March 22, 1949. R. W. HARVEY 2,465,095

SAFETY DEVICE FOR FLUID CONTAINERS

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Fig:1.

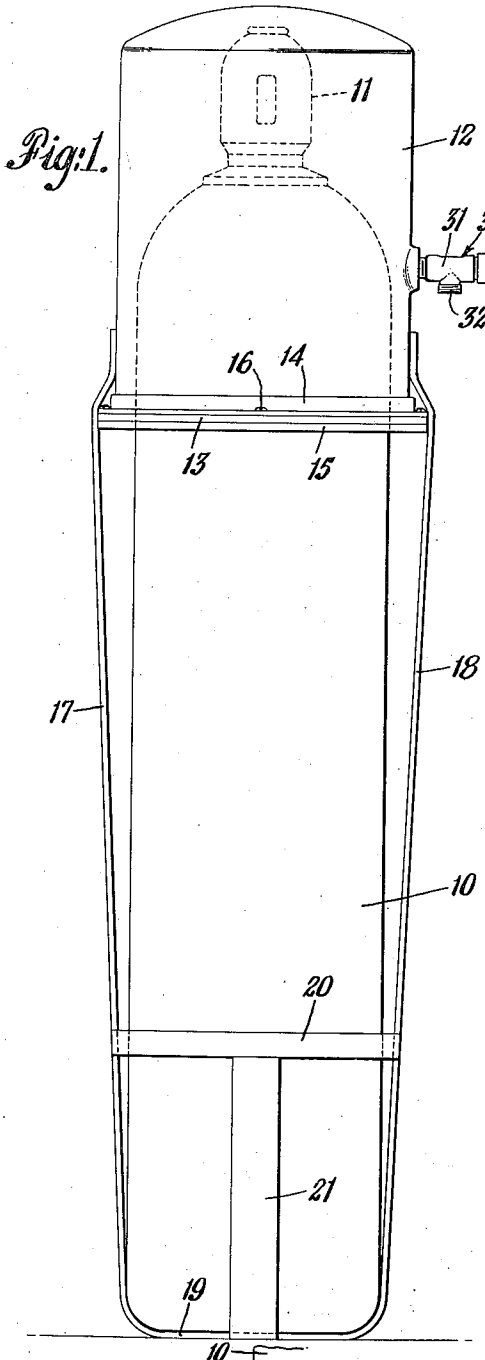


Fig:2.

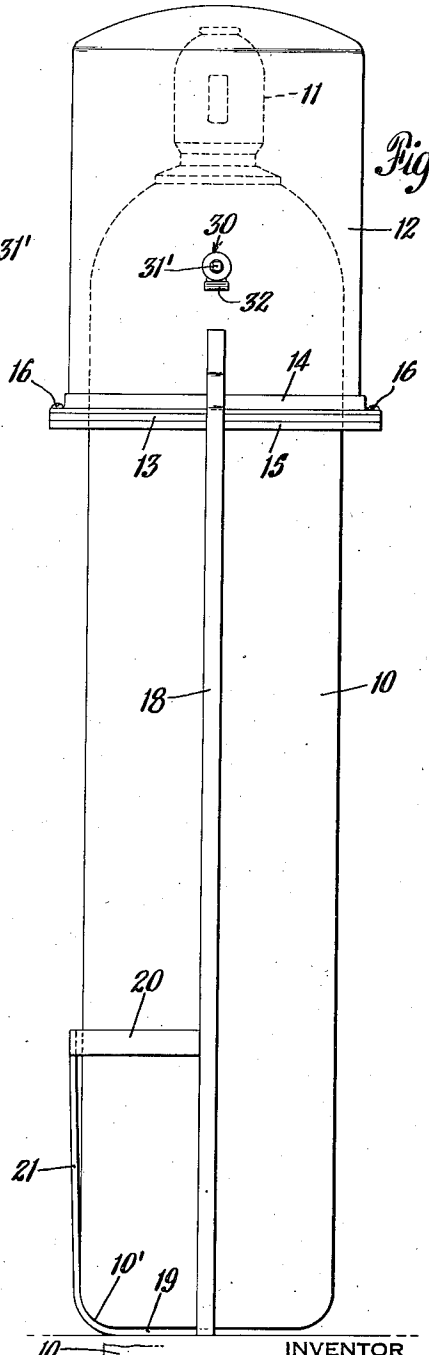


Fig:7.

