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VALVE AND DISPENSING APPARATUS FOR PRESSURE CONTAINERS AND THE LIKE

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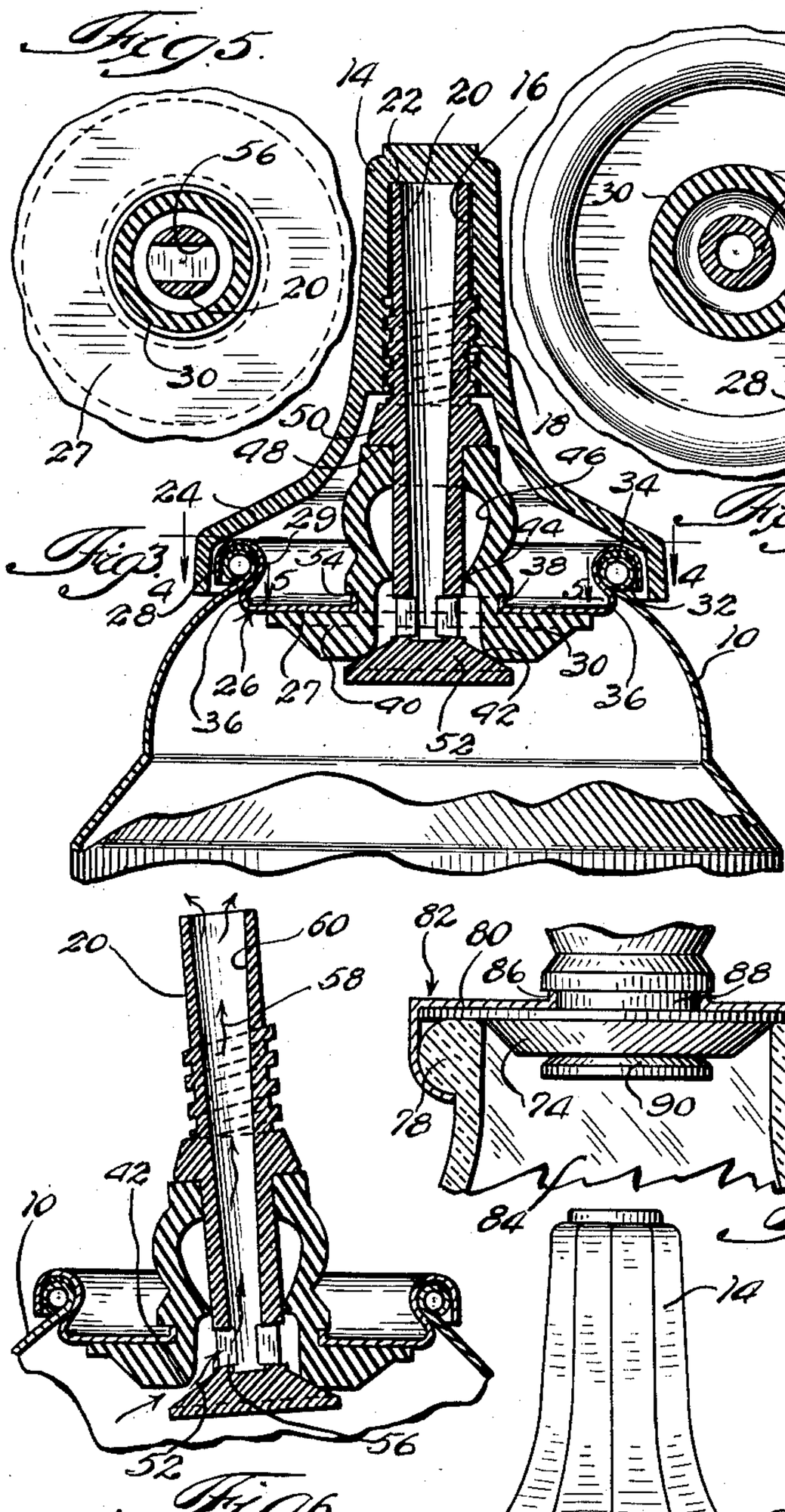

Fig. 3.

Fig. 4.

