July 12, 1960 G. R. PIPES ET AL 2,944,698

CLOSURE DEVICE

Filed Feb. 21, 1957 2 Sheets-Sheet 1

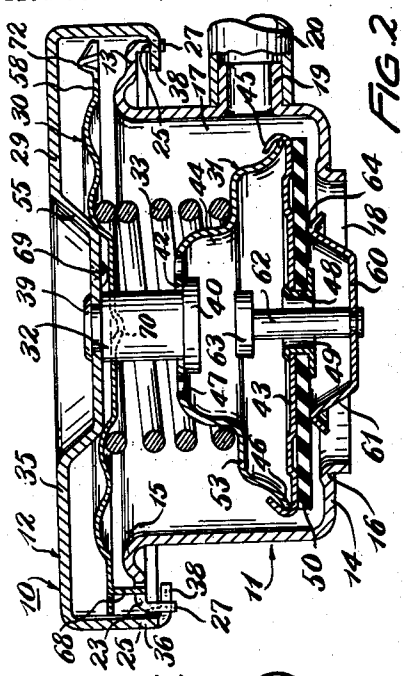


FIG. 2

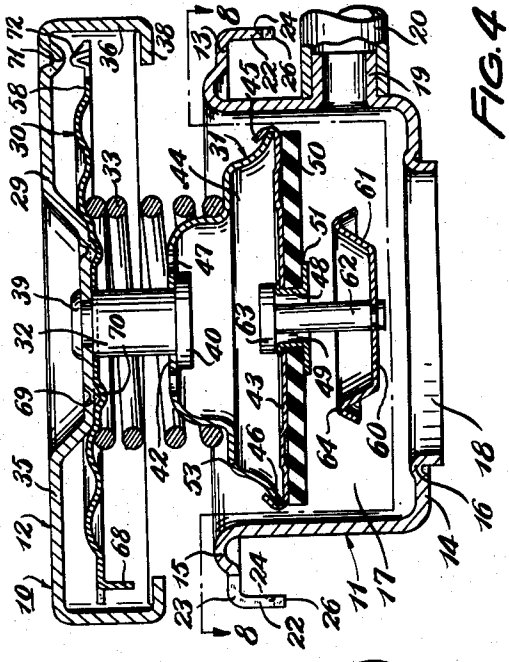


FIG. 4

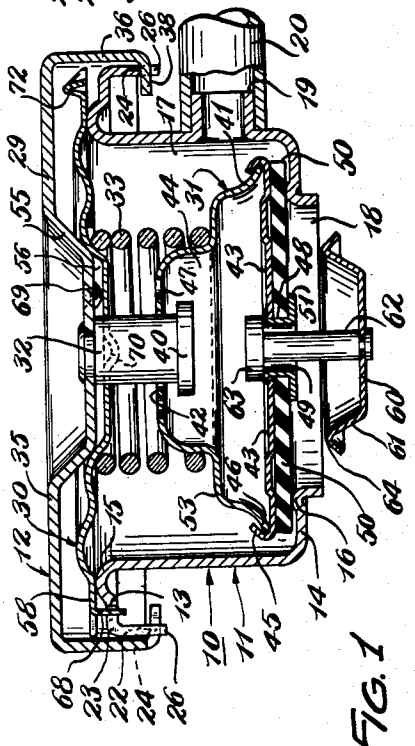


FIG. 1

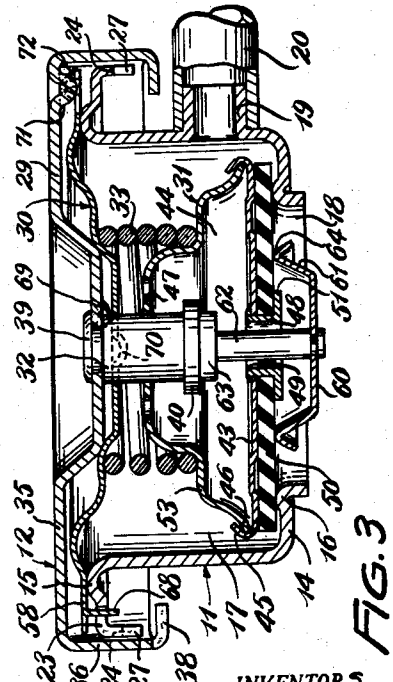


FIG. 3

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CLOSURE DEVICE

Filed Feb. 21, 1957 2 Sheets-Sheet 2

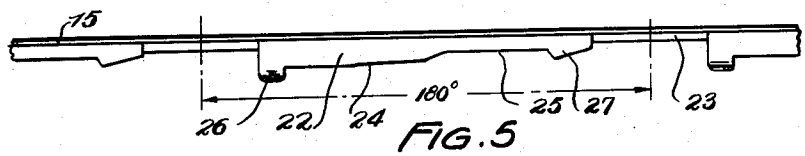


FIG. 5

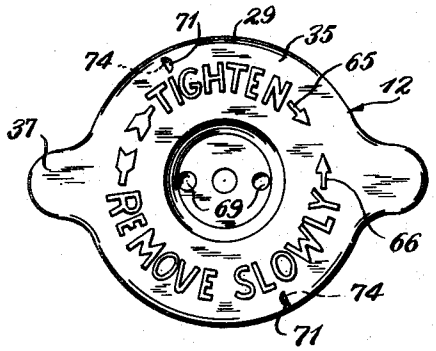


FIG. 6