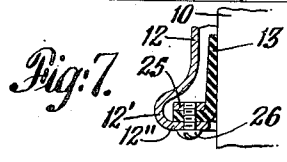
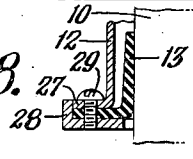


Fig:8.



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Fig:3.

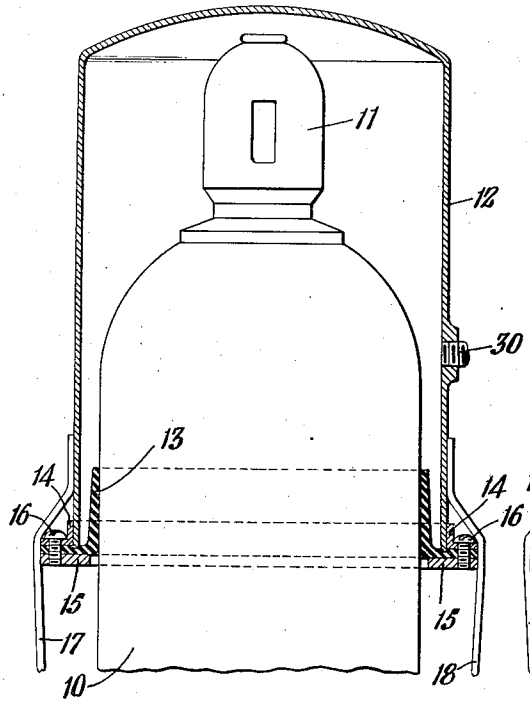
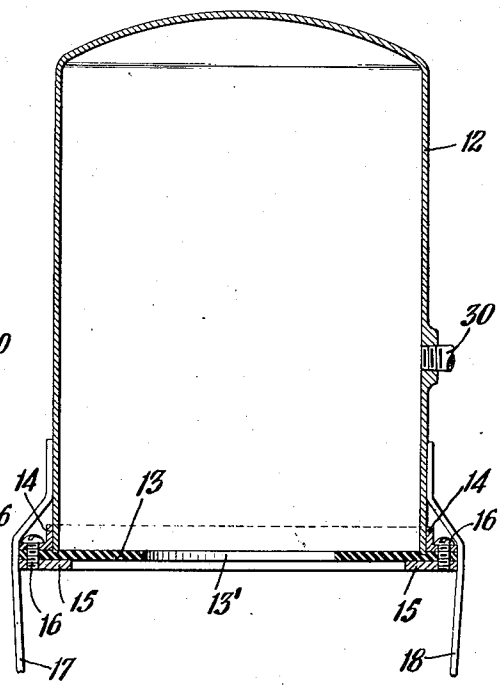


Fig:4.



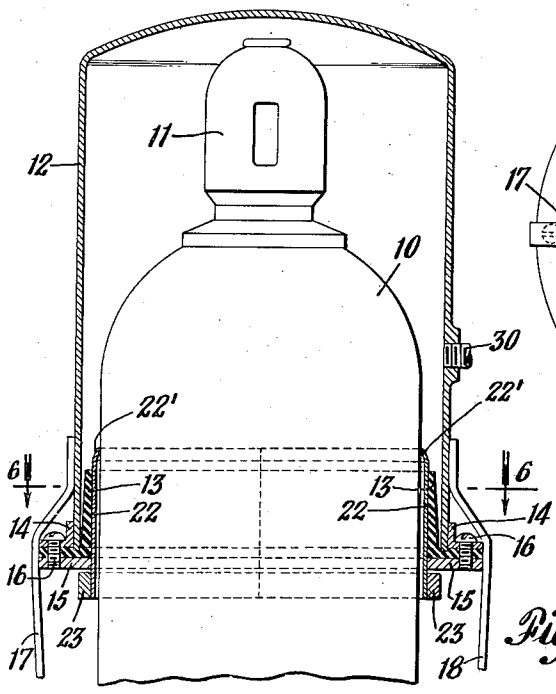


Fig:5.

