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LOCKING AND RELEASE MECHANISM
FOR PRESSURE VESSEL CLOSURES
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Fig. 1.

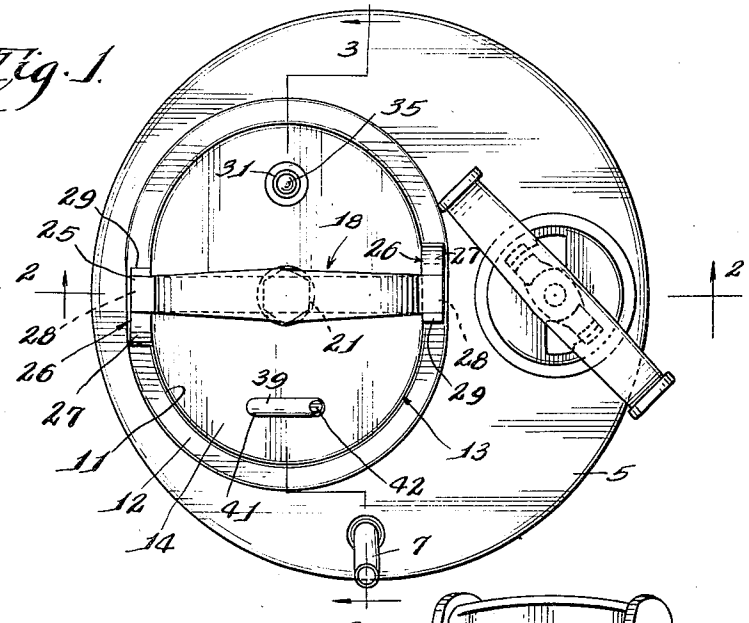


Fig. 2.

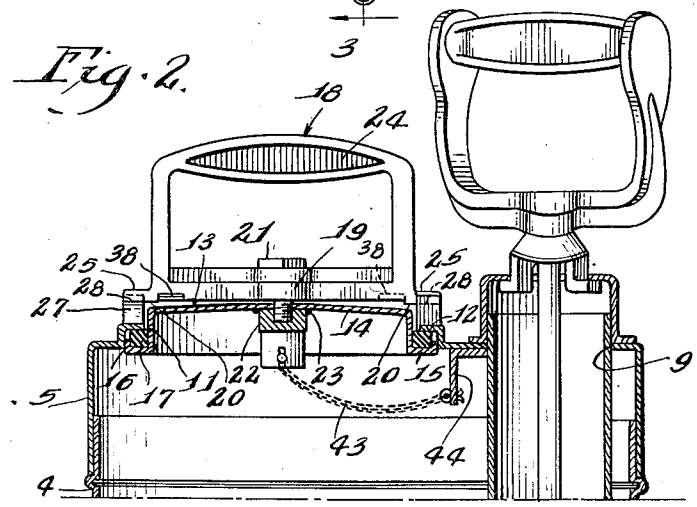
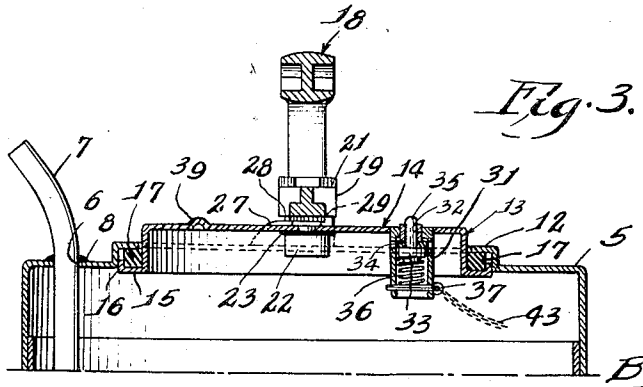


Fig. 3.



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LOCKING AND RELEASE MECHANISM FOR PRESSURE VESSEL CLOSURES

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5 Claims. (Cl. 220—44)

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The invention relates to locking and release mechanisms for the closures of pressure-type vessels such, for example, as pressure-type tanks for sprayers, which, together with their contents may be placed under a substantial internal pressure. More particularly the invention is concerned with the provision of simple but effective and certain means whereby a closure or cover for an access or other opening of substantial area in a pressure vessel may be firmly secured in both air and liquid tight engagement with the vessel over such opening and yet may be readily released, and involves an arrangement whereby dissipation of the internal pressure of the tank may be effected prior to opening the closure.

