounted on the latter by means of tabs or fingers 45 deflected inwardly into an overlying relation to the flared annular lip 46 of such cup-shaped member. The member 41 has one or more openings 47 in the upper portion thereof through which the chamber 44 is in communication with the neck passage 17 at all times.

The transverse bottom plate 43 is provided with a depending hollow stem portion 48 defining a vent passage 49 extending axially through this bottom plate and through a gasket 50 lying against the lower face of such bottom plate. The gasket 50 is retained against the bottom plate 43 by an in-turned flange 51 of the stem 48 and has sealing engagement with the inner annular seat 16 of the filler neck when the closure cap is applied thereto. The connection provided for the bottom plate

43 by the tabs 45 permits the member 41 to rotate relative to the bottom plate, such that the gasket 50 can remain stationary against the seat 16 and be relatively free of any scuffing action.

The inner closure means 31 is axially slidable on the stem 32 of the cap body 29 and is provided with an annular shoulder or spring seat 53 which is engaged by the lower end of the spring 33. The spring 33 is effective on the inner closure means 31 to press the latter against the inner seat 16 of the filler neck when the closure cap 12 is applied thereto and also presses the central portion of the diaphragm 30 against the central portion of the cap body 29.

The central portion of the cap body 29 is preferably inwardly offset so as to form a tapered axial boss 55 thereon. The diaphragm 30 preferably also has an axially offset or recessed central portion which is held in seating engagement with the tapered boss 55 by the spring 33 for centering, or assisting in centering, the diaphragm in the cap body.

The annular portion of the diaphragm 30, which lies outwardly of and surrounds the recessed central portion thereof in which the tapered boss 55 is received, is preferably of a wavy or corrugated transverse shape as shown in the drawings. The peripheral portion of the diaphragm lying outwardly of such corrugated annular portion is a substantially flat portion 58 for seating engagement against the outer annular seat 15 of the neck.

The inner closure means 31 is also provided with a check valve 60 comprising a valve member 61 and a supporting stem 62 extending through the vent passage 49. The stem 62 is provided with a head 63 which is located in the chamber 44 and is engageable with the upper side of the bottom plate 43 for maintaining the valve member 61 in a suspended relation adjacent the gasket 50. The valve member 61 is preferably in the form of a dished sheet metal member having an annular rim 64 for sealing engagement with the gasket 50 when this valve member is lifted and pressed against the latter by pressure in the radiator or tank to which the closure device 10 has been attached.

In the construction of the closure device 10 as thus far described, it will be seen that the cap 12 can be applied to the filler neck 11 by inserting the inner closure means 31 into the passage 17 of the neck and by simultaneously moving the attaching lugs 38 through the access openings 23. By rotation of the closure cap 12 in a clockwise locking direction relative to the neck as indicated by the arrow 65, the attaching lugs 38 are moved along the cam members 22 and into engagement with the locking cams 24. This rotation of the cap and the accompanying movement of the lugs 38 along the locking cams 24, causes the cap to assume a locked position on the neck in which the diaphragm 30 is pressed against the outer annular seat 15 and the gasket 50 of the inner closure means 31 is pressed against the inner annular seat 16, as shown in Fig. 1.

When pressure builds up in the radiator or tank, the check valve member 61 is lifted and pressed against the gasket 50 as shown in Fig. 2 to close the vent passage 49 and to maintain the radiator in a sealed condition. When the pressure in the radiator or tank subsides, such as upon cooling of the radiator, the check valve member 61 drops to its suspended position shown in Fig. 1, thereby venting the radiator or tank to atmosphere to prevent the occurrence of a vacuum therein.

When the closure cap 12 is rotated in an unlocking or releasing direction relative to the filler neck as indicated by the arrow 66, the lugs 38 are moved in a downhill direction along the cams 24 and when they arrive at the pressure releasing or dwell portions 25, the pressure of the diaphragm against the outer seat 15 is relieved and the sealing engagement of the gasket 50 against the inner seat 16 is likewise relieved. At this time, the cap 12

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occupies a position relative to the filler neck corresponding with that illustrated in Fig. 2, in which the pressure of the radiator or tank is being properly and safely relieved and vented to atmosphere either through the open outer end of the neck or through the overflow and drain pipe connected with the nipple 19.