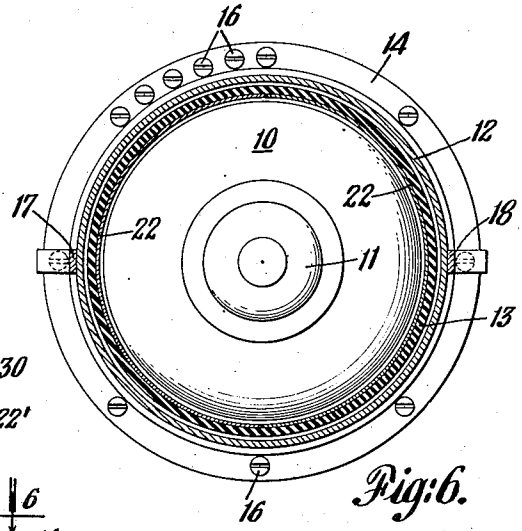


Fig:6.

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SAFETY DEVICE FOR FLUID CONTAINERS

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Application December 30, 1944, Serial No. 570,647

7 Claims. (Cl. 220—46)

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This invention relates to the control of fluids escaping from containers. It is especially concerned with preventing the passage into the atmosphere of noxious gases leaking from containers in which they are stored. As a specific example of the utility of the invention, it may be noted that the storage of chlorine under pressure has long presented a problem owing to the disastrous consequences likely to arise in the event of leakage of the gas into the presence of human beings. A source of such leakage is presented by the development of defects in the valves or the bodies of the cylinders in which the chlorine is stored and transported under pressure.

The present invention has for an object the provision of a simple yet highly effective safety device for confining gases or liquids which leak from a container and preventing their escape into the atmosphere. A further object is to provide a safety device of the above noted character which shall be light in weight and readily applicable to the container by one person. An additional object is the provision of such a device for maintaining a fluid-tight joint with the container by adhesion which is increased by rise of pressure within the device.

The invention also comprises means for facilitating the expeditious removal of the device from the container when desired.

Other objects and advantages of the invention will be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a view in elevation showing a safety-device embodying my invention applied to a conventional container for the storage and transportation of fluid under pressure.

Fig. 2 is a similar view, taken at right angles to Fig. 1.

Fig. 3 is a view in longitudinal section through the upper portion of the safety device as applied to the container.

Fig. 4 is a view similar to Fig. 3 showing the upper portion of the device when removed from the container.

Fig. 5 is a view similar to Fig. 3, but illustrating the insertion of means for facilitating the removal of the safety-device from the container.

Fig. 6 is a view in transverse section, taken on line 6—6 of Fig. 5.

Figs. 7 and 8 are detail views of certain modifications.

Referring to the drawings, there is shown at 10 a conventional container of generally cylindrical shape, customarily used for the storage and transporting of chlorine under pressure. The upper end of said container has attached thereto the usual valve (not shown) which is covered by the customary cap 11.

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In carrying out my invention, I provide a cap 12, of metal or other suitable material, closed at one end and open at its opposite end, and of an internal cross-sectional area greater than that of the portion of the container to which it is to be applied. Secured to the cap adjacent its open end is a flexible membrane or diaphragm 13 of rubber, rubberized fabric, or other suitable elastic material, and having a central opening 13' (Fig. 4). The diameter of said opening is substantially less than that of the body of the container 10 so that said flexible membrane will adhere tightly to the outer wall of the container 10 when the cap is applied thereto and will create a pressure-tight bond.

The flexible membrane 13 may be secured to the cap 12 in any suitable and convenient manner. For example, there may be provided a rigid metallic flange 14 surrounding the cap 12 at its lower end and brazed or otherwise suitably secured thereto; and the outer rim portion of the membrane 13 may be firmly clamped between said rigid flange and an annular plate 15, through screws 16, as illustrated. I prefer that the rigid flange 14 be positioned with its bottom surface slightly above the bottom edge of the cap 12, so that said bottom edge extends into the flexible membrane 13 when the latter is clamped in position, thereby insuring a gas-tight seal between said membrane and said lower edge of the cap, completely around said lower edge.

Connected to the cap 12 and extending therefrom is a yoke comprising a pair of arms 17, 18. Said yoke also comprises an end piece 19 extending between the lower ends of said arms adapted to engage the lower end of the container 10. In addition, the yoke may include a transverse member 20, of semi-circular conformation, extending between said arms 17, 18. A plate 21 extends between said transverse member and the end piece 19.

