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DISPENSING VALVE WITH STEM SEALING MEANS

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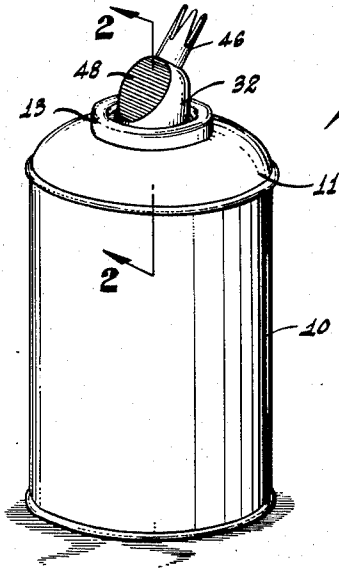


Fig. 1

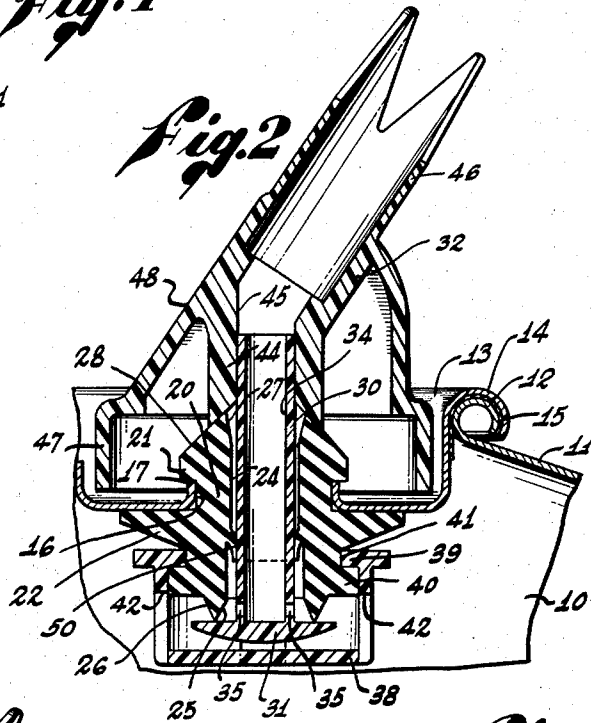


Fig. 2

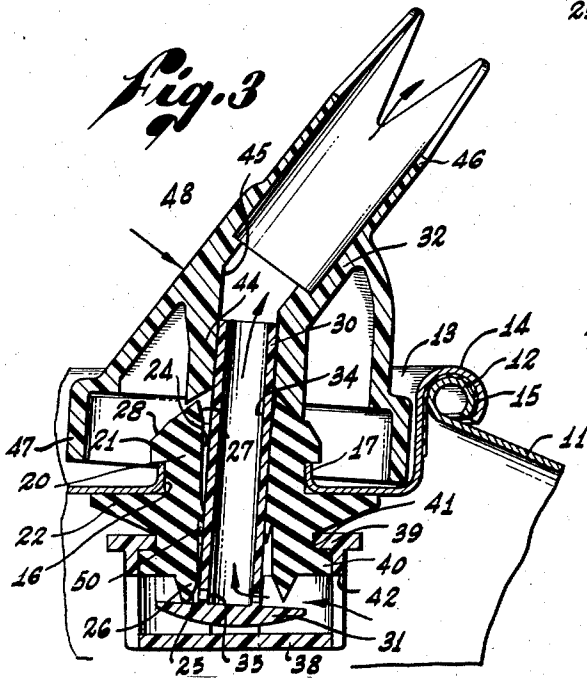


Fig. 3

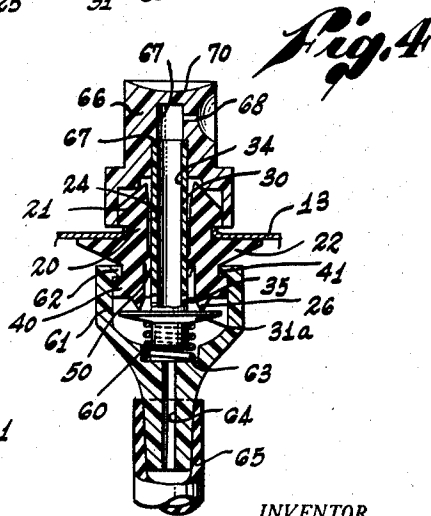


Fig. 4

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DISPENSING VALVE WITH STEM SEALING MEANS

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7 Claims. (Cl. 222—394)

This invention relates generally to valves and more particularly to the construction of a dispensing valve which is highly advantageous for use on all types of pressurized containers.