For safety purposes, the unlocking rotation of the closure cap 12 is arrested or interrupted by the safety stops 27 of the neck so as to maintain the attaching lugs 38 of the cap in cooperation with the dwell portions 25 of the cam members for retaining the cap on the neck. While the cap is thus retained on the neck in its unlocked condition, the pressure of the radiator is being safely vented to atmosphere such that personal injury to an operator is not likely to occur by reason of a too sudden and complete removal of the cap from the neck.

From the construction of the closure device 10 as thus far described, it will also be seen that when the cap 12 has been applied to the filler neck 11 and rotated to its locked position thereon, the diaphragm 30 bears against the external annular seat 15 and is subjected to load by being axially deflected toward the transverse top wall 35 of the cap body 29. When the attaching lugs 38 occupy a position opposite the dwell portions 25 of the cam members 22, the diaphragm is substantially unloaded, but the safety stops 27 are still engageable by the lugs 38 to delay the complete removal of the cap from the neck. The safety stops 27 are surmountable by the attaching lugs 38 and further rotation of the cap body 29 in the releasing direction causes the lugs 38 thereof to ride over the safety stops, whereupon the cap 12 can be lifted off the filler neck 11.

From the construction above described it will also be seen that the cap body 29 is rotatable relative to the diaphragm 30 during the locking and unlocking movements of the cap body relative to the neck 11. The diaphragm 30 is held against rotation by the neck 11 by means of downturned retaining lugs 68 formed on the diaphragm adjacent the periphery thereof and which are engageable in the access openings 23 when the cap 12 is applied to the neck. Thus, at all times when the cap 12 is in an applied position on the neck 11, the diaphragm 30 is nonrotatably held by the neck but the cap body is always rotatable except when such rotation is prevented by the arresting stops.

In order that the holding lugs 68 of the diaphragm 30 be readily movable into the excess openings 23 when the cap 12 is being applied to the neck, the present invention provides novel interlock means by which the diaphragm lugs are located in an initial position substantially in alignment with the attaching lugs 38 of the cap body 29. This interlock means comprises cooperating elements carried by the attaching and holding lugs themselves and which interlock elements consist of a female element or recess 69 and a male element or projection 70 engageable therein. In the case of the cap shown in the drawings the recess 69 is provided in the attaching lugs 38 of the cap body 29 and the projection 70 is provided on the holding lugs 68 of the diaphragm 30.

The recess 69 is in the form of a notch or opening of an appropriate arcuate length cut in each of the lugs 38 at or adjacent the midpoint thereof. The projection is formed as a free end portion of appropriate axial length on each of the lugs 68 at or adjacent the midpoint thereof and is of an arcuate width somewhat less than that of the recess 69 so as to be engageable in the latter. The projection 70 is preferably of a cam profile, as by being provided with sloping edges 70^a, which facilitate the movement of the projection into its associated recess 69 but, more especially, facilitate the disengagement of the projection from its associated recess when the cap body is rotated relative to the diaphragm. The sloping edges 70^a also tend to produce self-centering of the projections 70 in their associated recesses 69.

When the cap 12 is applied to the neck 11 with the

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paired lugs 38 and 68 engaged in the access openings 23, the cap body 29 can be rotated relative to the diaphragm 30 to bring the attaching lugs 38 into locking cooperation with the tapered cams 24, and, during this rotation of the cap body, the diaphragm will be held against rotation on the neck by the engagement of the holding lugs 68 in the access openings. During this locking rotation of the cap body, the recesses 69 disengage themselves from the projections 70 by a camming action of adjacent edge portions of the lugs 38 with the sloping edge portions 70^a of the projections.

