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3,011,686

VALVE ASSEMBLY FOR PRESSURIZED CONTAINERS

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2 Sheets-Sheet 1

Fig. 1.

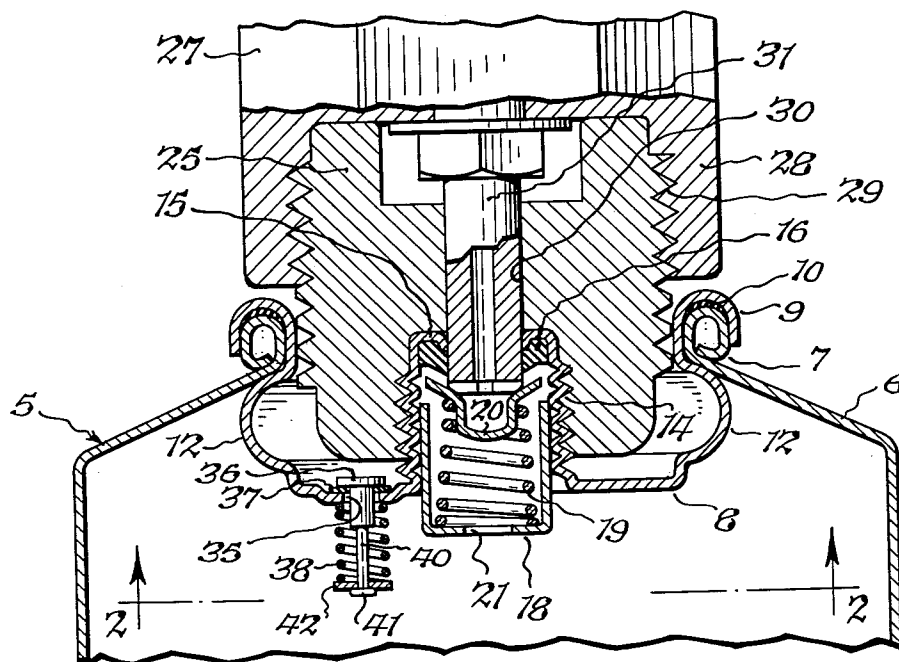
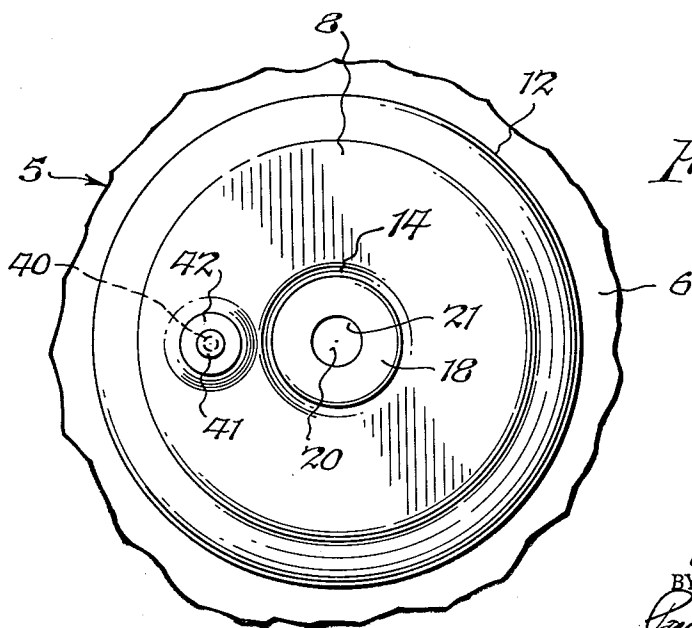


Fig. 2.