A pressure vessel, such as a portable spray tank for spraying fungicides, insecticides and other liquid or vapor sprays, ordinarily is equipped with a fill or access opening of substantial area. Usually such an opening is located in the top or top portion of the tank, and generally in connection with or adjacent to a power or manually operated air pump by which pressure of a substantial degree is built up within the tank to effect displacement of the liquid contents. Quite often it is preferable to have the access or fill opening in the tank closed by a cover or closure which will seat from within the tank against the margin of the tank wall about the opening so that the pressures developed within the tank may hold or tend to hold the closure firmly in place, and so that such pressures tend to make and to increase the effectiveness of a seal between the closure and the tank wall forming the margin about such opening. Arrangements of this character not only effect a tight seal to prevent the escape of the compressed air or other gas within the tank, but also minimize the chance of leakage of the spray material and the possibility of injury to the person or the clothing of the user.

However, when occasion demands that the pressure tank be opened when there is still substantial pressure within it, it becomes necessary to reduce the pressure in the tank before the closure over the access opening may be opened. Even were it possible to effect the opening of the closure against the pressure in the tank, it would be inadvisable to do so lest some of the contents of the tank escape with force, to the possible injury of the user. It would be possible, of course, to release the pressure from within the tank by opening the spray nozzle control valve, but that might be undesirable in that it might require wastage of spray material. Consequently, it is preferable to provide an air bleed valve in an upper portion of the tank for exhaustion of the air or gas under pressure in the tank.

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The employment of an air bleed or release valve in a spray tank of the character mentioned presents certain problems including that of location for accessibility and that of safety, ease and speed of operation. Problems of production or manufacturing as distinguished from problems of utility, safety, etc. are also present and must be considered in this connection. Accordingly, one of the principal and important objects of the invention is to provide a closure locking and release mechanism for pressure tanks of the character mentioned which will be of such construction and arrangement as will not only lend itself to ease and economy of manufacture, but also to ease, certainty and effectiveness in use.

A more specific but important object is to provide an arrangement whereby a single handle or manually operable member may serve not only as a convenient means by which to manipulate or carry the sprayer as a whole, but also as a part of the closure locking and release mechanism and as a means whereby the tank pressure release valve may be opened and held in open position until the pressures internal of and external to the tank have been equalized. In this connection it may be mentioned that the preferred arrangement includes means for releasably securing the handle or operating member in its position where the pressure release valve is held open and until the pressure has been reduced.

Many other objects as well as the several advantages and uses of the invention will or should become apparent and understood after reading the following description in which:

Fig. 1 is a top plan view of a spray tank or the like embodying a presently preferred form of the invention;

Fig. 2 is a section taken along the section line 2—2 of Fig. 1, the view being confined to the upper portion of the tank since the lower portion of the tank is not particularly concerned with the invention, and

Fig. 3 is a section taken along the section line 3—3 of Fig. 1, and at right angles to the section of Fig. 2.

The pressure tank, the upper portion only of which is illustrated, may be of cylindrical shape including a side wall 4 and a top portion 5 welded or otherwise firmly secured and sealed to the cylindrical wall 4. The top portion 5 may be

constructed as a heavy sheet metal stamping or the like and is provided with three apertures or openings, a small circular opening 6 for the passage of a spray outlet tube 7 which is sealed to the tank wall as by welding or soldering as at 8, a circular opening 9 for the reception of a hand air pump or the like which may be similar to that disclosed in Winks et al. application Serial No. 599,258 filed June 13, 1945, now Patent No. 2,529,645, and a relatively large oval-shaped access or fill opening 11. About the access opening 11 the top 5 of the tank has a marginal flange 12 struck upwardly from the general plane of the top surface, thereby to provide a sealing seat extending entirely about the perimeter or margin defining the opening 11.

A closure or cover 13 has a dome portion 14 and an outwardly extending perimetrical flange 15, the outer marginal edge of which is turned upwardly as indicated at 16 entirely about the closure. The arrangement of the outwardly extending flange 15, together with the upstanding edge portion 16 thereof, provides a perimetrically extending channel for the reception of a gasket 17 of rubber or other suitable material adapted to seat against the internal surface of the marginal flange 12 thereby to seal the opening. As will be observed, the closure seats with and opens against the internal pressure of the tank but, being oval or elliptical in shape, may be tipped and removed through the fill or access opening if so desired.

A handle generally designated 18 has a central boss 19 pivotally mounted upon a stud screw 21 secured in a cap nut 22, in turn secured and sealed to the dome 14 by a circumferentially extending weld or solder 23. Preferably the axis of the stud 21 is located at the intersection of the short and long diameters of the closure 13 and is substantially normal to the general plane of the top surface of the closure.