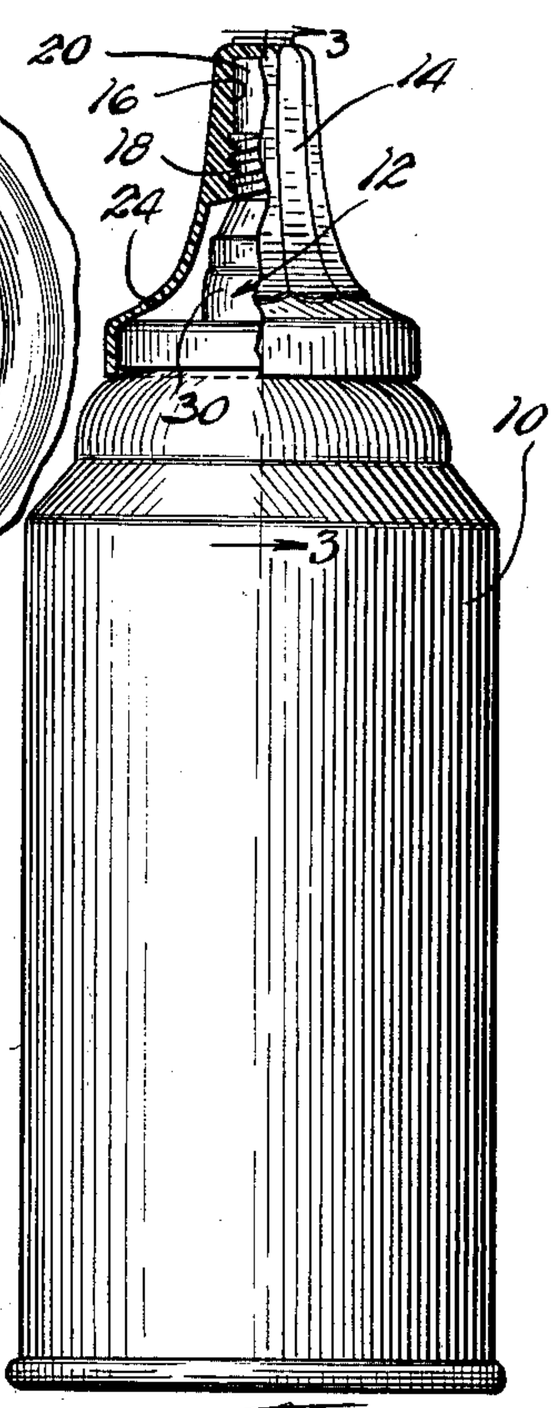

Fig. 1.

Fig. 6.

Fig. 8.

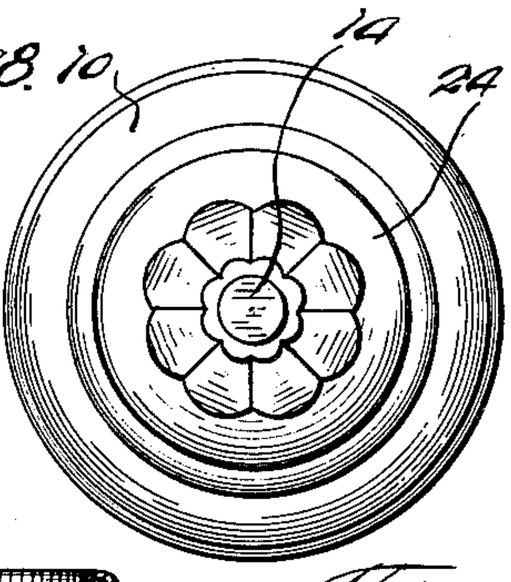

Fig. 2.

Fig. 7.

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VALVE AND DISPENSING APPARATUS FOR PRESSURE CONTAINERS AND THE LIKE

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This invention relates to improved dispensing apparatus and more particularly to an improved valve and dispenser of simplified construction and assembly.

It is a principal object of this invention to provide improved dispensing apparatus for use with any fluent product, either liquid, gaseous, or comminuted solids, said apparatus being characterized by the simplicity of the various elements and the ease with which said elements may be assembled.

There are many prior art teachings which describe devices for dispensing a fluent product. All of these, however, include detrimental characteristics which render the devices unsatisfactory under certain conditions. It is believed that the instant teaching overcomes all of these detriments. Many of the prior art dispensers were subject to accidental discharge, either of the propellant or of the combined product and propellant. Furthermore, certain prior art structures which included means for preventing such accidental discharge produced concomitant effects such as wear or damage to the parts or additional complex parts and assemblies which render the entire structure expensive and unwieldy. When dispensers of the general type herein described are used over a long period of time, as when the product dispensed is shaving cream or the like, it is essential that no metal parts subject to rust or corrosion are externally exposed whereby objectionable corrosive deposits will collect in and around the dispenser.