When the cap body is rotated in the reverse direction to unlock the same, the projections 70 are returned to a position in which they reengage in the recesses 69 whereby the attaching lugs 38 are restored to position in alignment with the holding lugs 68. When the cap 12 is lifted off of the neck 11 the holding lugs 68 of the diaphragm will, by reason of the engaged condition of the interlock elements 69 and 70, remain in the above-described aligned relation with the attaching lugs 38 so that upon reapplication of the cap to the filler neck the aligned lugs will be readily movable into the access openings 23.

In completing the removal of the cap 12 from the neck 11 after the lugs 38 have been moved in the unlocking direction to a position opposite the dwell portions 25 of the cam members 22, the lugs 38 are movable past the safety stops 27 by rotating the cap while a sufficient axial pressure is being applied to the cap body 29 to shift the same toward the neck member, in opposition to the expansive forces of the diaphragm 30 and the spring 33, to locate the lugs 38 in a clearing relation to these safety stops. To avoid the possibility of a too sudden removal of the cap 12 by an unlocking rotation thereof while the lugs 38 are being maintained in such a clearing relation to the safety stops 27 by an axial pressure being manually maintained on the cap body, a second interlock means is provided on the cap which is effective for preventing such a complete or uninterrupted releasing rotation of the cap body. This second interlock means utilizes the neck-restrained condition of the diaphragm 30 for interrupting the unlocking rotation of the cap body 29, as will be described next.

The second interlock means comprises safety stop means which is here shown as comprising stop elements 71 on the cap body 29 and stop elements 72 on the diaphragm 30. The interlock or stop elements 72 of the diaphragm are located adjacent the periphery thereof so as to lie outside of the annular seat 15 and, as here shown, may comprise partially sheared diaphragm portions which have been deflected upwardly so that the stop elements 72 are of a circumferentially tapered height and wedge-like shape, as shown in Fig. 10, with the high ends of these elements defining substantially right-angularly disposed abutments 73 facing in the same arcuate direction.

The interlock or stop elements 71 of the cap body 29 are preferably formed by partially sheared portions of the transverse wall 35 which have been deflected axially inwardly and have a circumferentially tapered height and wedge-like shape, such that the high ends of these elements define substantially right-angularly disposed abutments 74 facing in the same arcuate direction and in an arcuate direction which is opposite to the arcuate direction in which the abutments 73 of the locking elements 72 face. The stop elements 71 of the cap body 29 are located at substantially the same radial distance from the rotation axis as the stop elements 72 of the diaphragm, such that when the cap body is shifted axially to a fully depressed condition by manual pressure applied thereto to move the attaching lugs 38 to the above-mentioned clearing relation to the safety stops 27, the safety stops 72 of the diaphragm will extend into the path of movement of the stops 71 of the cap body during the unlocking rotation of the latter.

The stop elements 72 of the diaphragm 30 are located

thereon in an angular relation to the holding lugs 68 and the stop elements 71 of the cap body are located thereon in an angular relation to the attaching lugs 38, such that the stop elements 72 will be engaged by the stop elements 71 substantially upon the arrival of the lugs 38 to a position opposite the dwell portions 25 of the cam members 22. The engagement of the stop elements 71 with the stop elements 72 at this time interrupts the rotation of the cap body in the unlocking direction, such that the cap body will be temporarily held against a full unlocking rotation by the neck-restrained diaphragm 30.

In order to continue the unlocking rotation of the cap body 29, it is necessary that the operator first relieve the axial pressure being applied to the cap body to thereby permit an axial movement of the cap body in a direction away from the neck sufficient to disengage the stop elements 71 of the cap body from the stop elements 72 of the diaphragm. As soon as this disengagement of the stop elements 71 and 72 has taken place, the cap body can again be rotated in the unlocking direction to cause the attaching lugs 38 to ride over the safety stops 27 such that the cap 12 can be lifted off of the neck.

When the cap 12 has been applied to the neck 11 and the cap body 29 is being rotated relative to the diaphragm for moving the attaching lugs 38 toward engagement with the tapered cams 24, the stop elements 71 of the cap body will readily move past the stop elements 72 of the diaphragm because at this time the taper of the stops 71 is presented toward the taper of the stops 72, which permits the stops 71 to readily ride over and move past the stops 72.