In small pressurized containers or cans, a flowable product is stored together with a volume of gas under pressure. Upon opening a dispensing valve the gas drives the flowable product out of the container for use. In order to direct the flow of fluid, and in some cases to atomize or form a fine spray of the product, a dispensing nozzle structure is mounted atop the valve and is in communication with the outlet thereof. In the usual construction the dispensing nozzle either by engagement with a valve stem or with the body surrounding it is used to cause relative displacement of the valve stem so that the valve is opened. It has been found that better control of the valve is obtained if the dispensing nozzle is used to move the valve stem and itself moves relative to the valve body so that it cannot be tightly engaged with the latter. It is of course, not desirable that there be any leakage of fluid between the body of the valve and the dispensing nozzle and this problem has heretofore prevented effective use of the type of valve just described.

With the foregoing in mind, it is a major object of this invention to provide a dispensing valve having means for preventing leakage between the valve body and the dispensing nozzle while permitting relative movement therebetween.

An equally important object of the invention is to provide a dispensing valve having a valve stem provided with an internal flow opening and mounted for free movement relative to an outer body together with a packing flange surrounding the stem and constructed to positively prevent the outward flow of fluid around the valve stem.

It is also an object of the invention to provide a resilient valve body or grommet having an integral packing flange formed thereon for engagement with a freely mounted valve stem and so shaped as to prevent outward flow of fluid around the valve stem but permitting flow into the container.

A further object of the invention is to provide a dispensing valve which includes means for limiting the movement of the freely mounted valve stem and which may be made with a self-closing feature if desired.

It is another object of the invention to provide a dispensing valve which can be used on all types of dispensing containers with only minor modification of a basic structure, and which is easily manufactured and assembled.

These and other objects and advantages of the invention will become apparent from the following detailed description of a preferred and modified form thereof and from an inspection of the accompanying drawings in which:

Figure 1 is a perspective view of a pressurized container having a preferred embodiment of the invention installed thereon;

Figure 2 is a sectional detail through the top of the

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container taken along the line 2—2 of Figure 1 and showing the valve in closed position;

Figure 3 is a view similar to Figure 2 showing the valve in open position; and

Figure 4 is a longitudinal section taken through a modified form of the invention.

Referring now to the drawings and particularly to Figure 1 thereof, a metal container or can 10 is shown typically as of cylindrical shape and adapted to hold the flowable product together with a volume of gas under pressure. Container 10 has a rounded top 11 formed with a rolled edge 12 as is seen in Figure 2. A cap 13 is engaged with top 11 by means of a rolled rim 14 which is secured over edge 12 and may be sealed therewith by a gasket 15. In the center of cap 13 is a circular opening 16 which is peripherally defined by a short upturned cylindrical edge 17 formed integrally with the wall of the cap. Either the preferred or modified form of the invention may be mounted within opening 16 to control the flow of material from the container, and it is to be understood that these are merely illustrative applications of the invention.

As is seen in detail in Figure 2, the preferred embodiment of the valve includes a valve body or grommet 20 which is formed of resilient rubber-like material and is elongated to extend beyond opening 16 on both the inside and outside of container 10. In order to secure body 20 tightly in place an outer flange 21 and inner flange 22 are formed on the external surface of the body to engage tightly against the top of edge 17 and the underside of cap 13, respectively. The flanges 21 and 22 are so proportioned as to be a force fit with edge 17 and thus seal tightly into place.

Extended axially through body 20 is an elongated bore 24 which provides a flow path for the flow of fluid from the container and opens to the bottom or inner end of body 20 through a beveled or chamfered surface 25. Surrounding surface 25 and projecting downwardly from body 20 is a raised bead or ring 26 which is of triangular cross section and forms a valve seat around the annular lower edge thereof. The upper end of bore 24 may also be inclined outwardly as at 27, and opens onto an upwardly inclined conical surface 28 on the top exterior portion of body 20.