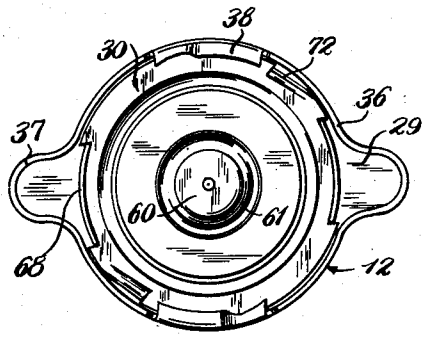


FIG. 7

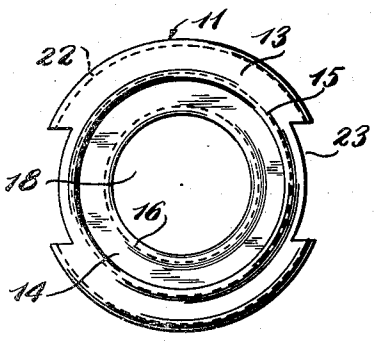


FIG. 8

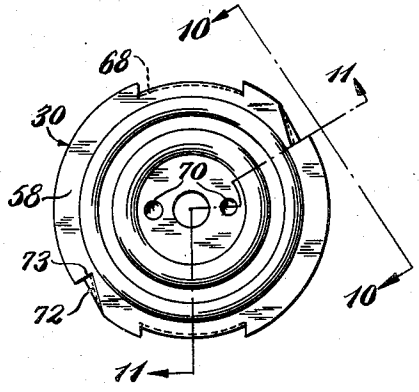


FIG. 9

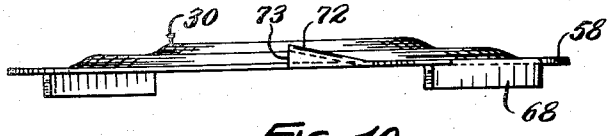


FIG. 10



FIG. 11

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United States Patent Office 2,944,698 Patented July 12, 1960

2,944,698

CLOSURE DEVICE

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Filed Feb. 21, 1957, Ser. No. 641,553

20 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.