Furthermore, it is desirable to provide a dispenser which will intimately mix the product and propellant and efficiently dispense the combination without permitting discharge of isolated propellant or leaving a substantial amount of the product in the container which will not dispense in the normal manner.

Dispensers of this type are generally used with a fluid product and a volatile or gaseous propellant confined within an associated container under substantial pressure. However, this disclosure is not limited in its usefulness to any particular product or propellant, and may, for example, use a comminuted product, such as a fine powder and may use gravity as the only dispensing force.

It is therefore a further object of this invention to provide an improved dispensing valve construction which is not subject to accidental discharge or excessive leakage.

It is another object of this invention to provide an improved valve and cover assembly having a plurality of seals arranged seriatim to insure against leakage and accidental discharge.

It is an additional object of this invention to provide a valve mechanism which is normally closed whereby no leakage will occur irrespective of the pressure within the associated container.

It is still another object of this invention to provide a valve assembly having a minimum number of parts of simple construction.

It is another object of this invention to provide an improved dispensing valve producing a predetermined constant pressure gradient along the nozzle thereof.

It is a further object of this invention to provide a dispenser having a nozzle of gradually increasing cross sectional area along the discharge path whereby the product and propellant gradually expand and intimately

mix to increase the efficiency of the propellant as a propelling and aerating agent.

It is another object of this invention to provide an improved liquid product dispenser in which no unfinished metal parts subject to corrosion or deterioration are exposed either in the original manufactured product or as a result of wear or deterioration of the parts.

It is still another object of this invention to provide means for sealing the nozzle of a liquid product dispenser to prevent loss of product or propellant, to prevent accidental operation of the dispenser, and to enclose the entire nozzle area when the dispenser is not in use.

Another object of this invention is the provision of a single deformable element to provide both a valve seat and a resilient diaphragm having a generally spherical nature to insure the sealing of a stem in said valve seat.

It is another object of this invention to provide improved means to facilitate the assembly of the various valve elements and to insure the proper disposition of said elements in an associated container.

Further and additional objects of the invention will become manifest from a consideration of this specification, the accompanying drawing and the appended claims.

In one form of this invention an improved dispenser for a liquid product and gaseous propellant is mounted on a can capable of withstanding substantial pressure. More particularly the dispenser comprises a two piece valve assembly and a cover therefor in which the discharge of the contents of the container is effected by tilting the valve assembly transversely from its normal axis whereby the liquid product is discharged through a frusto-conical central aperture in the valve stem. The valve seat is so constructed that it, in addition to providing a seal for said container, is constructed of a resilient material and functions as a means to urge the associated stem into sealing engagement with said seat and is also adapted to facilitate the rigid assembly of the two piece valve mechanism in the container. The cover portion associated with the valve threadably engages the valve stem and seals the outer end of the frusto-conical aperture therein, whereby leakage of the container contents is prevented.

For a more complete understanding of this invention reference will now be made to the accompanying drawings wherein:

FIG. 1 illustrates one embodiment of this invention in elevation with a portion of the cover therefor shown in section;

FIG. 2 is a top plan view of the embodiment of FIG. 1;

FIG. 3 is a transverse sectional view taken through the upper portion of the embodiment of FIG. 1 along the line 3—3 thereof;

FIG. 4 is a cross sectional view of the embodiment of FIG. 1 taken along the line 4—4 of FIG. 3;

FIG. 5 is a cross sectional view of the embodiment of FIG. 1 taken along the line 5—5 of FIG. 3;

FIG. 6 is a transverse sectional view of the embodiment of FIG. 1 showing the valve stem angularly shifted to effect discharge of the contents of an associated container;

FIG. 7 partially illustrates the described embodiment applied to an alternate can construction; and

FIG. 8 illustrates the described embodiment applied to glass container.

Referring now to the drawings and more particularly to FIGS. 1 and 2, a can **10** is provided having a central apperture therein which receives a cap **26** having a valve and nozzle assembly **12** mounted therein to which a cover **14** is threadably secured. The can **10** may be any one of a plurality of available types provided only that it be capable of withstanding pressures of several atmospheres

and be adapted to receive a valve mechanism constructed in accordance with this discloseure. The cover 14 will generally enclose the entire valve and nozzle mechanism 12 whereby the nozzle area is maintained clean and sanitary, and accidental tilting of the nozzle which would cause accidental discharge, is prevented.