To control the flow of fluid through bore 24 a rigid metal or plastic valve member is mounted within the body 20 and has an elongated stem 30 extended through the bore and formed integrally with an enlarged head 31 which overlies seat 26. Stem 30 passes freely through bore 24 and is of such a length as to extend upwardly beyond the top of body 20 for connection with a dispensing nozzle 32. Extended axially along stem 30 is an upwardly open chamber or passageway 34 which terminates just outwardly of head 31 and is communicated to the exterior of the stem by a plurality of radially directed ports 35. Fluid passing over head 31 may therefore flow through ports 35, passageway 34, and thence into dispensing nozzle 32.

Normally, head 31 is held upwardly against seat 26 by the fluid pressure within container 10 and thus prevents any outward flow of the fluids stored within the container. However, under some conditions, as during filling, the fluid pressure within container 10 will not be sufficient to hold head 31 against seat 26 and since the head and stem 30 are freely movable relative to body 20 it is necessary to provide means for limiting the inward movement of the stem and head. For this purpose a cup-shaped member or cage 38 is secured to body 20 so as to project downwardly around head 31. The upper end of member 38 is provided with a flange 39 which is adapted to be pressed over a flange 40 formed on the lower end of body 20 and seat within an adjacent groove 41. The bottom wall of

member 38 is spaced from head 31 so as to allow limited free movement of the head away from seat 26, and a plurality of side openings 42 are formed in the side wall of the member to allow free fluid flow past the head when the valve is opened.

As was previously mentioned, the upper end of stem 30 is engaged with a dispensing nozzle 32. The latter is typically formed of molded plastic and may be designed for ornamental as well as functional purposes. In the interior of nozzle 32 is a central hub 44 which has a central passageway 45 leading therethrough and opening upwardly into an inclined spout 46. The wall of hub 44 is a close fit with the end of stem 30 so as to prevent any fluid flow therebetween and also to provide a firm mechanical connection, and the lower end of the hub is beveled so as to seat against the inclined top surface of body 20. Surrounding hub 44 is an outer skirt 47 which extends downwardly in spaced relationship to body 20 and on one side thereof is provided with an upper thumb plate 48.

In order to open the valve, hand pressure is applied to plate 48 to tilt and depress nozzle 32 as is indicated in Figure 3. Stem 30, through its connection with hub 44, is also tilted and depressed relative to the resilient body 20 and head 31 is moved away from seat 26. The desired flow of fluid may then take place through stem passageway 34, into nozzle passageway 45, and thence through spout 46. Since there is a positive connection between stem 30 and hub 44 it can be appreciated that the tilting of stem 30 is under accurate control in accordance with the hand pressure applied.

In addition to the desired flow through stem 30 it can be seen that fluid may also flow upwardly around the stem through the clearance with bore 24. Such flow is highly undesirable since the communication between bore 24 and nozzle passageway 45 is closed off by the connection between stem 30 and hub 44. The result is that fluid flowing upwardly around stem 30 would tend to flow between the bottom end of hub 44 and the surface 28 of body 20 and collect in cap 13. It should also be remembered that in the operation of the valve, nozzle 32 is tilted relative to body 20 so as to lift one side of the bottom of hub 44 away from surface 28 and thus prevent any effective sealing therebetween.

Therefore, to prevent fluid flow upwardly around stem 30, packing means are provided within bore 24. The packing means takes the form of an annular packing flange 50 which is formed integrally with body 20 and projects into bore 24 to surround stem 30. Flange 50 is of inverted frusto-conical shape and the free edge or lip portion which engages against the surface of stem 30 is displaced inwardly towards head 31 from the base portion which is attached to the wall of bore 24. Flange 50 is, of course, resiliently deformable and due to its shape is adapted to be pressed tightly inwardly against the wall of stem 30 by the fluid pressure within container 10. In other words, fluid under pressure which is attempting to flow up bore 24 around stem 30, acts not only upwardly against flange 50, but forces it radially inwardly by acting against the wall of the lip portion thereof which is displaced downwardly from the base portion. This seal around stem 30 is maintained regardless of the tilting or depression of the stem for opening the valve.