The handle 18 is of generally D-shape and includes a handle grip portion 24 and projections 25 extending in opposite directions from the bottom portion thereof. Secured as by welding or otherwise to the top or outer surface of the flange 12 at substantially diametrically opposed positions across the narrow width of the access opening is a pair of cam members or cam risers 26, each including a beveled riser portion 27, a flat or dwell portion 28 (in Fig. 1 the dwell portions lie beneath the projections 25 of the handle in the position shown), and an upwardly projecting stop portion 29 to limit the movement of the projections 25 in one direction. Normally, and when the handle 18 is turned in a counter-clockwise direction viewing Fig. 1 to a position where the cam engaging projections 25 are not in engagement with the cams, the level of the bottom surfaces 20 of the projections 25 will be slightly below the level of the flat dwell portions 28, i. e. closer to the level of the top surface of flange 12, than are the flat dwell portions 28 of the cams or risers 26. Thus, when the handle is turned in a clockwise direction viewing Fig. 1, the surfaces 20 will first engage the upwardly inclined or beveled surfaces 27 of the cams 26 and be urged upwardly until the projections ride on to the dwell portions 28 and are stopped by the upwardly projecting stops 29. The reaction between the projections 25 of the handle and the cams 26 results in forcing the handle upwardly, thereby pulling the closure 13 upwardly of the tank and forcing the gasket 17 into tight sealing engagement with the interior surface of the flange 12 entirely about the access opening. This mechanism effects a very simple and easily manufactured and operated closure fastening means.

The dome 14 of the closure 13 is equipped with a pressure relief valve which may comprise a tubular cage 31 welded or otherwise secured and sealed in a suitable aperture in the closure dome and an air escape passage 32 surrounded at its interior end by a valve seat, a valve 33 having a suitable gasket 34 adapted to seat against the valve seat, a valve stem 35 attached to the valve and projecting through the air escape passage to the exterior of the dome, a spring 36 normally urging the valve against its seat and a cotter key 37 or another abutment means for the spring 36. Normally the valve is held against its seat by the spring 36 and by the pressure within the tank when the tank is under pressure. The upper or outer end of the valve stem 35 projects into the path of rotation or swinging movement of the handle and is arranged to be engaged by an under surface of the handle and depressed to open the valve when the handle is swung to a position substantially ninety degrees (90°) from that indicated in Fig. 1. In order to facilitate interengagement of the handle with the valve stem to effect opening of the valve, the handle is beveled as indicated at 38 at that edge which would first engage the valve stem, and the top of the valve stem itself is rounded off. In order to facilitate manufacturing and assembly operations the bottom portion of the handle is provided with a bevel 38 at each end so that it becomes immaterial which end is to engage the valve stem.

While the pressure release valve could be located in the top 5 of the tank it is preferred that it be located in the closure itself, and that with respect to such closure it be located on the long diameter of the closure or approximately ninety degrees (90°) from either of the cams 26, but within the radial reach of that portion of the handle which it is to engage. This preferred arrangement is shown in Fig. 1. In order to insure the positive displacement of the valve 33 from its seat and to hold the valve open until such time as it is desired to permit the valve to resume its seat, and also for the purpose of preventing the handle from being cocked on its pivot and thereby failing to depress the stem 35 and the valve, the closure dome 14 is provided with a struck-up projection or raised portion 39 extending transversely of the long axis of the closure and at a position radially outward from the axis of the stud 21 corresponding to the radial distance of the stem 35 from the axis of the stud, so that when one of the beveled surfaces 38 is engaging and starting to depress the stem 35 the other beveled surface 38 is engaging and riding up on the rounded or sloping end 41 of the projection 39. The opposite end of the projection 39 is provided with an upwardly projecting boss 42 which serves to limit the movement of the handle beyond that position where the handle is fully depressing the valve 33. Therefore, when the handle is moved in a counter-clockwise position from its locked position shown in Fig. 1 to a position at ninety degrees (90°) thereto, one end of the handle will be depressing the valve while the other end rests upon and is held by projection 39. The handle will remain in this position until it is positively rotated in a clockwise direction with respect to the closure.

It is, of course, desirable that the closure, with the attached handle, be prevented from dropping down into an inaccessible position within the

tank when the closure is unlocked and pressure in the tank has been released. This may be easily accomplished by attaching one end of a chain 43 to the cotter key 37 and its other end to an internal stay or brace member 44 welded or otherwise secured across a portion of the top 5 on the inside thereof. This brace and the air pressure hand pump are more fully disclosed in the aforesaid co-pending application.