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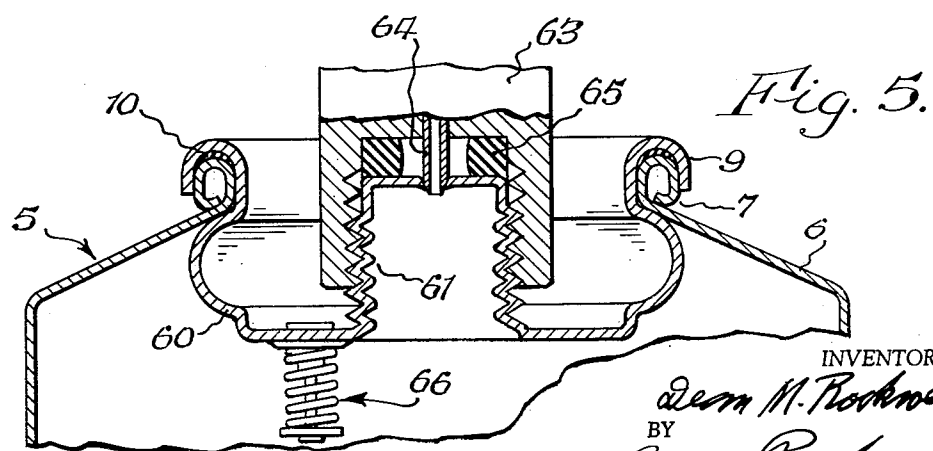
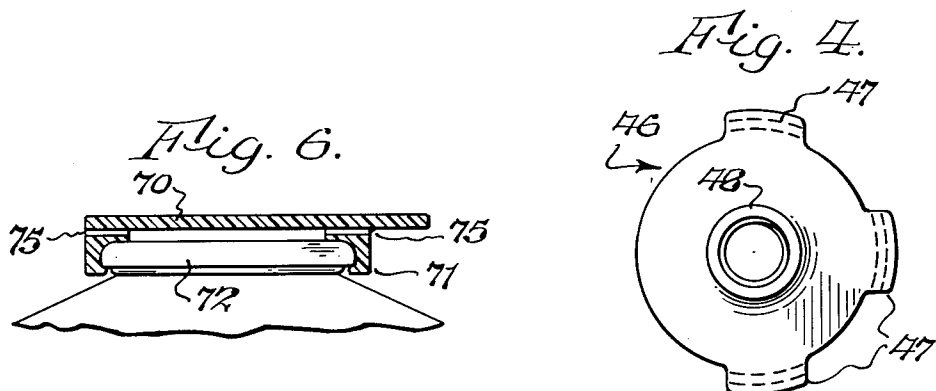
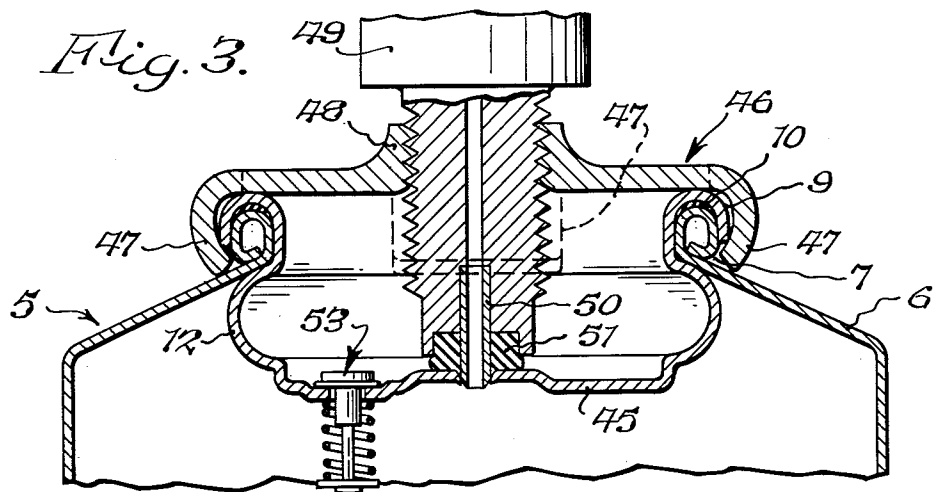
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2 Sheets-Sheet 2



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3,011,686 VALVE ASSEMBLY FOR PRESSURIZED CONTAINERS

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This invention relates to valve assemblies for use in connection with cylinders or other containers for gases or liquids under pressure.

Valve mechanisms of this kind are generally provided either with a valve which is normally closed but which may be moved into open position either manually or when an appliance is connected therewith, or the containers may have cups or other closures which may be punctured to permit fluid to pass to the appliance. Such appliance comprises a separate valve which controls the discharge of fluid from the container. It is also desirable in some containers of this kind, particularly those containing combustible gases or liquids under pressure, to provide a safety or pressure relief valve for discharging some of the fluid from the container to the outside when the pressure in the same becomes excessive.

It is an object of this invention to provide a valve assembly for use in connection with containers of this kind which include both the means for permitting the discharge of fluid from the container to an appliance and a safety or pressure relief valve, thus facilitating the installation of both of these fluid discharge means on a container.

