Jan. 21, 1964 R. M. KLAUS 3,118,561

CAPPING MEANS

Filed June 18, 1962 2 Sheets-Sheet 1

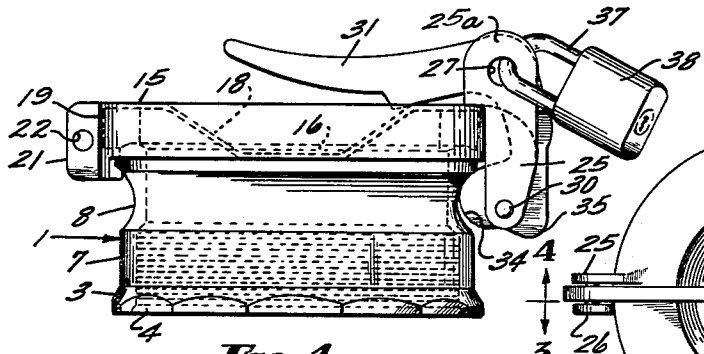


FIG. 1

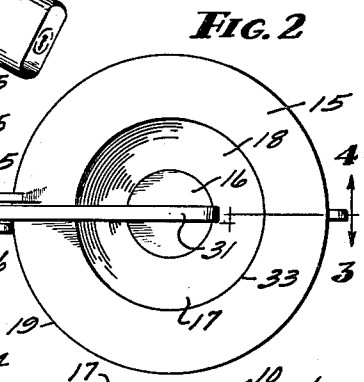


FIG. 2

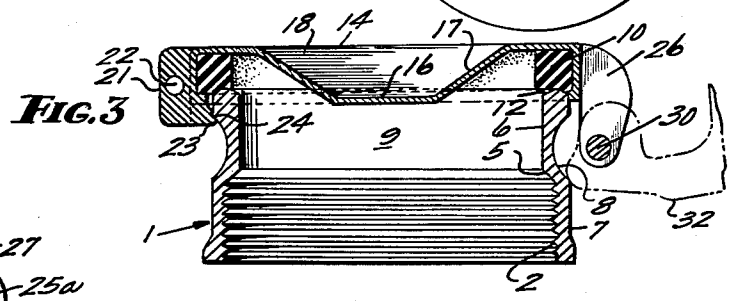


FIG. 3

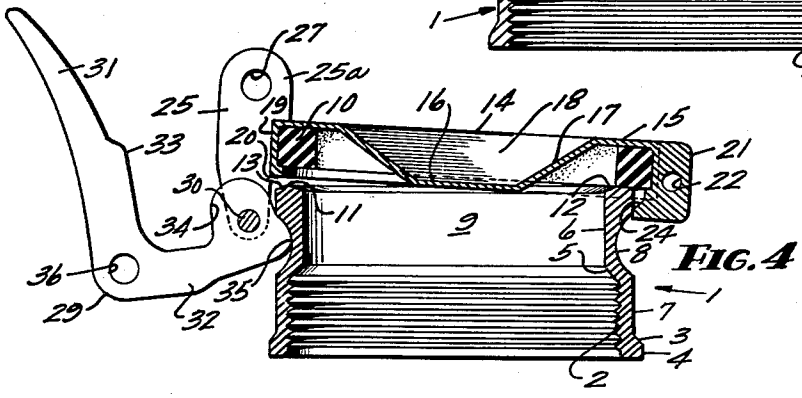


FIG. 4

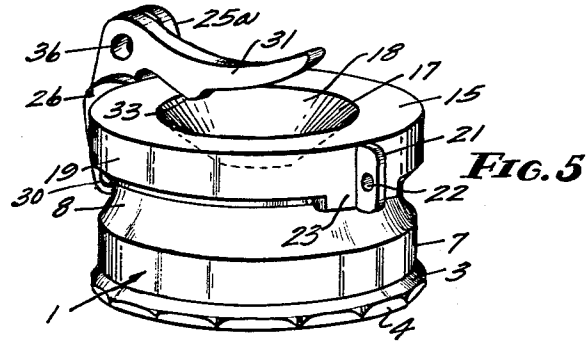


FIG. 5

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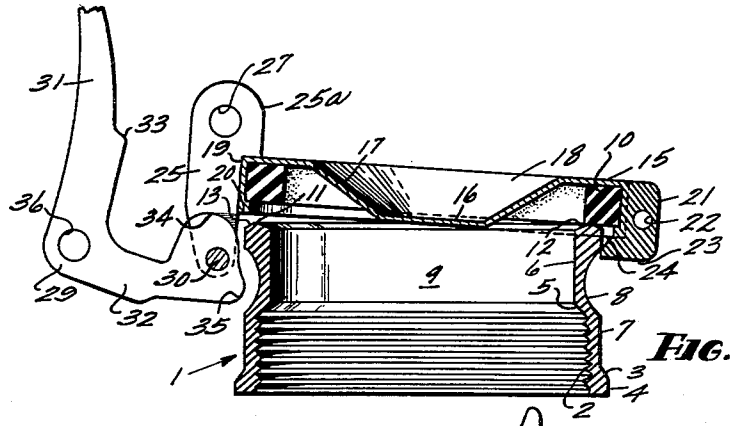


FIG. 6

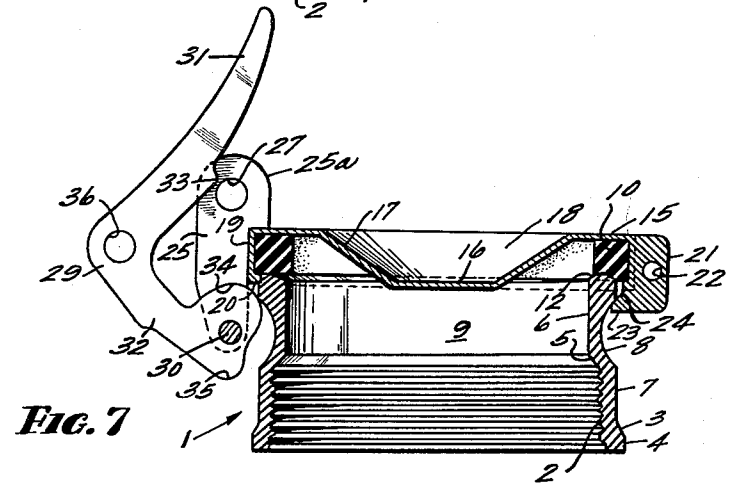


FIG. 7

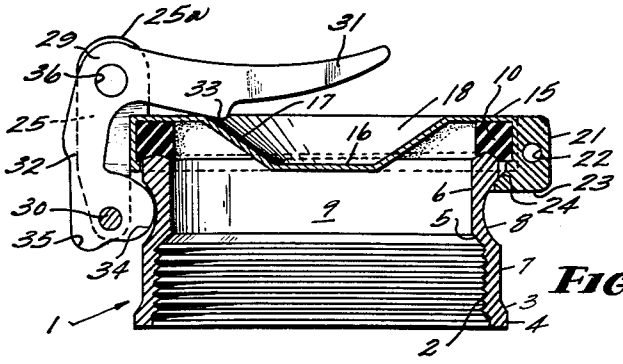


FIG. 8

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CAPPING MEANS

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11 Claims. (Cl. 220—55)

The present invention relates to closures and, more particularly, to improved capping means for pipes or fill ports of storage tanks and the like.

Because of the difficulty of effecting adequate cleaning operations in connection with underground storage tanks, it is important to prevent the entry of contaminants such as water, dirt or other matter foreign to the material stored therein. Since the fill pipes of underground storage tanks are normally located at relatively low points and because of the possibility of flooding or seepage of foreign liquids, it is desirabie that a liquid in tight type of closure be provided. It is equally desirable to provide a dust-tight type of closure. Heretofore, threaded fill pipes and caps, as well as gasketed type of caps have been employed for such purposes.

Experience has shown that certain disadvantages are encountered with either of these types of closure means. For example, the fill pipe for an underground storage tank may be of 3 or 4" size thereby requiring a sizable pipe wrench in order to properly make or remove the closure. However, the space adjacent such fill pipes is always extremely limited, thereby rendering the use of such wrenches difficult if not impossible.