The nature of flange 50 is also such that it is advantageous in filling container 10. During the filling operation the nozzle 32 has not yet been put in place, and the filling equipment is seated downwardly on body 20. While the fluid from the filling equipment may flow downwardly through stem 30 the operation is expedited if it may also flow downwardly around the stem. Flange 50 permits such downward flow into container 10 since the deformable lip portion is forced radially outwardly away from stem 30 by the fluid traveling down bore 24. As soon as the filling operation is completed flange 50 seats

tightly against stem 30 and remains there under the fluid pressure within the container.

Figure 4 shows a modified form of the invention which has the same basic structure as the preferred device but is adapted for use in a container wherein a syphon tube is used, and where an atomized spray is to be delivered. This form of the invention also includes a self-closing valve construction which is particularly desirable for use when the container is to be filled by a so-called cold filling operation in which there is no initial fluid pressure within the container. In the device, body 20 is the same as the body just described and is again seated within the container cap 13. The valve member has a stem 30 fitted within body bore 20 and is provided with a head 31a which is similar to the head 31 but includes a lower projecting boss.

In order to provide a self-closing valve a spring 60 is seated beneath head 31a and is fitted around the boss thereon to urge the head upwardly against seat 24 at all times. Thus the valve will be closed even though the fluid pressure within container 10 is no greater than the external atmospheric pressure. This construction is desirable when the container is filled with the normal pressurizing gas at a low temperature and in a liquid state for ease of handling. In such a cold filling operation there is substantially no pressure in the container until the pressurizing gas has been warmed to the point at which it passes into a gaseous state. Prior to this time the self-closing valve construction prevents leakage or dissipation of the pressurizing gas and the stored product.

To support spring 60 a cup member 61 is secured to body 20 by means of an upper flange 62 which is forced over body flange 40 and into groove 41. Cup member 61 extends downwardly around head 31a in spaced relationship, and provides a lower seat 63 which receives the lower end of spring 60. The lower end of member 61 is formed of reduced diameter and is provided with a central axial bore 64 which opens into the interior of the member for permitting the outward flow of fluid around head 31a. As was mentioned, it may be desirable to provide a syphon tube for some types of containers designed to be used in an upright position in order that the product can be removed from the bottom of the container ahead of the pressurizing gas. The lower end portion of cup member 61 is adapted for connection to such a syphon tube 65 in this form of the invention, with the latter frictionally secured around the end portion and in communication with bore 64.

As was also mentioned, it is desirable to dispense some products in the form of a fine atomized spray and for this purpose a dispensing nozzle 66 having an atomizing chamber 67 in communication with the upper end of stem 30 may be provided. Chamber 67 is opened externally by a small side aperture 68 through which the spray is discharged upon opening of the valve structure. The wall of nozzle 66 fits tightly around stem 30 to prevent leakage therebetween, and an upper shoulder 69 may be provided in chamber 67 at the top of the stem so as to positively depress the stem upon depression of the nozzle through an upper recessed thumb plate 70. Again, the packing flange 50 prevents upward flow of fluid around stem 30 so as to positively prevent leakage between body 20 and nozzle 66.

While I have thus described in some detail specific preferred and modified forms of the invention, it will be apparent that different combinations of features and changes of design and construction can be made without departing from the scope of the invention. Therefore, I do not wish to be restricted to the foregoing details except as defined in the appended claims.

I claim:

1. A tilt-opening dispensing valve for a pressurized container comprising: a resilient body mounted in an opening in said container, said body having a bore there-
75 through from the outer to the inner end and a valve seat

at the inner end thereof within said container, said valve seat comprising an annular resilient bead projecting from said body and being substantially narrower, in cross-section, than the inner end of said body; a rigid valve member having a stem extending through said bore and a head on the inner end adapted to engage against said annular resilient bead valve seat, said stem having an opening therein extending from the outer end to a position just outwardly of said head, said head being normally held against said annular resilient bead valve seat by fluid pressure within said container and being readily movable away from said annular resilient bead valve seat upon lateral displacement of the outer end of said stem relative to said body to thereby open said valve and cause the exit of fluid from said container under fluid pressure; and an annular packing flange formed on said body and surrounding said stem in said bore, said flange having a deformable lip portion in sealing engagement with said stem and displaced towards the inner end of said bore from the base portion of said flange adjacent said body whereby to be moved away from said stem by fluid flowing into said container and held against said stem by fluid flowing out of said container.