A further object of the invention is to provide a cup which can be readily applied to a container and which includes a pressure relief valve as well as means for withdrawing gas from the container.

It is also an object of this invention to provide a cup of this kind with means for directing the flow of excess fluid from the container when the pressure relief valve is opening in such manner as to avoid subjecting the container to a jet action resulting from the discharge of the excess gas from the cup.

In the accompanying drawings:

FIG. 1 is a central, sectional elevation of a valve assembly embodying this invention showing the same applied to the upper part of a pressurized container or cylinder and showing a part of the discharge connection applied thereto.

FIG. 2 is a bottom plan view thereof on line 2-2, FIG. 1.

FIG. 3 is a sectional elevation of a valve assembly of modified construction.

FIG. 4 is a top plan view of a removable cap used in connection with the construction shown in FIG. 3.

FIG. 5 is a sectional elevation of a valve cup of another modified construction.

FIG. 6 is a side view of the upper portion of a cylinder or container and showing in section a cover member or cap for protecting the cup during shipment or storage.

In the particular construction illustrated by way of example in the drawings, 5 represents the upper portion of a pressurized container, such as a tank or cylinder of any suitable or usual construction, that shown by way of example being a cylinder of the type which is discarded after the contents have been discharged from the same. This container has the cylindrical wall terminating at the upper end thereof in a frusto conical end portion 6 which has the usual, open end thereof beaded over as shown at 7. The upper ends of these cylinders or containers are usually closed by means of a closure member or cup 8 having a substantially flat base and an upwardly extending, substantially cylindrical, peripheral wall provided at its upper end with an outwardly overturned flange 9 which is formed to fit over the bead 7 and which is preferably

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provided with an elastic sealing compound 10 on the inner surface thereof facing the bead 7. This cup may be inserted into the opening in the container or cylinder after which the cylindrical side wall is deformed by pressing the same outwardly by any suitable tool to form an outwardly extending projection 12 which bears against the under surface of the conical top 6 of the tank and consequently securely locks the cup on the container and forces the turned-over portion 10 of the cup against the bead 7 to form a gas-tight connection therewith. Any other means for securing the cup or closure member on the container may be provided.

The valve assembly in the construction shown in FIGS. 1 and 2 includes a normally closed discharge valve through which fluid from the container 5 may be withdrawn as desired. This valve may be of any desired construction and to mount the same on the cup, this cup 8 is provided with an upwardly extending, centrally disposed cylindrical wall 14 having screw threads pressed into the same. The upper portion of this upwardly extending, cylindrical wall 14 has an annular end wall or flange 15 provided on the under surface thereof with a washer or gasket 16 of rubber or other flexible sealing material.

The valve assembly also includes a spring-retaining cup 18 which is pressed into holding engagement with the cylindrical wall 14 of the cup 8 and contains a spring 19 bearing against a valve member 20 in a direction to press the same against the sealing gasket 16. This spring-retaining cup has an opening 21 therein through which fluid under pressure from the tank or cylinder may pass into the interior of the cup 8.

From the foregoing description it will be obvious that the valve 20 will be urged by the spring 19 and by the fluid pressure within the cylinder 5 into engagement with the gasket or sealing member 16 so that the escape of fluid from the container or cylinder 5 is prevented.

The fluid dispensing mechanism for cooperation with the valve mounting includes a valve adapter 25 which has a portion thereof extending into the cup 8 and which has a recess in the lower portion thereof provided with internal threads which engage with the threads of the upwardly extending, cylindrical portion 14 of the cup. This valve adapter may be secured to a body portion 27 of an appliance, either by screw threads formed on a flange 28, as indicated at 29, or the adapter may be formed integral therewith, and the appliance includes a suitable valve (not shown), for controlling the discharge of fluid from the container 5 when the valve 20 is opened. This adapter is provided with a central hole or passage 30 into which a hollow gas outlet stem 31 of the appliance 27 may extend. When this stem 31 has entered the hole 30 in the adapter, by turning the appliance while the threaded sleeve 28 engages the threads 29, the stem 31 will contact with the valve 20 and force it off of its seat on the gasket 16, as shown in FIG. 1, whereupon the fluid from the interior of the container 5 may flow around the edges of the valve 20 and into the hollow stem 31 to the appliance, where it is controlled by means of the appliance valve, not shown. Other means for opening the valve 20 for discharging fluid from the container 5 may of course be provided.