In certain closure devices embodying such a safe-removal closure cap, the cap is releasably connected with a filler neck by cooperating lug and cam elements and a sudden removal of the cap is normally prevented by providing the neck with safety stops which are engageable by the lug elements for temporarily arresting or interrupting the unlocking or disengaging rotary movement of the cap. However, in such closure devices it is still possible to effect a too-sudden removal of the cap if the cap is manually held in an axially shifted position with the lugs thereof in a relatively clearing relation to the safety stops, while the cap is being rotated in the unlocking or disengaging direction.

The present invention, as one of its objects, accordingly provides a closure device of the safe-removal cap type in which greater safety is achieved by preventing a too-sudden removal of the cap regardless of whether the cap is being manually held in an axially shifted position at the time of the unlocking rotation thereof.

As another of its objects, this invention provides a novel closure cap having a diaphragm means adapted to be held against rotation relative to the filler neck during the locking and unlocking rotary movements of the cap.

A further object is to provide a novel closure device employing a filler neck having locking cams and access openings affording access to such cams for the attaching lugs of the closure cap and in which diaphragm means of the closure cap is held against rotation relative to the neck by restraining means, preferably in the form of lugs, engaging in such access openings.

Still another object is to provide a novel closure device in which holding means is effective between the cap body and diaphragm means for initially locating the restraining lugs of the diaphragm means in a substantially aligned relation with the attaching lugs of the closure cap.

Another object is to provide a novel closure device having safety stop means effective between the cap body and the neck-restrained diaphragm means for interrupting the unlocking rotation of the closure cap to prevent a too-sudden removal of the latter.

This invention also provides such a novel closure device in which the engagement or release of the safety stop means of the cap body and diaphragm means is responsive to a relative axial movement between the cap body and at least a portion of the diaphragm means.

It is also an object of this invention to provide such a novel closure device in which the diaphragm means is resilient, and in which the safety stop means of the cap body and diaphragm means comprises partially sheared portions of such cap body and diaphragm means.

Additionally, this invention provides a novel closure device of the kind above referred to in which the closure

cap has a diaphragm means and an inner closure means engageable, respectively, with axially spaced annular seats of the filler neck and in which stop means effective between the cap body and the neck-restrained diaphragm means interrupts the unlocking or disengaging rotation of the cap body for temporarily maintaining the closure cap in a pressure-venting position on the filler neck.

Other objects and advantages of this invention will be apparent in the following detailed description and in the accompanying sheets of 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 closure cap in its locked position on the filler neck;

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

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

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

Fig. 5 is a side elevation showing a development of the cam members of the filler neck;

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

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

Fig. 8 is a top plan view of the filler 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 diapragm taken as indicated by the directional line **10—10** of Fig. 9; and

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

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 internal 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 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 a diaphragm means associated therewith and here shown as comprising a single resilient flexible disk-like diaphragm 30. The closure 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 32 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 central portion defining a recess having a tapered side wall 56 which is held in seating engagement with the tapered boss 55 by the spring 33 for centering the diaphragm in the cap body.

The annular portion of the diaphragm 30, which lies outwardly of the tapered wall portion 56, 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 filler 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 closure cap 12 can be applied to the filler neck 10 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.

When pressure builds up in the radiator or tank, the check valve member 61 is lifted and pressed against the gasket 50 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 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 closure cap 12 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 relieved and is 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 filler neck so as to maintain the lugs 38 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 closure 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 to ride over the safety stops, whereupon the closure cap 12 can be lifted off the filler neck.

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 filler neck. The diaphragm is held against rotation by the filler 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 closure cap 12 is applied to the neck.

In order that the retaining lugs 68 be readily movable into the access openings 23 when the closure cap 12 is being applied to the neck, it is necessary that these retaining lugs have an initial position substantially in alignment with the attaching lugs 38 of the cap body 29. The retaining lugs 68 of the diaphragm 30 and the attaching lugs 38 of the cap body 29 are inititially maintained in such an aligned relation by cooperable holding elements effective between the cap body and diaphragm.