From the accompanying drawings and the foregoing detailed description, it will now be readily understood that this invention provides novel interlock means in a closure device of the kind having a safe-removal closure cap and which embodies safety stop means for preventing a too-sudden removal of the closure cap from the filler neck, regardless of whether an axial pressure of a sufficient magnitude is being manually applied to the cap to hold the attaching lugs thereof in a clearing relation to the safety stops of the filler neck during the unlocking rotation of the cap body. It will now also be understood that the novel interlock means comprises cooperating lug aligning elements located on the lug elements of the diaphragm means and cap body for producing an initial alignment of those lug elements for movement of the same through the access openings of the filler neck. Additionally, it will be understood that this invention has provided a second interlock means in combination with the first interlock means and which second interlock means comprises cooperable safety stop elements on the cap body and neck-restrained diaphragm means which effectively interrupt the unlocking rotation of the cap body.

Although the closure device of this invention has been illustrated and described herein to a somewhat detailed extent, it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope, but includes all changes and modifications coming within the terms of the claims hereof.

Having described our invention, we claim:

1. A closure cap comprising, a hollow cap body having a transverse disk wall and flange means depending from outer edge portions of said wall, an inner transverse member retained in said body and located adjacent said wall, said body and inner member being relatively rotatable about a common axis, attaching lugs on said flange means and extending in a radial direction relative to said axis, axially extending holding lugs on said inner member, and interlock means comprising mutually cooperating male and female elements on said holding and attaching lugs, said male elements being normally engaged in said female elements and being disengageable therefrom in response to the relative rotation between said body and inner member.

2. A closure cap comprising, a hollow cap body having a transverse disk wall and flange means depending from outer edge portions of said wall, a diaphragm member retained in said body and located adjacent said wall, said body being rotatably relative to said diaphragm member and about an axis common to said body and diaphragm member, attaching lugs on said flange means and extending in a radial direction relative to said axis, axially extending holding lugs on said diaphragm member, and mutually cooperating male and female interlock elements on said holding and attaching lugs, said male elements being normally engaged in said female elements and being disengageable therefrom in response to the rotation of said body relative to said diaphragm member.

3. A closure cap comprising, a cap body having a transverse top wall and a depending marginal flange, attaching lugs on said flange, said attaching lugs having recesses therein, a resiliently flexible transverse diaphragm member retained in said cap body, said body being rotatable relative to said diaphragm member, and holding lugs on said diaphragm member and extending toward said attaching lugs, said holding lugs having free end portions of relatively reduced width and provided with a cam profile, said free end portions being normally engaged in said recesses but being disengageable therefrom by cooperation of said cam profile with portions of said attaching lugs in response to rotation of said body relative to said diaphragm member.

4. A closure cap comprising, a cap body having a transverse wall and depending attaching lugs on the underside of said body, transverse diaphragm means retained in said cap body and having holding lugs extending toward said attaching lugs, said body being rotatable and axially shiftable relative to said diaphragm means, cooperable stop elements on said wall and diaphragm means for interrupting the rotation of said body relative to said diaphragm means, said stop elements being releasable in response to axial shifting of said body relative to said diaphragm means, and interlock means comprising male and female elements on said holding and attaching lugs, said male elements being normally engaged in said female elements and being disengageable therefrom in response to the rotation of said body relative to said diaphragm means.

5. A closure cap comprising, a cap body having a transverse wall and a depending marginal flange, attaching lugs carried by said flange, transverse diaphragm means retained in said body and lying adjacent said wall, holding lugs on said diaphragm means substantially in axial alignment with and extending toward said attaching lugs, said body being rotatable and axially shiftable relative to said diaphragm means, cooperable stop elements on said wall and diaphragm means for interrupting the rotation of said body relative to said diaphragm means, said stop elements being releasable in response to axial shifting of said body relative to said diaphragm means and interlock means on said attaching and holding lugs comprising recesses in said attaching lugs and free end portions on said holding lugs, said free end portions being normally engaged in said recesses and being disengageable therefrom in response to the rotation of said body relative to said diaphragm means.