When the container 5 is filled with a compressed or liquefied gas which may, due to heat or other causes, exceed the desired pressure, a safety or pressure relief valve is provided, and in the construction shown I have positioned this valve on the flat base portion of the cup 8 between the peripheral wall and the cylindrical wall 14. For this purpose the base portion is provided with a hole 35 which is normally closed by means of a valve having a head 36 cooperating with a gasket 37 and urged in seating position by means of a spring 38. The pres-

sure relief valve has a stem 40 provided with a head 41 on the inner end thereof which seats on a washer 42 which engages one end of the coil spring 38. The other end of the spring bears against the inner face of the closure cup 8. A pressure relief valve of any other suitable construction may be employed if desired. By proper design of spring and length of the stem 40, any desired pressure relief setting may be obtained.

If the pressure within the container 5 becomes excessive so that the pressure relief valve becomes opened, excess fluid will enter the interior of the closure cup. It will be noted that the screw threads 29 of the adapter 25 are preferably in contact with the upper portion of the closure cup 8. Consequently the excess fluid which has passed into the cup 8 will flow around the screw threads which serve the two-fold purpose of retarding the flow of this fluid and also causing the same to pass outwardly away from the valve assembly so that it will be kept away from any flame which may be burning on the appliance. In this way an explosion hazard is materially reduced. Furthermore, by discharging this excess gas laterally of the container 5, propulsion of the container by the gas, by a jet action is avoided.

By providing the pressure relief valve on the cup 8, a considerable saving of expense results. Heretofore pressure relief valves were mounted on the upper end of the container 5 which required a special machined relief valve bushing which was brazed or welded in a hole in the top side of the container 5. Furthermore the pressure relief valve in that case was on the exterior of the container where it might easily be damaged by contact with other objects and where its operation might be interfered with by dirt or other foreign matter collecting on the spring, thus causing malformation of the pressure relief valve. In the construction herein shown, the pressure relief valve is entirely removed from possible contact with exterior objects or substances and is also protected against corrosion.

In FIG. 3 I have shown a modified form of my invention applied to constructions in which the valve 20 shown in FIGS. 1 and 2 is replaced by an appliance fitting which forms a hole in the cup 45 through which fluid from the container passes into the appliance. In this construction a removable cap or fitting 46 having prongs or claws 47 is formed to engage the flanged-out portion 9 of the cup. This fitting, for example, may be provided with two prongs 47 arranged about 180 degrees apart, and another prong intermediate between these two prongs, thus leaving half of the cap 46 without any prongs. Consequently the cap 46 can be slid over the top of the cup with the claws extending under the turned-over part of the cup. This cap has a sleeve 48 preferably formed integral with the fitting and which is internally threaded for engagement with an adapter 49 having a central, tubular portion 50, the lower end of which is tapered downwardly to form sharp edges about the lower end of the bore of the tubular portion 50. As the adapter 49 is screwed down relatively to the cap 56, the sharpened, lower end of the tubular part 50 will be pressed against the middle portion of the cup 45 and cut a small opening therein from which fluid can escape upwardly through the tubular portion 50. 51 represents an annular sealing member or bushing which is pressed by the adapter 49 against the upper surface of the cup 45 and thus prevents the escape of fluid outwardly. When the container or cylinder 5 has been emptied, it is discarded, but the cap 46 is then retained and is available for use with another cylinder or container.

This structure for withdrawing gas from a container or cylinder is well known. I have however found that my improvements can be applied to a closure cap of this construction, and as shown in FIG. 3, I have positioned a pressure relief valve 53 on the base of the cup in the same manner as shown in FIGS. 1 and 2. This

valve may be identical in construction with the one shown in FIGS. 1 and 2. This arrangement has the advantage that the pressure relief valve is located mainly within the cylinder 5, and also that this valve arrangement permits use of higher pressure flammable and toxic fluids in a cylinder of this type.

FIG. 5 shows the construction of a valve assembly very similar to that shown in FIG. 1, including a cup 60 having an upwardly extending, substantially cylindrical, middle portion 61 which has screw threads formed thereon. The upper end of the portion 60 is imperforate but may be perforated by means of an appliance adapter 63, somewhat similar to the one shown in FIG. 1, in that the adapter 63 has an internally screw threaded portion formed to cooperate with the screw threads on the upstanding part of the cup 60. As this adapter is screwed down along these threads, a centrally located tube 64 will puncture the upper end of the cylindrical projection 61, whereupon fluid from the interior of the cylinder or container may be withdrawn through the tube 64 as in the construction shown in FIG. 3. 65 represents a compressible sealing ring extending about the tube 64 and which prevents the escape of fluid from the cylinder except through the tube 64.