These cooperable holding elements are here shown as comprising rounded projections or bosses 69 formed on the transverse top wall 35 of the cap body and corresponding concave depressions 70 formed in the upper side of the diaphragm 30 and in which such projections of the cap body are engageable. The locations of the projections and recesses 69 and 70 of the cap body and diaphragm are such that when the retaining lugs 68 are in substantial alignment with the attaching lugs 38, the spring 33 will cause the recesses 70 to be axially shifted into an engaged relation with the projections 69, whereby rotation of the cap body relative to the diaphragm will be normally resisted.

By reason of the rounded character of the projections 69, the cap body 29 can be rotated relative to the diaphragm 30 to overcome the initial holding action of these cooperating holding elements. Thus, when the closure cap is applied to the filler neck with the retaining lugs 68 engaged in the access openings 23, the cap body 29 can be rotated relative to the diaphragm 30 to bring the 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 retaining lugs 68 in the access openings.

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

In completing the removal of the closure device 12 from the filler neck 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 11, 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 closure 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, the present invention provides safety stop means on the cap which is effective for preventing such a complete or uninterrupted releasing rotation of the cap body. This safety stop 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.

This safety stop means of the cap 12 is here shown as comprising stop elements 71 on the cap body 29 and stop elements 72 on the diaphragm 30, these stop elements 71 and 72 being mutually co-operable stop elements as explained hereinafter. The 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 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 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 retaining 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 filler 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 closure cap 12 can be lifted off of the filler neck.

When the closure cap 12 has been applied to the filler 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 safety stops 71 of the cap body will readily move past the safety stop-

72 of the diaphragm because at this time the taper of the safety stops 71 is presented toward the taper of the safety stops 72, which permits the safety stops 71 to readily ride over and move past the safety stops 72.

From the accompanying drawings and the foregoing detailed description, it will now be readily understood that this invention provides a novel 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 this invention provides a novel closure cap and closure device in which the cap body is rotatable relative to its associated diaphragm means, and in which releasable holding means effective between the cap body and diaphragm means maintains the lug elements of the diaphragm means and cap body in an initial alignment for movement of such lug elements through the access openings of the filler neck. Additionally, it will be seen that the cooperable safety stop elements of the cap body and neck-restrained diaphragm means are rendered engageable and disengageable, in response to axial shifting of the cap body relative to the neck, and supplement the action of the safety stops of the filler neck in effectively interrupting 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 thus described our invention we claim.

1. A closure cap comprising, a cap body having a depending marginal flange, attaching lugs carried by said flange, diaphragm means in said cap body, other lugs carried by said diaphragm means, said cap body and said diaphragm means being relatively rotatable, and releasably cooperating elements on said cap body and diaphragm means and resisting relative rotation therebetween for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation.

2. A closure cap comprising a cap body having a depending marginal flange, attaching lugs carried by said flange, diaphragm means in said cap body, other lugs carried by said diaphragm means, said cap body and said diaphragm means being relatively rotatable, releasably cooperating holding elements on said cap body and diaphragm means and resisting relative rotation therebetween for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation, and cooperable stops on said cap body and diaphragm means for interrupting the relative rotation therebetween.

3. A closure cap comprising, a cap body having a transverse top wall and a depending marginal flange, attaching lugs carried by said flange, diaphragm means in said cap body, other lugs carried by said diaphragm means, said cap body being rotatable relative to said diaphragm means, releasably cooperating holding elements on said cap body and diaphragm means and resisting the relative rotation of said cap body for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation, and cooperable stops on said wall and diaphragm means for interrupting the relative rotation of said cap body, said cap body and diaphragm means being relatively movable axially of the closure cap and said stops being disengageable in response to relative axial separating movement between said cap body and diaphragm means.

4. A closure as defined in claim 3 in which said diaphragm means is resilient, and in which the relative axial movement between said cap body and diaphragm means is responsive to flexing of the latter.