In the case of a gasketed type of cap, it has been found that after such caps have been installed for relatively long periods of time, there is a pronounced tendency for the cap and gasket to become stuck to the pipe which requires considerable prying action in order to effect removal. As noted heretofore, this is very difficult to achieve within the limited space available. Accordingly, it is an object of the invention to provide means for obviating such difficulties.

Another object of the invention is to provide an improved capping means of simple construction which is sturdy and reliable and yet is inexpensive to manufacture.

A further object is to provide improved capping means which can be readily installed or removed by hand and which does not require the use of tools or other equipment.

A further object of the invention is in the provision of an improved capping means having a readily accessible single lever which performs the dual functions of effecting closure and locking of the capping means in closed position and also functions as a prying means to effect removal of the capping means.

Other objects and advantages will be apparent to those skilled in the art from a consideration of the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a view of capping means embodying the present invention.

FIG. 2 is a plan view of the capping means of FIG. 1.

FIG. 3 is a section view taken along the section line 3—3 of FIG. 2 with the lever illustrated in one position by phantom lines.

FIG. 4 is a sectional view taken along the section line 4—4 of FIG. 2 and showing the lever in another position.

FIG. 5 is a perspective view of the capping means of FIG. 1 in closed position.

FIGS. 6, 7 and 8 are further sectional views of the capping means illustrating various stages in the process of opening or closing the cap.

Referring now to the drawings, a hollow fitting 1 is provided for the purpose of connecting the capping means

of this invention to a pipe or storage tank opening to be capped. As illustrated in the drawings, the fitting is of generally cylindrical configuration and may be made of any suitable material depending upon the type of liquid or fluid to which it may be subjected. Connection to the pipe or opening to be capped is effected by any convenient type of connecting means such as a threaded type of fastening 2. If desired, the lower portion of fitting 1 may be provided with an annular rim 3 having a plurality of flattened areas 4 for engagement by a suitable tool or wrench.

Above the internally threaded portion 2, the interior surface of the fitting angles inwardly and upwardly, as at 5, to an unthreaded surface 6. The outer surface 7 is provided with an annular groove or depression 8 which serves as a cam surface as noted more particularly hereinafter.

The upper edge of fitting 1, indicated generally at 9, is suitably configured to form a seat for a resilient gasket 10 carried by a cap 14. For example, the seat may comprise an annular flat surface 11, an annular inwardly sloping surface 12, and an annular outwardly sloping surface 13.

As illustrated in the drawings, gasket 10 is of circular configuration and rectangular cross-section to conform with the configuration of upper edge 9 of fitting 1. Any suitable resilient gasket material such as rubber chloroprene or the like, dependent upon the kind of fluid or liquid to which the gasket may be subjected, can be employed.

The outside diameter of cap 14 is somewhat greater than that of the upper edge 9 of fitting 1 so that the gasket may be retained by the cap and at the same time engage upper surface 9 as illustrated in the drawings. The upper portion of cap 14 is of dished construction comprising an annular flat portion 15 and a flat bottom 16 connected to the annular flat portion by wall 17 to form a central depression 18 the purpose of which will become apparent as the description proceeds.

As noted heretofore, gasket 10 is carried by cap 14 and is retained therein. This is accomplished by the provision of a downwardly depending outer edge 19 having an inwardly extending rim 20. If desired, an outwardly extending member 21 having a perforation 22 may be provided for the attachment of a chain or the like to prevent loss or theft of the cap 14.

Means are provided for exerting pressure for forcing fitting 1 and cap 14 together and for compressing gasket 10 when the cap is secured in place. This is accomplished by the provision of a depending member or lug 23 which extends downwardly from a portion of rim 20. The lower portion of lug 23 extends inwardly beyond the inner edge of rim 20 and has a slanted or angled surface 24 for engaging the upper edge portion of the annular depression or groove 8.

