

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO PRESSURE CONTAINERS

(71) We, H. D. HUDSON MANUFACTURING COMPANY, a corporation organized under the laws of the State of Minnesota, one of the United States of America, of 154 East Erie Street, City of Chicago, State of Illinois, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a pressure container and, more particularly, to a container for storing fluid under pressure which is provided with an improved closure to cause release of the container pressure before the cover can be removed from the tank. The closure also includes improved sealing means.

Many containers are commercially available for storing air, liquid or other fluids under pressure. These containers, however, do not combine depressurization safety features with adequate sealing means in a pressure container which is economical to manufacture.

An object of this invention is to provide a container for storing fluid under pressure.

This invention seeks to provide a container for storing fluid under pressure which is provided with an improved closure which causes the release of the internal fluid pressure before the user can remove the cover from the container tank.

According to the present invention there is provided a container for storing fluid under pressure of the type including a tank for storing the fluid and which is provided with a mouth through which fluid can be added to the tank, a removable cover extending across the mouth of the tank, means carried by the cover for removably securing the cover to the tank, a seal for sealing the cover to the tank to render the container pressure-tight, an outlet for removing the

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fluid contents from the tank while under pressure, and a pressure release valve communicating with the interior of the tank, in which container said pressure release valve is carried by the cover, and said means carried by the cover includes a member for cooperation with a movable member of the valve as the cover is uncoupled from the tank and while the container is pressure-tight, said means carried by the cover being rotatable relatively to the cover with lost motion when moved in a direction to remove the cover from the tank and being adapted to move the movable valve member to an open position causing the pressure in the tank to be released before the cover is uncoupled from the tank and the seal therebetween is broken.

In order that the invention may be better understood and more readily carried into effect, the same will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a top plan view of the container and closure;

Figure 2 is a vertical sectional view taken along the line 2-2 of Figure 1;

Figure 3 is a top plan view of the container and closure with the pressure valve in the open position prior to removal of the container top from the tank;

Figure 4 is a top plan view of the container and closure showing the container cover in the removable position;

Figure 5 is a sectional view of the upper portion of the container tank and closure taken along the line 5-5 of Figure 1, showing the pressure release valve in the closed position;

Figure 6 is a sectional view similar to that shown in Figure 5 depicting the pressure release valve in the open position;

Figure 7 is an exploded partial sectional view showing the upper portion of the container tank and closure in disassembled re-

lationship;

Figure 8 is a side elevation view of the closure;

5 Figure 9 is a sectional view through a portion of upper container showing the sealing gasket elastically deformed by the fluid pressure in the tank into sealing engagement with the cover and tank neck; and

10 Figure 10 is a similar sectional view as that of Figure 9 showing the sealing gasket when the interior of the tank is not under pressure.

In accordance with this invention, the container for storing fluid under pressure includes a tank for storing the fluid which is provided with a mouth through which the fluid can be added to the tank. The tank has a helical flange on its neck surrounding the tank mouth and a removable cover having a mating helical flange so that when the cover is positioned over the tank mouth and then rotated, the helical flange of the cover and the helix of the tank neck are brought into mating engagement to secure the cover on the tank. A flexible sealing gasket is circumferentially positioned about the tank mouth and is provided with a bevelled lower section. The gasket is elastically deformed under the fluid pressure of the tank into sealing engagement with the tank and cover to render the container pressure-tight. Also included are means for removing the fluid contents of the tank while under pressure, and a pressure release valve carried by the cover which communicates with the interior of the tank. Means are provided for rotating the cover to secure or disassemble the cover and tank. In addition, means cooperating with the cover rotating means are also provided for opening the release valve so that when the cover is rotated for disassembly from the tank, and while the container is pressure-tight, the valve will be opened causing the pressure in the tank to be released before the cover breaks sealing engagement with the gasket.

Referring now to the drawings, Figures 1, 7 and 8 show the container including tank 10 and closure 50. The upper portion of tank 10 includes neck 15 which is provided with cam surfaces or helix 14 and 51 and which surrounds tank mouth 40. Lip 16 serves to circumferentially position gasket 17 about tank mouth 40. Closure 50 includes removable tank cover 60 which is provided with helical flanges 27 and 28 for engaging mating cam surfaces or helices 14 and 51, respectively, of tank neck 15. Handle 11 is provided with legs 21 and 22 which extend downwardly through openings 21a and 22a, respectively, of plate 25. Handle 11 functions as a means for rotating closure 50 into engagement with neck 15 to couple or uncouple the cover and tank.