5. A closure cap comprising, a cap body having a transverse wall and a depending marginal flange, attaching lugs carried by said flange, an inner closure means connected with said cap body, diaphragm means in said cap body and lying adjacent said wall, other lugs carried by said diaphragm means, said cap body being rotatable relative to said diaphragm means, releasably cooperating projection and recess holding elements on said wall and diaphragm means for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation, and spring means disposed between said inner closure means and said diaphragm means and effective on the latter for urging said holding elements to an engaged condition.

6. A closure device comprising, a filler neck having flange means providing an annular seat and carrying locking elements, a cap body cooperating with said neck and having a transverse wall and a depending marginal flange, attaching lugs carried by said marginal flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, diaphragm means in said cap body and engaging said annular seat, and other lugs carried by said diaphragm means and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging said attaching lugs with said locking elements.

7. A closure device comprising, a filler neck having flange means providing an annular seat and carrying locking elements, a cap body cooperating with said neck and having a transverse wall and a depending marginal flange, attaching lugs carried by said marginal flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, diaphragm means in said cap body and engaging said annular seat, other lugs carried by said diaphragm means and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging said attaching lugs with said locking elements, and releasably cooperating holding elements on said cap body and diaphragm means and resisting relative rotation therebetween for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation.

8. A closure device comprising, a filler neck having flange means providing an annular seat and carrying locking elements, a cap body cooperating with said neck and having a transverse wall and a depending marginal flange, attaching lugs carried by said marginal flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, diaphragm means in said cap body and engaging said annular seat, other lugs carried by said diaphragm means and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging and disengaging said attaching lugs with respect to said locking elements, and cooperable stop elements on said cap body and diaphragm means for interrupting the disengaging relative rotation of said cap body.

9. A closure device comprising, a filler neck having flange means providing an annular seat and carrying locking elements, a cap body cooperating with said neck and having a transverse wall and a depending marginal flange, attaching lugs carried by said marginal flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, diaphragm means in said cap body and engaging said annular seat, other lugs carried by said diaphragm means

and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging and disengaging said attaching lugs with respect to said locking elements, releasably cooperating holding elements on said cap body and diaphragm means and resisting relative rotation therebetween for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation, and cooperable stop elements on said cap body and diaphragm means for interrupting the disengaging relative rotation of said cap body.

10. 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 having 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 in said cap body and engaging said outer seat, inner closure means connected with said cap body and engaging said inner seat, other lugs carried by said diaphragm means and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging and disengaging said attaching lugs with respect to said locking elements, releasably cooperating holding elements on said cap body and diaphragm means and having an engaged condition resisting relative rotation between said cap body and diaphragm means for initially maintaining said attaching lugs and said other lugs in a substantially aligned relation, and spring means disposed between said inner closure structure and said diaphragm means, said spring means acting to urge said inner closure means toward said inner seat and to urge said holding elements toward said engaged condition.

11. 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 having 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 in said cap body and engaging said outer seat, inner closure means connected with said cap body and engaging said inner seat, other lugs carried by said diaphragm means and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging and disengaging said attaching lugs with respect to said locking elements, releasably cooperating holding elements on said cap body and diaphragm means and having an engaged condition resisting relative rotation between said cap body and diaphragm means for initially maintaining said attaching lugs and said outer lugs in a substantially aligned relation, spring means disposed between said inner closure structure and said diaphragm means, said spring means acting to urge said inner closure means toward said inner seat and to urge said holding elements toward said engaged condition, and cooperable stops on said diaphragm means and transverse wall for interrupting rotation of the cap body in the direction for disengaging said attaching lugs from said locking elements.

12. A closure device as defined in claim 11 in which said diaphragm means is resiliently flexible for a relative axial movement between said transverse wall and the peripheral portion of said diaphragm means, and in which the stop of said diaphram means is on said peripheral portion and is disengageable by the stop of said transverse wall in response to said relative axial movement.