It is believed that the operation as well as the construction of the locking and release mechanism will be fully understood from the foregoing description. Those skilled in the art will also appreciate the advantages of the invention as well as the fact that many variations and changes may be made in the construction and arrangement of the parts. Accordingly, we desire to be limited only by the spirit of the invention and the scope of the appended claims.

We claim:

1. A closure locking and release mechanism for a pressure vessel of the character described having an access opening and a closure for such access opening arranged to close with the pressure and to open against the pressure in the vessel comprising, a handle member pivotally mounted on the exterior side of said closure on an axis substantially normal to the general plane of said exterior side, cooperative camming means carried by said handle and by said vessel at substantially opposite sides of said closure and opening whereby rotation of said handle in one direction will interengage said camming means to draw said closure toward and against said vessel around the margins thereof defining said opening and whereby rotation in the opposite direction will release said camming means from interengagement, an inwardly opening valve mounted in said closure and having a stem projecting above the exterior side of the closure into the path of rotation of a part of said handle, said handle part being adapted to engage said stem and open said valve when said camming means are disengaged.

2. A closure locking and release mechanism for a pressure vessel of the character described having an access opening and a closure for such access opening arranged to close with the pressure and to open against the pressure in the vessel comprising, a handle member pivotally mounted on the exterior side of said closure on an axis substantially normal to the general plane of said exterior side, cooperative camming means carried by said handle and by said vessel at substantially opposite sides of said closure and opening whereby rotation of said handle in one direction will interengage said camming means to draw said closure toward and against said vessel around the margins thereof defining said opening and whereby rotation in the opposite direction will release said camming means from interengagement, an inwardly opening valve mounted adjacent to said handle and having a stem projecting into the path of rotation of a part of said handle, said handle part being adapted to engage said stem and open said valve when said camming means are disengaged.

3. A closure locking and release mechanism for a pressure vessel of the character described having an access opening and a closure for such access opening arranged to close with the pressure and to open against the pressure in the vessel comprising, a handle member pivotally mounted on the exterior side of said closure on an axis substantially normal to the general plane of said exterior side, cooperative camming means carried by said handle and by said vessel at a plurality of spaced places about said closure and opening whereby rotation of said handle in one direction will interengage said camming means to draw said closure and vessel relatively together around the margins of the vessel defining said opening and whereby rotation in the opposite direction will release said camming means from interengagement, an inwardly opening valve mounted adjacent to said handle and having a stem projecting into the path of rotation of a part of said handle, said handle part being adapted to engage said stem and open said valve when said camming means are disengaged.

4. A closure locking and release mechanism for a pressure vessel of the character described having an access opening and a closure for said opening arranged to close with the pressure and to open against the pressure in the vessel comprising, a handle member mounted upon said closure for swinging movements about an axis substantially normal to the general plane of the external surface of said closure, a cam riser on the exterior of said vessel at each of substantially opposite sides of said opening, a cam riser on the exterior surface of said closure at a position disposed between said cam risers on said vessel and in the path of swinging movements of said handle, cam riser engaging means carried by said handle for cooperative and substantially simultaneous engagement with each of said cam risers on said vessel upon swinging movement of said handle in one direction whereby to secure said closure over said access opening, swinging movement of said handle to a predetermined position in the opposite direction serving to disengage said cam riser engaging means from said cam risers on said vessel and to effect interengagement of a portion of said handle and said cam riser on said closure, pressure relief valve means associated with said vessel and opening against the pressure therein, and a valve operating stem associated with said valve and located in the path of swinging movement of said handle member in a position to be intercepted and operated thereby substantially when the said handle portion and cam riser on the closure are inter-engaged thereby to open said valve.

5. A closure locking and release mechanism for a pressure vessel of the character described having an access opening and a closure for said opening arranged to close with the pressure and to open against the pressure in the vessel comprising, a handle member mounted upon said closure for swinging movements about an axis substantially normal to the general plane of the external surface of said closure, a cam riser on the exterior of said vessel at each of substantially opposite sides of said opening, cam riser engaging means carried by said handle for cooperative and substantially simultaneous engagement with each of said cam risers upon swinging movement of said handle in one direction whereby to secure said closure over said access opening, swinging movement of said handle in the opposite direction serving to disengage said cam riser engaging means from said cam risers, means for releasably securing said handle in predetermined position with respect to said closure when said riser engaging means is disengaged from said risers, pressure relief valve means associated with said vessel and open-

ing against the pressure therein for a release of the pressure, and means operated by said handle upon its movement to the last said position for effecting the opening of said valve.

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