65 Figures 9 and 10 show the detailed con-

struction and operation of flexible gasket 17. Figure 10 shows gasket 17 mounted on lip 16 of the tank with cover 60 in place. Bevelled section 18 in the lower part of gasket 17 is positioned so that its tip engages cover 60. Figure 9 shows the effect of the internal fluid pressure of the tank on gasket 17, which is here shown in an elastically deformed state (the internal fluid pressure in the tank being represented schematically by the arrows) wherein lower bevelled section 18 is pressed into engagement with cover 60 and the remainder of gasket 17 is pressed upwardly into sealing engagement with neck 15. As the internal pressure in the tank is increased, gasket 17 is further deformed elastically so as to increase sealing engagement with the cover and tank neck. It has been found that an included angle of about 20° to the adjacent cylindrical wall of the cover is satisfactory for bevelled section 18.

Figures 1, 3 and 4 show the sequence of operations in removing cover 60 from tank 10. Figure 1 is a top plan view of the container with cover 60 assembled on the tank 10 and plate 25 rotatably mounted on cover 60. Members 34 and 35 comprising headed pins protrude upwardly from cover 60 through slots 33 and 36, respectively, of plate 25. When handle 11 is rotated counterclockwise, leg 22 engages the edge of opening 22a and leg 21 engages the edge of opening 21a so that plate 25 is rotated with respect to cover 60 from the position shown in corresponding Figures 1 and 5 to that shown in corresponding Figures 4 and 6. As plate 25 is rotated counterclockwise, lip 32 projecting upwardly at an angle of less than 90° to plate 25 (as shown in Figure 5) engages valve pin 30 of pressure release valve 37 mounted in cover 60 (as shown in Figure 6). Valve pin 30, under the action of the cam surface of lip 32, is depressed downwardly to open valve 37 and release the pressure in the interior of tank 10. As can be seen from Figure 3, as lip 32 covers or engages valve pin 30, protruding members 34 and 35 are pressed against the ends of slots 33 and 36, respectively, of plate 25, and rotate plate 25 along with cover 60 so that the mating helices of cover 60 and neck 15 are disengaged for removal of closure 50 from tank 10. Figures 1, 3 and 4 show slots 33 and 36 to be of predetermined angular extent and position such that plate 25 is rotated through a predetermined angle corresponding to the slot size before members 34 and 35 engage the ends of slots 33 and 36, respectively, to cause plate 25 to rotate in cooperation with cover 60. Moreover, when members 34 and 35 engage the end edges of slots 33 and 36, respectively, lip 32 will have moved valve pin 30 into a depressed position to

open valve 37. When plate 25 is caused to rotate in the opposite direction and members 34 and 35 engage the opposite end edges of slots 33 and 36, respectively, lip 32 will have broken engagement with valve pin 30 permitting valve pin 30 to move upwardly into a raised position to close valve 37. When valve 37 is closed the assembled container will retain pressure. It is to be noted, however, that before cover 60 can be removed from tank 10 valve pin 30 is first depressed causing valve 37 to open and release the pressure in the tank 10 before sealing engagement between gasket 17 and the cover and neck is broken. As cover 60 is rotated in the counterclockwise direction to uncouple cover 60 from tank 10, plate 25 will move along with cover 60 and lip 32 will maintain valve pin 30 in a depressed position keeping valve 37 open to ensure equal pressure between the inside and outside of tank 10. Figure 4 shows cover 60 in the position for removal from tank 10 by lifting upwardly. The safety of the container is thus improved by causing a release of the internal tank pressure before the cover is removed.

Figure 2 shows handle 11 connected to a pump comprising piston rod 44 extending downwardly into casing 12 and connecting to piston 42. Piston rod 44 forms a pressure-tight seal with plate 25 so that handle 11 can be moved upward and downward in reciprocating motion to increase the interior pressure of tank 10. The fluid contents of tank 10 are removed through outlet tube 19 and connecting hose 20 which can be opened to the atmosphere.

Figures 4 and 8 show cover 60 provided with separate helical flanges 27 and 28. Neck 15 shown in Figure 1 is provided with a pair of mating helices for engaging helical flanges 27 and 28 of cover 60. Figure 4 shows cover 60 inserted on to tank 10 by aligning cut-out sections 61 and 63 of neck 15 with cut-out sections 62 and 64 of cover 60. Cover 60 is then rotated clockwise by means of handle 11 so that the mating helices engage and cover 60 is tightened onto tank 10.