13. A closure device comprising, a filler neck having flange means providing an annular seat and carrying locking elements, a cap body cooperating with said neck and having a transverse wall and a depending marginal flange, attaching lugs carried by said marginal flange, said flange means having access openings therein affording access to said locking elements for said attaching lugs, diaphragm means in said cap body and engaging said annular seat, other lugs carried by said diaphragm means and engaging in said access openings for preventing rotation of said diaphragm means relative to said neck, said cap body being rotatable relative to said diaphragm means for engaging and disengaging said attaching lugs with respect to said locking elements, safety stop means on said flange means adjacent said access openings and engageable by said attaching lugs for normally interrupting the disengaging relative rotation of said cap body, said safety stop means being surmountable by said attaching lugs upon manual axial shifting of said cap body toward said flange means during said disengaging relative rotation, and other cooperable safety stop elements on said cap body and diaphragm means for normally interrupting disengaging relative rotation imparted to said cap body while the latter is in such an axially shifted relation toward said flange means, the interruption of said disengaging relative rotation of said cap body being releasable in response to axial shifting of said cap body away from said flange means.

14. A closure device as defined in claim 13 in which said diaphragm means is resilient such that the manual axial shifting of said cap body toward said flange means causes loading of the diaphragm means, and in which unloading of said diaphragm means causes said axial shifting of said cap body away from said flange means.

15. A closure device as defined in claim 13 in which said other safety stop element are cam shaped for a self-clearing action therebetween during rotation of said cap body in a direction for engaging said attaching lugs with said locking elements.

16. A closure cap comprising, a cap body having attaching means on the inner side thereof, an inner transverse member retained in said body, said body being rotatable and axially shiftable relative to said inner member, first and second pairs of cooperably engageable and disengageable elements carried by and effective between said body and inner member for temporarily preventing such relative rotation, one pair of said elements being disengageable in response to a manually forced rotation of said body relative to said inner member, the other pair of said elements being disengageable in response to a manually produced combined rotary and axial movement of said body relative to said inner member.

17. A closure cap for application to a filler neck having an annular seat and access openings laterally outwardly of said seat comprising, a cap body having a transverse wall and a depending marginal flange, securing means carried by said flange for releasable co-operation with said neck, diaphragm means in said cap body and engageable with said seat, said diaphragm means having holding elements engageable in said openings for preventing rotation of the diaphragm means relative to said neck when the cap is applied to the latter, axially extending stop elements on said wall and diaphragm means and being co-operably engageable for preventing rotation of said body relative to said diaphragm means, and means urging said diaphragm means toward said wall to cause the co-operable engagement of said stop elements but being yieldable to permit limited axial separation between said wall and diaphragm means for the disengagement of said stop elements in response to a manually forced rotation of said body relative to said diaphragm means.

18. In a closure cap for application to a filler neck having locking cams thereon and access openings affording access to the cams, a cap body having a trans-

verse wall and a depending marginal flange, securing means on said flange for locking and unlocking co-operation with said cams in response to locking and unlocking rotation of said body relative to the neck, a transverse inner member retained in said body adjacent said wall and having holding means engageable in said openings for preventing rotation of said inner member relative to the neck, said body being rotatable and axially shiftable relative to said inner member for producing the locking and unlocking co-operation of said securing means with said cams, and mutually co-operable stop elements on the axially adjacent sides of said wall and inner member for interrupting the unlocking rotation of said body, said stop elements being relatively positionable for the interrupting co-operating engagement therebetween in response to a predetermined extent of manual axial shifting of the body toward the neck during the unlocking rotation of said body.

19. A closure cap as defined in claim 18 wherein said body and inner member are sheet metal members, and wherein said stop elements are axially projecting portions of said transverse wall and inner member.

20. A closure cap as defined in claim 18 wherein said body is a sheet metal member and said inner member is a resilient sheet metal diaphragm of disk form, and wherein said stop elements are axially projecting portions of said transverse wall and diaphragm.

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