Spaced lugs 25 and 26 are connected to the outer edge 19 of the cap and are oppositely disposed relative to lug 23. Lugs 25 and 26 both extend downwardly from the upper edge surface of cap 14; but lug 25 has an upward extension 25a having a perforation 27 therein. Lug 25 is best shown in FIG. 4 and lug 26 is best illustrated in FIG. 3. Lugs 25 and 26 have co-axially aligned perforations at their lower ends.

A lever 29 is pivotally mounted between lugs 25 and 26 by means of a pin or rivet 30 passing through the co-axially aligned perforations provided in lugs 25, 26 and a similar perforation provided in the lever. The lever 29 is generally of an L-shaped configuration with a relatively long handle portion 31 and a relatively shorter portion 32. When the lever is in closed position, an abutment portion 33 provided on the handle portion 31 engages the

upper surface of cap 14 (best illustrated in FIG. 1) so that the handle portion 31 is caused to remain sufficiently elevated above the bottom of depression 18 to allow a man's hand and/or fingers to be inserted under the handle portion 31.

In order that lever 29 may perform the dual functions of prying and locking, the shorter portion is provided with cam portions 34, 35 at its pivoted end. Cams 34 and 35 coact with the cam surface of the annular depression or groove 8 of fitting 1 as hereinafter described. If desired, lever 29 may be provided with a perforation 36 which, when the lever is in closed position, is co-axially aligned with the perforation 27 of lug 25, thereby permitting the insertion of a locking device such as the hasp 37 of a padlock 38 (FIG. 1).

In the assembly and operation of the structure of the invention, fitting 1 is first connected to the pipe or opening to be capped. The sequence of steps and the method of fastening cap 14 to fitting 1 are best illustrated in FIGS. 6, 7, and 8. With lever 29 in open position, the cap 14 is placed on the upper edge 9 of fitting 1. The slanted or angled surface 24 of lug 23 is then engaged beneath the rim-like portion of the fitting formed by the upper edge of the annular depression or groove 8. The cap is then rocked downwardly into place with gasket 13 in engagement with the upper edge 9 throughout the entire circumference thereof as is illustrated in FIG. 7. Thereafter, lever 29 is advanced toward the closed position illustrated in FIG. 7 until cam 34 begins to coact with the upper edge of the annular depression or groove 8. When this occurs, and as lever 29 continues to move toward closed position, the co-action of cam 34 with the surface of annular depression or groove 8 is in such a way as to force the cap downwardly against the compression of gasket 13. As lever 29 continues to move toward closed position, cam 34 enters into the depression or groove 8 until the lever reaches the closed position as shown in FIG. 8. When lever 29 is in closed position, the cap 14 is tightly secured to fitting 1 with gasket 13 seating in compressed condition on the upper edge 9 thereof. The compression force exerted on the gasket is substantially uniform because cam 34 is oppositely disposed relative to lug 23 and because of the co-action of the edge of the annular groove or depression 8 with the slanted or angled surface 24 and also with the then oppositely slanted surface of cam 34.

The sequential steps concerning the opening of the capping means are best shown in FIGS. 8, 7, 6, 3 and 4. The depression 18 in the central portion of the cap permits the handle portion 31 of lever 29 to be grasped, while in closed position, by a bare or gloved hand. Lever 29 is then raised to the opened position, indicated in FIG. 6, thereby disengaging cam 34 from depression 8. Frequently, there is no sticking of the cap or gasket to fitting 1 and in such instances, the cap may be raised to the position shown in FIG. 1, following which lug 23 may be disengaged and the cap removed.

In the event that either the cap or gasket tends to stick to fitting 1, lever 29 is moved further in the unlocking direction to the position indicated by the phantom lines in FIG. 3. In such position, cam 35 will engage the lower edge of the groove or depression 8 and, as the lever continues to rotate in a clockwise direction (FIG. 3), cam 35 forces cap 14 upwardly, ultimately freeing it (FIG. 4). Lever 29 is then returned to the position illustrated in FIG. 6, following which the cap is removed as indicated above. It will be noted that the cap, in any orientation with respect to the fitting, may be fastened to or removed therefrom in the ways described above, since fitting 1 and the annular depression 8 are of uniform cross section and configuration throughout the entire circumference of the fitting.