WHAT WE CLAIM IS:—

1. A container for storing fluid under pressure of the type including a tank for storing the fluid and which is provided with a mouth through which fluid can be added to the tank, a removable cover extending across the mouth of the tank, means carried by the cover for removably securing the cover to the tank, a seal for sealing the cover to the tank to render the container pressure-tight, an outlet for removing the fluid contents from the tank while under pressure, and a pressure release valve communicating with the interior of the tank, in which container said pressure release valve is carried

by the cover, and said means carried by the cover includes a member for cooperation with a movable valve member of the valve as the cover is uncoupled from the tank and while the container is pressure-tight, said means carried by the cover being rotatable relatively to the cover with lost motion when moved in a direction to remove the cover from the tank and being adapted to move the movable valve member to an open position causing the pressure in the tank to be released before the cover is uncoupled from the tank and the seal therebetween is broken.

2. A container as claimed in Claim 1, wherein the tank is provided with a neck having a helical flange surrounding the tank mouth.

3. A container as claimed in claim 2, wherein the removable cover is provided with a mating helical flange so that when the cover is positioned over the tank mouth and then rotated, the helical flange of the cover and the helical flange of the tank neck are brought into mating engagement to secure the cover on the tank.

4. A container as claimed in any one of claims 1, 2 or 3, wherein the seal includes a flexible gasket circumferentially positioned about the tank mouth in contact with the tank and cover and provided with a bevelled lower section, said gasket being elastically deformed under the fluid pressure of the tank into sealing engagement with the tank and cover to render the container pressure-tight.

5. A container as claimed in any one of the preceding claims, wherein the pressure release valve is carried by the cover.

6. A container as claimed in any one of the preceding claims, including a member for rotating the cover to couple or uncouple the cover and tank.

7. A container as claimed in any one of the preceding claims, wherein the means carried by the cover comprises a plate rotatably mounted on the cover, the plate carrying said member for engaging the movable member of the pressure release valve.

8. A container as claimed in claim 7 wherein the movable member of the pressure release valve is an upwardly extending valve pin.

9. A container as claimed in claim 8 wherein the member for co-operation with the movable member of the pressure release valve comprises a lip protruding upwardly from the plate so that when the lip of the plate engages the valve pin, the pin will be moved into a depressed position to open the valve and release the internal pressure of the tank.

10. A container as claimed in claim 9, wherein the plate is provided with at least one slot of predetermined angular extent

open valve 37. When plate 25 is caused to rotate in the opposite direction and members 34 and 35 engage the opposite end edges of slots 33 and 36, respectively, lip 32 will have broken engagement with valve pin 30 permitting valve pin 30 to move upwardly into a raised position to close valve 37. When valve 37 is closed the assembled container will retain pressure. It is to be noted, however, that before cover 60 can be removed from tank 10 valve pin 30 is first depressed causing valve 37 to open and release the pressure in the tank 10 before sealing engagement between gasket 17 and the cover and neck is broken. As cover 60 is rotated in the counterclockwise direction to uncouple cover 60 from tank 10, plate 25 will move along with cover 60 and lip 32 will maintain valve pin 30 in a depressed position keeping valve 37 open to ensure equal pressure between the inside and outside of tank 10. Figure 4 shows cover 60 in the position for removal from tank 10 by lifting upwardly. The safety of the container is thus improved by causing a release of the internal tank pressure before the cover is removed.

Figure 2 shows handle 11 connected to a pump comprising piston rod 44 extending downwardly into casing 12 and connecting to piston 42. Piston rod 44 forms a pressure-tight seal with plate 25 so that handle 11 can be moved upward and downward in reciprocating motion to increase the interior pressure of tank 10. The fluid contents of tank 10 are removed through outlet tube 19 and connecting hose 20 which can be opened to the atmosphere.

Figures 4 and 8 show cover 60 provided with separate helical flanges 27 and 28. Neck 15 shown in Figure 1 is provided with a pair of mating helices for engaging helical flanges 27 and 28 of cover 60. Figure 4 shows cover 60 inserted on to tank 10 by aligning cut-out sections 61 and 63 of neck 15 with cut-out sections 62 and 64 of cover 60. Cover 60 is then rotated clockwise by means of handle 11 so that the mating helices engage and cover 60 is tightened onto tank 10.