As shown in FIGS. 1 and 3 the valve assembly 12 includes two basic parts, the stem and nozzle 20 and the seat 30. The cover 14 has a central cavity 16 therein which has a threaded portion 18 adapted to receive a correspondingly threaded portion of the nozzle 20. The cap and nozzle are so designed that the uppermost portion 22 of the nozzle engages the inner surface of the top of cover 14 in sealing engagement whereby the product and propellant will not be inadvertently discharged. In the event that a notched or slotted nozzle is used to provide decorative shapes in the expelled product, the uppermost portion of the nozzle may engage the cap whereby a seal is provided in the threaded portions of the stem and cover or in the alternative a snap-on cap may be employed similar to the cap shown in my Patent No. 2,562,111, issued July 24, 1951. The cover 14 has a flared portion 24 depending therefrom, said flared portion being adapted to enclose the entire valve and nozzle assembly. The cover may be fluted, ribbed, or otherwise shaped in any convenient manner to provide surfaces which are readily engageable by a user for removal of the cover.

As shown in FIG. 3 the flared portion does not engage the can 10 or the metal cap 26 which provides a closure for said can but is in close proximity to the lip 28 formed at the edge of said cap whereby accidental tilting of the valve mechanism will be prevented. It is not essential that clearance be provided between the flared portion 24 and the lip 28 but these members may be in static contact. It is, however, considered undersirable that the flared portion 24 engage the lip 28 with any substantial force, as this produces two undersirable effects. Such engagement will not only reduce the force of the seal between the nozzle 20 and the cover 14 but will also damage the metal portions of the can and the cap whereby the finish is removed therefrom, rendering the entire device subject to corrosion and deterioration. The valve stem 20 and the cover 14 are in this embodiment formed of an inflexible moldable plastic material while the valve seat 30 is composed of a flexible material either rubber or a synthetic plastic, and the can 10 and cap 26 are of metal, usually black iron.

The central opening at the top of can 10 is of substantial diameter with a bead 32 of generally round cross section surrounding said opening. The cap 26 has a configuration as shown in FIG. 3, including a central web 27 and a generally U-shaped annular flange 28 formed thereabout. The flange 28 rests on the bead 32 formed in can 10. A small deposit of plastic sealing material 34 is contained within the flange 28 and seals said flange to the bead 32 when the cap is crimped in a predetermined manner. The cap 26 is originally manufactured having a vertical side wall 29 forming a part of the U-shaped flange 28. The wall 29 is generally straight whereby the side wall is receivable inside of the bead 32. By applying a radial force to the vertical wall 34 with an appropriate forming tool, the wall is forced outwardly at point 36 whereby the cap 26 is forced into sealing engagement with bead 32. The web 27 of cap 26 has a central aperture therein about which a vertical flange 38 is formed. The flange 38 is adapted to engage the deformable valve seat 30 in a manner which will be explained.

The valve seat 30 has a cross sectional configuration as shown clearly in FIGS. 3 and 6. The seat 30 has a base portion 40 which engages the inner surface of web 27 and a generally tubular portion extending upwardly therefrom. The base portion 40 is of substantial diameter and has a flat surface of substantial area in contact

with the inner surface of web 27. Thus, the pressure within can 10 increases the tenacity of the seal between these surfaces. The seat has a central aperture to reseive the stem 20. The base portion 40 has a central curved surface 42 defining an annular seat at the terminus of the central aperture which is adapted to sealingly engage the frusto-conical plug 52. Tilting of stem 20 produces controlled flow of the contents of the can through the nozzle. A recess 54 is formed about the outer periphery of seat 30 which is adapted to receive the flange 38 of cap 26. The flange 38 is forced into the recess 54 to provide a second seal in addition to the seal formed between seat portion 40 and web 27. This double seal produces several advantages over the prior known devices. The nozzle may be vertically depressed for pressure filling without effecting the seal between seat 30 and cap 26. Furthermore, if the nozzle is shifted to a substantial angle, the seat portion 40 may tend to separate from the web 27. In the devices heretofore known this results in leakage of the product around the edge of cap 26, while with with the flange 38 engaged in the recess 54, an intimate seal is maintained irrespective of the degree of tilting.