2. A tilt-opening dispensing valve for a pressurized container comprising: a resilient grommet mounted in an opening in said container and having external peripheral flanges adapted to engage with the edge of said container surrounding said opening on both the inside and outside of said container, said grommet having an axial bore therethrough and a valve seat surrounding said bore at the inner end thereof within said container, said valve seat comprising an annular resilient bead projecting from said grommet, and being substantially narrower, in cross-section, than the inner end of said grommet; a rigid valve member having a stem extending through said bore and a head on the inner end adapted to engage against said annular resilient bead valve seat, said stem having an opening therein extending from the outer end to a position just outwardly of said head, said head being normally held against said annular resilient bead valve seat by fluid pressure within said container and being readily movable away from said annular resilient bead valve seat upon lateral displacement of the outer end of said stem relative to said grommet to thereby open said valve and cause the exit of fluid from said container under fluid pressure; and an annular packing flange formed on said grommet and surrounding said stem in said box, said flange having a deformable lip portion in sealing engagement with said stem and inclined inwardly of said container towards the free end of said lip portion whereby said lip portion is held tightly against said stem by fluid pressure within said container.

3. A tilt-opening dispensing valve for a pressurized container comprising: a resilient grommet mounted in an opening in said container and having external peripheral flanges adapted to engage with the edge of said container surrounding said opening on both the inside and outside of said container, said grommet having an axial bore therethrough and a valve seat surrounding said bore at the inner end thereof within said container, said valve seat comprising an annular resilient bead projecting from said grommet, and being substantially narrower, in cross-section, than the inner end of said grommet; a rigid valve member having a stem extending through said bore and a head on the inner end adapted to engage against said annular resilient bead valve seat, said stem having an opening therein extending from the outer end to a position just outwardly of said head, said head being normally held against said annular resilient bead seat by fluid pressure within said container and being readily movable inwardly, away from said annular resilient bead seat, upon lateral displacement of the outer end of said stem relative to said grommet to thereby open said valve and cause the exit of fluid from said container under fluid pressure; an annular packing flange formed on said grom-

met and surrounding said stem in said box, said flange having a deformable lip portion in sealing engagement with said stem and inclined inwardly of said container towards the free end of said lip portion whereby said lip portion is held tightly against said stem by fluid pressure within said container; and an apertured cup member fitted loosely around said head and engaged with said grommet to limit inward movement of said valve member.

4. A tilt-opening dispensing valve for a pressurized container comprising: a resilient grommet mounted in an opening in said container and having external peripheral flanges adapted to engage with the edge of said container surrounding said opening on both the inside and outside of said container, said grommet having an axial bore therethrough and a valve seat surrounding said bore at the inner end thereof within said container, said valve seat comprising an annular resilient bead projecting from said grommet, and being substantially narrower, in cross-section, than the inner end of said grommet; a rigid valve member having a stem extending through said bore and a head on the inner end adapted to engage against said annular resilient bead valve seat, said stem having an opening therein extending from the outer end to a position just outwardly of said head, said head being normally held against said annular resilient bead seat by fluid pressure within said container and being readily movable inwardly, away from said annular resilient bead seat, upon lateral displacement of the outer end of said stem relative to said grommet to thereby open said valve and cause the exit of fluid from said container under fluid pressure; an annular packing flange formed on said grommet and surrounding said stem in said bore, said flange having a deformable lip portion in sealing engagement with said stem and inclined inwardly of said container towards the free end of said lip portion whereby said lip portion is held tightly against said stem by fluid pressure within said container; an apertured cup member fitted loosely around said head and engaged with said grommet to limit inward movement of said valve member; and a spring fitted between said cup member and said head for urging said head against said annular resilient bead valve seat.