WHAT WE CLAIM IS:—

1. A container for storing fluid under pressure of the type including a tank for storing the fluid and which is provided with a mouth through which fluid can be added to the tank, a removable cover extending across the mouth of the tank, means carried by the cover for removably securing the cover to the tank, a seal for sealing the cover to the tank to render the container pressure-tight, an outlet for removing the fluid contents from the tank while under pressure, and a pressure release valve communicating with the interior of the tank, in which container said pressure release valve is carried

by the cover, and said means carried by the cover includes a member for cooperation with a movable valve member of the valve as the cover is uncoupled from the tank and while the container is pressure-tight, said means carried by the cover being rotatable relatively to the cover with lost motion when moved in a direction to remove the cover from the tank and being adapted to move the movable valve member to an open position causing the pressure in the tank to be released before the cover is uncoupled from the tank and the seal therebetween is broken.

2. A container as claimed in Claim 1, wherein the tank is provided with a neck having a helical flange surrounding the tank mouth.

3. A container as claimed in claim 2, wherein the removable cover is provided with a mating helical flange so that when the cover is positioned over the tank mouth and then rotated, the helical flange of the cover and the helical flange of the tank neck are brought into mating engagement to secure the cover on the tank.

4. A container as claimed in any one of claims 1, 2 or 3, wherein the seal includes a flexible gasket circumferentially positioned about the tank mouth in contact with the tank and cover and provided with a bevelled lower section, said gasket being elastically deformed under the fluid pressure of the tank into sealing engagement with the tank and cover to render the container pressure-tight.

5. A container as claimed in any one of the preceding claims, wherein the pressure release valve is carried by the cover.

6. A container as claimed in any one of the preceding claims, including a member for rotating the cover to couple or uncouple the cover and tank.

7. A container as claimed in any one of the preceding claims, wherein the means carried by the cover comprises a plate rotatably mounted on the cover, the plate carrying said member for engaging the movable member of the pressure release valve.

8. A container as claimed in claim 7 wherein the movable member of the pressure release valve is an upwardly extending valve pin.

9. A container as claimed in claim 8 wherein the member for co-operation with the movable member of the pressure release valve comprises a lip protruding upwardly from the plate so that when the lip of the plate engages the valve pin, the pin will be moved into a depressed position to open the valve and release the internal pressure of the tank.

10. A container as claimed in claim 9, wherein the plate is provided with at least one slot of predetermined angular extent



- and the cover is provided with at least one member protruding through the slot and so positioned on the cover so that when the plate is rotated in one direction through a predetermined angle corresponding to the slot size, the valve pin will be depressed by the lip to open the valve and the protruding member will engage an end edge of the slot, and when the cover is rotated in the opposite direction, the valve pin will be disengaged by the lip to allow the valve pin to move upward into a raised position to close the valve while the protruding member engages the opposite end edge of the slot.
- 15 11. A container as claimed in claim 10 wherein the plate is provided with a pair of oppositely disposed slots and the cover is provided with a pair of members each protruding through a slot.
- 20 12. The container as claimed in claim 10 or claim 11, wherein the lip protrudes upwardly from the plate and makes an angle of less than 90° with the plate.
- 25 13. A container as claimed in claim 10, 11 or 12, wherein the cover is provided with a pair of helical flanges and the neck is provided with a pair of mating helices for engaging the helical flanges of the cover.
- 30 14. A container as claimed in any one of claims 11 to 14, wherein a handle is provided for rotating the cover, the handle having a pair of downwardly extending legs for engaging the plate.
15. A container as claimed in claim 14, wherein the plate is provided with a pair of spaced openings for receiving the legs of the handle so that when the handle is rotated the legs are urged against the edges of the openings to cause the cover to rotate.
16. A container as claimed in claim 15, wherein a piston-type air pump is provided for pressurising the tank and a connecting line extending from the interior of the tank to the outside is provided for removing the contents of the tank.
- 45 17. A container as claimed in any one of the preceding claims, wherein the gasket has a lower section bevelled at an included angle of about 20 degrees relative to an adjacent cylindrical wall of the cover.
- 50 18. A container for storing fluid under pressure, substantially as hereinbefore described with reference to the accompanying drawings.

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