6. A closure device comprising, a filler neck having flange means carrying locking elements, a cap body cooperable with said neck and having depending attaching lugs on the underside thereof, said flange means having access openings therein affording access to said locking elements for said attaching lugs, an inner transverse member retained in said body and having holding lugs engageable in said access openings, said body being rotatable relative to said inner member and also being rotatable relative to said neck for engaging said attaching lugs with said locking elements, and interlock means comprising male and female elements on said holding and attaching lugs and having a normally engaged relation

for locating said holding and attaching lugs in an aligned relation, said male elements being disengageable from said female elements in response to the rotation of said body relative to said inner member.

7. A closure device comprising, a filler neck having flange means carrying locking elements, a cap body cooperable with said neck and having a transverse wall and an axially depending flange, attaching lugs on said depending flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, transverse diaphragm means retained in said body and having holding lugs extending toward said attaching lugs and engageable in said access openings, said body being rotatable relative to said diaphragm means and also being rotatable relative to said neck for engaging said attaching lugs with said locking elements, and cooperating interlock elements on said lugs comprising recesses in said attaching lugs and free end portions on said holding lugs, said free end portions being normally engaged in said recesses and being disengageable therefrom in response to the rotation of said body relative to said diaphragm means.

8. A closure device comprising, a filler neck having flange means carrying locking elements, a cap body cooperable with said neck and having a transverse wall and an axially depending flange, attaching lugs on said depending flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, transverse diaphragm means retained in said body and having holding lugs extending toward said attaching lugs and engageable in said access openings, said body being rotatable and axially shiftable relative to said diaphragm means and also being rotatable relative to said neck for engaging said attaching lugs with said locking elements, cooperable stop elements on said wall and diaphragm means for interrupting the rotation of said body relative to said diaphragm means in an unlocking direction, said stop elements being releasable in response to axial shifting of said body relative to said diaphragm means, and cooperating interlock elements on said lugs comprising recesses in said attaching lugs and free end portions on said holding lugs, said free end portions being normally engaged in said recesses and being disengageable therefrom in response to the rotation of said body in a locking direction relative to said diaphragm means.

9. A closure device comprising, a filler neck having axially spaced outer and inner flanges providing outer and inner annular seats, locking elements on said outer flange, a cap body cooperating with said neck and hav-

ing a transverse wall and a depending skirt, attaching lugs carried by said skirt, said outer flange having access openings therein affording access to said locking elements for said attaching lugs, diaphragm means retained in said cap body and engaging said outer seat, inner closure means connected with said cap body and engaging said inner seat, holding lugs on said diaphragm means and engageable in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable and axially shiftable relative to said diaphragm means and also being rotatable relative to said neck for engaging and disengaging said attaching lugs relative to said locking elements, cooperable stop elements on said wall and diaphragm means for interrupting rotation of said cap body relative to said diaphragm means in the direction for disengaging said attaching lugs from said locking elements, said stop elements being releasable in response to axial shifting of said cap body in one direction relative to said diaphragm means, and cooperating elements on said lugs comprising recesses in said attaching lugs and free end portions on said holding lugs, said free end portions being normally engaged in said recesses and being disengageable therefrom in response to rotation of said cap body relative to said diaphragm means and in the direction to engage said attaching lugs with said locking elements.

10. A closure cap comprising, a hollow cap body having a transverse disk wall and flange means depending from outer edge portions of said wall, a diaphragm member retained in said body and located adjacent said wall, said body being rotatable relative to said diaphragm member and about an axis common to said body and diaphragm member, attaching lugs on said flange means and extending in a radial direction relative to said axis, axially extending holding lugs on said diaphragm member, said attaching lugs having recesses therein, and free end portions on said holding lugs and normally engaged in said recesses and being disengageable from said recesses in response to the rotation of said body relative to said diaphragm member.

11. A closure cap as defined in claim 10 in which the free end portions of said holding lugs are of a relatively reduced width and have a cam profile to facilitate their disengagement from said recesses.

References Cited in the file of this patent

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