The upper ends of the yoke arms 17, 18, may be connected to the cap 12 in any convenient way. For example, they may be rigidly secured to the cap, as by brazing or otherwise.

The yoke is particularly effective in enabling the cap, with its flexible membrane 13, to be applied to the container with an especially tight and advantageous fit. To apply the cap, the latter is pushed downwardly over the top of the container until the yoke end plate 19 engages the lower curved end portion 10' of the container 10,

Thereupon, the attendant may complete the operation by pushing or kicking the plate 21, with the result that the cap 12 is brought into its position shown in Figs. 1, 2 and 3, and the bottom piece 19 of the yoke is engaged with the lower end of the container 10. The flexible membrane 13 now engages the container 10 in a zone of substantial width, extending around the container, and with an especially tight and leakproof fit. Any gas leaking through the cap 11, or from any part of the container 10 above the membrane 13 is thus imprisoned within the cap 12. Through the engagement of the yoke piece 19 with the bottom of the container 10, the cap 12 is prevented from receding from the position to which it has been placed, and the seal between the membrane 13 and the container 10 is maintained with undiminished tightness.

So tight is this seal in practice that I have found it necessary to devise special means for removing the cap from the container. For that purpose, I provide a pair of shoes 22, 22 (Figs. 5 and 6) each comprising a semi-cylindrical piece of sheet metal rigidly attached, as by brazing, to a curved bar 23 of rectangular cross-section. This bar serves both as a support for the sheet metal portion of the shoe and also to provide a shoulder against which to drive the sheet metal portion between the flexible membrane 13 and the wall of the container 10. The sheet metal section of the shoe is crimped, as illustrated at 22' to facilitate entry of the shoe between the membrane and the container wall.

It will be noted that the opening in the annular plate 15 is of such diameter as to provide sufficient space for the entry of the shoes 22 between said plate and the container wall. When the shoes are driven upwardly between the membrane 13 and the container 10, as illustrated in Figs. 5 and 6, they break the adhesive seal between said membrane and container; so that the cap 12 may now be removed by first drawing the yoke to the left (Fig. 2), disengaging the yoke plate 19 from the container, and then pushing the yoke and cap upwardly.

In Figs. 7 and 8, I have illustrated alternative arrangements for obtaining a pressure-tight seal between the cap 12 and the flexible membrane 13. As shown in Fig. 7, the lower end portion of the cap 12 may be flared outwardly at 12' and then extended inwardly to provide a flange 12'' for receiving the membrane 13. The latter may be clamped between said flange 12'' and an annular plate 25 by screws 26.

In Fig. 8 the lower end portion of the cap is bent outwardly to form a flange 27; and the membrane 13 is clamped between said flange and an annular bar 28 of angular cross-section, through screws 29.

The cap 12 may be provided with a suitable valve, as indicated at 30, for relieving pressure within the cap when desired. The valve 30 should, of course, be open during the applying of the cap to the container. Said valve may be of well-known construction, comprising a body member 31 having screw threaded engagement in the valve casing and normally obstructing passage to the outlet 32. The body member 31 has a stem 31' extending outside the valve casing for operation by a suitable wrench.

It will be seen that my invention provides a safety-device of simple construction for effectively preventing the escape of noxious gases from the container to the atmosphere. The device may be quickly applied to the container by one attendant without tools and, when applied, is maintained in tightly sealed condition through the engagement of the flexible membrance 13 with one end portion of the container and the yoke plate 19 with the opposite end. When removal of the cap 12 is desired, the shoes 22 provide a simple and effective means whereby the gas-tight seal between the membrane 13 and container 10 may be broken. It will be apparent that, while I have illustrated the cap 12 as applied to the upper end of the container, said cap may instead, if desired, be applied to the lower end, in which event the yoke plate 19 is engaged with the container cap 11. The cap 12 may be readily applied to either end of the container 10 whether the latter be in horizontal, vertical, or other position. The device may further be applied to either end of a container not equipped with shipping cap 11, and also when the container valve (not shown) is fitted with the customary auxiliary valve or connected piping to the user's processes, if such connecting piping be severed or confined to an area which may be encased within cap 12.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

I claim:

1. Apparatus for confining fluids escaping from a container, said apparatus comprising a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said membrane having an opening therein of substantially less area than the cross-sectional area of said container whereby said membrane surrounds the container and adherently engages the same over a substantial zone on the container body when the cap is applied, a yoke comprising a pair of arms connected with said cap, a plate extending between the ends of said arms opposite said cap, said arms being of such length that when said cap is pushed over an end of said container said plate is adjacent the other end of the container in position for being pushed into engagement with said other end.