While a particular embodiment of the invention has been illustrated and described, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the invention, and it is intended in the appended claims to cover all such changes and modifications that fall within the true spirit and scope of the invention.

What is claimed is:

1. In a structure of the class described, a hollow fitting, a gasketed cap for said fitting, inter-engagement means at one side of said cap for holding said cap to said fitting, and releasable means at the other side of said cap for holding said cap to said fittings, said releasable means comprising a lever, ears on said cap to which said lever is pivoted at one end, cam means on said lever together with cam means on said fitting, both said cam means coacting when said lever is in one position to hold said cap means to said fitting and both said cam means coacting when said lever is in another position to exert an upward prying force on said cap, said cap having a central depression, said lever when in said first mentioned position extending across said depression so as to provide sufficient space to permit insertion of the fingers of an operator between the lever and the bottom of said depression said lever being L-shaped, said cam means on the lever comprising a pair of cams located on opposite sides of the pivoted end of said lever, the cam means on said fitting comprising an annular groove, said lever having a first position in which one of said cams coacts with said annular groove to hold the cap closed, a second position in which both of the lever cams are disengaged from said groove permitting removal of the cap, and a third position in which said second lever cam coacts with said groove to accomplish said prying force.

2. A closure device comprising a fitting having a peripheral wall inclosing a chamber, said wall having a free end comprising a seat surrounding said chamber, said wall having an outer surface, a closure cap adapted to abut said seat and close said chamber, first means connecting one side of said cap to said wall, second means releasably connecting another side of said cap to said wall; said second means including an elongated lever having spaced end portions, pivot means pivotally connecting one of said end portons to said other side of said cap, spaced first and second cam means secured on said one end portion, third cam means secured to the outer surface of said wall, said lever being pivotal on said pivot means to selectively engage said first and second cam means with said third cam means so as to selectively force said cap towards and away from said seat.

3. A closure device as defined in claim 2, wherein said first and second cam means comprise first and second convexly curved projections angularly spaced on substantially opposite sides of said pivot means and said third cam means comprises a concavely curved recess.

4. A closure device as defined in claim 3, wherein said concavely curved recess comprises a peripheral groove in said outer surface which is substantially arcuate in cross section.

5. A closure device as defined in claim 4, wherein said lever is L-shaped, the free end portion of said lever adapted to extend over and adjacent to a central portion of said cap when said first cam means engages said third cam means.

6. A closure device as defined in claim 4, wherein said cap has a central depression formed in the outer surface thereof, said free end portion of said lever adapted to extend over said depression when said first cam means engages said third cam means so as to provide finger space between the lever and cap.

7. A closure device as defined in claim 2, wherein said pivot means includes an ear secured to said other side of said cap and having one end extending adjacent to said third cam means when said cap is seated on said seat, and a pivot pin extending through said one end of said ear and said one end portion of said lever.

8. A closure device as defined in claim 4, wherein said first means includes a lug fixed to said one side of said

cap, and said lug includes a projection extending into said peripheral groove for releasably engaging a surface thereof.

9. A closure device comprising a tubular fitting having a cylindrical wall enclosing a chamber, said wall having a free end comprising a seat surrounding an end of said chamber, said wall having an outer surface, a closure cap adapted to abut said seat and close said one end of said chamber, first means movably connecting one side of said cap to said wall, second means releasably connecting another side of said cap to said wall, said second means including an elongated lever having spaced end portions, a lever support secured to said other side of said cap, a pivot pin pivotally connecting one of said end portions of said lever directly to said lever support, first and second cam means fixed on said one end portion and spaced from one another so as to be located on substantially diametrically opposite sides of said pivot pin, third cam means secured to said wall at the outer surface thereof, said lever being pivoted on said pivot pin to selectively engage said

first and second cam means with said third cam means so as to selectively force said cap towards and away from said seat.

10. A closure device as defined in claim 9, wherein said first and second cam means comprise first and second convexly curved projections angularly spaced on substantially opposite sides of said pivot pin and said third cam means comprises a concavely curved recess in said outer surface.

11. A closure device as defined in claim 10, wherein said concavely curved recess comprises a peripheral groove in said outer surface which is substantially arcuate in cross section.

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