66 represents the pressure relief or safety valve which is arranged on the cup 60, in the same manner as shown in FIGS. 1 and 2 so that the means for withdrawing fluid from the cylinder and the pressure relief valve are both on the cup.

In many of these containers or cylinders it is desirable to apply a protecting device or shield to the upper end thereof during shipment or handling of the same so as to prevent damage to the cup and parts mounted thereon.

In FIG. 6 I have shown by way of example, a cup protecting cover or member 70 which may be made of a suitable plastic material which is somewhat flexible and which has an annular, downwardly extending flange 71 which may be slightly stretched to fit around the bead of the cup 72. The lower part of this flange is of slightly less diameter than the bead so that the flange will securely hold the cover member on the tank. This cover member may be used in connection with any of the tank closure cups shown in the drawings.

The cover member serves not only to protect the cup secured to the upper end of a tank or cylinder, but also directs any gases discharged through the pressure relief valve laterally in such manner that the lengthwise jet propulsion of the cylinder is avoided, which might happen if gas under heavy pressure were directed outwardly lengthwise of the cylinder from the pressure relief valve or any other part of the cup. To prevent such jet action by escaping gas, I provide in the cover member 70 two or more holes 75 extending substantially perpendicular to the axis of the cylinder, these holes being arranged equidistant to each other about the circumference of the cover member. Consequently, fluid under pressure entering the space between the cup and the cover member will be projected outwardly through the holes 75 in directions extending radially with reference to the axis of the cylinder. By spacing these holes at equal distances from each other the resultant of the forces produced by the jets will be zero.

By mounting the pressure relief valve in the bottom of the cup, the discharge from this valve may be readily controlled, for example, by passing it along the screw threads of the valve adapter in FIGS. 1 and 2, or by discharging it through the laterally extending holes in the cover member shown in FIG. 6.

It will be understood that various changes in the details, materials and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art, within the principle and scope of the invention, as expressed in the appended claims.

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I claim:

1. A valve assembly for a pressurized container having a discharge opening at one end thereof, a bead extending about said opening, a closure cup having a peripheral wall extending into said opening and having an outwardly flared upper end formed to cooperate with said bead to form a fluid tight joint therewith, said cup having a bottom formed integral with said peripheral wall, means at the middle portion of said bottom through which fluid may be withdrawn from said container, a spring-seated pressure relief valve cooperating with an opening in said bottom and having a valve head seated on the exterior surface of the bottom of said cup and having a stem extending into the interior of said container, and a spring acting on said head and arranged on the interior wall of said cup, and extending into said container, said spring holding said valve head in seated position except when the pressure in the container becomes excessive.

2. A valve assembly for a pressurized container having an opening in one end thereof, including a closure cup having a peripheral wall formed for attachment to said container at said opening, and a bottom wall, a substantially cylindrical wall formed integral with the bottom of said cup and spaced from said peripheral wall and having screw threads coaxial therewith, the top of said cylindrical wall being provided with normally closed fluid discharge means, a valve adapter having a threaded part formed to cooperate with the screw threads of said cylindrical wall and having means for providing an opening in said fluid discharge means when turned relatively to said screw threads of said cylindrical wall, and a pressure relief valve mounted on said bottom wall in the space between said peripheral wall and said cylindrical wall to discharge excess fluid from said container into said cup.

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3. A valve assembly according to claim 2, in which said pressure relief valve has a head seated on the upper exterior surface of said bottom wall of said cup, and a spring arranged below said bottom wall and within said container and urging said valve into seated position, said spring reacting against the inner surface of said bottom wall.

4. A valve assembly for a pressurized container having a closure cup provided with an upright annular outer wall provided with means at its upper portion for securing said cup to said container and extending into said container, said closure cup including a bottom formed integral with said outer wall and having a centrally located substantially cylindrical wall formed integral with said cup and extending upwardly within said cup and spaced from the peripheral wall thereof, an appliance for use with said assembly and having an adapter, means on said cylindrical wall for fastening said adapter thereto, said adapter having an outer surface contacting with said peripheral wall and forming therewith a restricted approximately spiral passage for gas, a relief valve in the bottom of said cup which when opening by excessive pressure in said container discharges fluid under pressure into said cup for discharge from said cup through said restricted passage.

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