5. A tilt-opening dispensing valve for a pressurized container comprising: a resilient grommet mounted in an opening in said container and having external peripheral flanges adapted to engage with the edge of said container surrounding said opening on both the inside and outside of said container, said grommet having an axial bore therethrough and a valve seat surrounding said bore at the inner end thereof within said container, said valve seat comprising an annular resilient bead projecting from said grommet, and being substantially narrower, in cross-section, than the inner end of said grommet; a rigid valve member having a stem extending freely through said bore and a head on the inner end adapted to engage against said annular resilient bead, said stem having an axial opening therein extending from the outer end to a position just outwardly of said head and connected laterally to the exterior of said stem by radial ports, said head being normally held against said annular resilient bead by fluid pressure within said container and being readily movable inwardly, away from said annular resilient bead, upon lateral displacement of said stem relative to said grommet to thereby open said valve and cause the exit of fluid from said container under fluid pressure; an annular packing flange formed integrally on said grommet and surrounding said stem in said bore, said flange having a deformable lip portion of generally frusto conical shape inclined inwardly towards said head and in sealing engagement with said stem whereby to be moved away from said stem by fluid flowing into said container and held tightly against said stem by fluid tending to flow out of said container; an apertured cup member fitted loosely around said head and engaged with said grommet to limit inward movement of said valve member.

6. A tilt-opening dispensing valve for a pressurized container comprising: a resilient grommet mounted in an opening in said container and having external peripheral flanges adapted to engage with the edge of said container surrounding said opening on both the inside and outside of said container, said grommet having an axial bore therethrough and a valve seat surrounding said bore at the end thereof within said container, said valve seat comprising an annular resilient bead projecting from said grommet, and being substantially narrower, in cross-section, than the inner end of said grommet; a rigid valve member having a stem extending freely through said bore and a head on the inner end adapted to engage against said annular resilient bead, said stem having an axial opening therein extending from the outer end to a position just outwardly of said head and connected laterally to the exterior of said stem by radial ports, said head being normally held against said annular resilient bead by fluid pressure within said container and being readily movable inwardly, away from said annular resilient bead upon lateral displacement of said stem relative to said grommet to thereby open said valve and cause the exit of fluid from said container under fluid pressure; an annular packing flange formed integrally on said grommet and surrounding said stem in said bore, said flange having a deformable lip portion of generally frusto conical shape inclined inwardly towards said head and in sealing engagement with said stem whereby to be moved away from said stem by fluid flowing into said container and held tightly against said stem by fluid tending to flow out of said container; an apertured cup member fitted loosely around said head and engaged with said grommet to limit inward movement of said valve member; and a nozzle adapted to fit over the outer end of said stem and having a thumb surface thereon for use in moving said stem laterally relative to said grommet.

7. A tilt-opening dispensing valve for a pressurized container comprising: a resilient grommet mounted in an opening in said container and having external peripheral flanges adapted to engage with the edge of said container surrounding said opening on both the inside and out-

side of said container, said grommet having an axial bore therethrough and a valve seat surrounding said bore at the inner end thereof within said container, said valve seat comprising an annular resilient bead projecting from said grommet, and being substantially narrower, in cross-section, than the inner end of said grommet; a rigid valve member having a stem extending freely through said bore and a head on the inner end adapted to engage against said annular resilient bead, said stem having an axial opening therein extending from the outer end to a position just outwardly of said head and connected laterally to the exterior of said stem by radial ports, said head being normally held against said annular resilient bead by fluid pressure within said container and being readily movable inwardly, away from said annular resilient bead, upon lateral displacement of said stem relative to said grommet to thereby open said valve and cause the exit of fluid from said container under fluid pressure; an annular packing flange formed integrally on said grommet and surrounding said stem in said bore, said flange having a deformable lip portion of generally frusto conical shape inclined inwardly towards said head and in sealing engagement with said stem whereby to be moved away from said stem by fluid flowing into said container and held tightly against said stem by fluid tending to flow out of said container; an apertured cup member fitted loosely around said head and engaged with said grommet to limit inward movement of said valve member; a spring fitted between said cup member and said head for urging said head against said annular resilient bead valve seat; and a nozzle adapted to fit over the outer end of said stem and having a thumb surface thereon for use in moving said stem laterally relative to said grommet.

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