2. Apparatus for confining fluids escaping from a container, said apparatus comprising a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said membrane having an opening therein of substantially less area than the cross-sectional area of said container whereby said membrane surrounds the container and adherently engages the same over a substantial zone on the container body when the cap is applied, a yoke comprising a pair of arms connected with said cap, a plate extending between the ends of said arms opposite said cap, said arms being of such length that when said cap is pushed over an end of said container said plate is adjacent the other end of the container in position for being pushed into engagement with said other end, a kick-plate extending part way between the first-mentioned plate and said cap, and means for connecting said kick-plate to said yoke arms.

3. Apparatus for confining fluids escaping from a container, said apparatus comprising a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said membrane having an opening therein of substantially less

area than the cross-sectional area of said container whereby said membrane surrounds the container and adherently engages the same over a substantial zone on the container body when the cap is applied, a yoke comprising a pair of arms connected with said cap, a plate extending between the ends of said arms opposite said cap, said arms being of such length that when said cap is pushed over an end of said container said plate is adjacent the other end of the container in position for being pushed into engagement with said other end, a kick-plate extending part way between the first-mentioned plate and said cap, and means for connecting said kick-plate to said yoke arms, said kick-plate connecting-means extending between said arms at only one side thereof, the space between said yoke arms being open at the other side to enable the yoke arms and first-mentioned plate to be applied to the container by a force applied to said kick-plate.

4. Apparatus for confining fluids escaping from a container, said apparatus comprising a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said membrane having an opening therein of substantially less area than the cross-sectional area of said container whereby said membrane surrounds the container and adherently engages the same over a substantial zone on the container body when the cap is applied, a yoke comprising a pair of arms connected with said cap, a plate extending between the ends of said arms opposite said cap and rigidly secured to said arms, said arms being of such length that when said cap is pushed down over an end of said container said plate is adjacent the other end of the container in position for being pushed into engagement with said other end.

5. Apparatus for confining fluids escaping from a container, said apparatus comprising a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said membrane having an opening therein of substantially less area than the cross-sectional area of said container whereby said membrane surrounds the container and adherently engages the same over a substantial zone on the container body when the cap is applied, a yoke comprising a pair of arms connected with said cap, a plate extending between the ends of said arms opposite said cap and rigidly secured to said arms, said arms being of such length that when said cap is pushed down over an end of said container said bottom plate is adjacent the other end of the container in position for being pushed into engagement with said other end, a kick-plate extending part way between the first-mentioned plate and said cap, and means for connecting said kick-plate to said yoke arms, said kick-plate connecting-means extending between said arms at only one side thereof, the space between said yoke arms being open at the other side to enable the yoke arms and first-mentioned plate to be applied to the container by a force applied to said kick-plate.

6. In combination, a fluid container, a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said cap being fitted over an end of said container, said membrane having an opening therein of substantially less area than the cross-sectional area of said container whereby said membrane surrounds said container and adherently engages the same over a substantial zone on the container body, a yoke comprising a pair of arms connected with said cap and extending to the other end of said container, an end plate connected to said arms and slidably engaging said other end of said container, and a kick-plate connected to said arms between the ends thereof.

7. In combination, a fluid container, a cap having a flexible membrane sealed thereto and extending inwardly of said cap, said cap being fitted over an end of said container, said membrane having an opening therein of substantially less area than the cross-sectional area of said container whereby said membrane surrounds said container and adherently engages the same over a substantial zone on the container body, a yoke comprising a pair of arms connected with said cap and extending to the other end of said container, an end plate connected to said arms and slidably engaging said other end of said container, a kick plate extending part way between said end plate and said cap, and means connecting said kick-plate to said yoke arms, said kick-plate connecting means extending between said arms at only one side thereof, the space between said yoke arms being open at the other side to enable said yoke arms and end plate to be applied to the container by a force applied to said kick-plate.

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