Formed on the inner axial bore of seat 30 is a tapered annular shoulder 44 which cooperates with the stem 20 to prevent undesired leakage of the product and propellant and also serves as an aid in the assembly of the valve mechanism. The inner diameter of the shoulder 44 is slightly smaller than the outside diameter of stem 20 whereby passage of the product upwardly from this point is prevented. Immediately above the shoulder 44 the seat 30 has an increased diameter with a central cavity 46 formed therein. The shoulder 44 is an important feature of the invention as it provides a seal to prevent the flow of product into the cavity 46 and also prevents leakage of the product to the outside between the shoulder 50 and the seat 30. If product accumulated in the cavity 46, the resiliency of the seat 30 would be impaired and thus the valve might fail to function properly. Immediately above the cavity 46 the valve seat 30 terminates in a substantially flat annular surface 48. The shoulder 50 is formed on the valve stem and nozzle 20 and is adapted to engage the upper surface 48 of seat 30. The length of the stem disposed between the shoulder 50 and the plug 52 is selected in such a manner that upon insertion of the stem and nozzle 20 through the axial bore in seat 30 the seat will be partially compressed effecting a radial expansion of the cavity 46 whereby the upper surface 48 of seat 30 will apply a vertical axial force to the shoulder 50 effecting a tight seal between the frusto-conical surface of plug 52 and the curved annular surface 42 of seat 30. The use of a valve seat having a curved annular surface at the point of engagement with the plug 52 insures an improved seal under all pressure conditions irrespective of slight irregularities or deformations in the various parts.

In assembling this valve the seat 30 is first forced upwardly through the central aperture in cap 26 whereby the vertical flange 38 formed in the central aperture of cap 26 will engage the corresponding recess 54 in the seat 30. However, as a result of the inherent resiliency of the material and the intimacy of the relationship of the various parts, the flange 38 may not readily position itself as desired in the recess 54 of seat 30. The next step in the assembly of the valve comprises insertion of the stem and nozzle 20 upwardly through the annular aperture in seat 30, and in the process of insertion of the stem the shoulder 50 engages the resilient tapered shoulder 44 formed on the inner surface of seat 30 forcing shoulder 44 outwardly and insuring the desired registry between the flange 38 and the recess 54 in seat 30. The stem 20 is forced further into the seat 30 until the upper surface 48 of seat 30 snaps over shoulder 50 to produce a complete valve unit.

A transverse aperture 56 is formed through the stem

20 immediately adjacent to the plug 52. Communication is thereby provided for the passage of the liquid product contained within can 10 to the frusto-conical nozzle portion of stem 20. The manner in which the product and the propellant are discharged from the can is most clearly shown in FIG. 6. While the valve is here illustrated in the vertical position in conformance with the other views of the drawing, it will be clear that in use this dispenser may be operated either in the position shown, or may be inverted. If the propellant is primarily gaseous or volatile, as might be the case in using this device for certain fire extinguishing or insect repelling product the valve will generally be operated in the position shown. However, where a liquid product is being dispensed best results are generally obtained by inverting the dispenser whereby the product is urged downwardly by the combined effects of gravity and a propelling agent within the can. If gravity is the sole propelling force, it will be essential that the can is inverted to effect downward discharge. The valve stem 20 is tilted to an angular position with respect to the can 10, as shown, to provide a path for the product and the propellant. When so positioned, the product will follow the path indicated by arrows 58 from within the can 10 through a restricted path between the curved seat portion 42 and the frusto-conical surface of plug 52 through the transverse aperture 56 and into the expanding aperture 60 in the nozzle portion of stem 20. In following this gradually expanding path, the product and propellant uniformly expand and are discharged as a homogeneous aerated mass into space.

The valve mechanism above described is illustrated in FIG. 7 as applied to an alternate can construction 62 having cylindrical side walls 64 and a unit end cover 66. The end cover 66 is beaded and rolled in such a manner that a pressure-tight seal 68 is formed between the side walls 64 and the end cover 66. A central aperture 70 is formed in the end plate 66 and has a vertical flange 72 formed thereabout to receive the deformable valve seat 30 already described. In other respects, the valve employed herein is identical to the valve already described and the same cover 14 may be used in association with the valve but the flared portion 24 thereof will not engage the can bead but will be disposed either in static engagement with or a very small distance above the end plate 66. Thus tilting of the valve stem is prevented when the cover is secured thereto and the valve stem is substantially enclosed to insure sanitary storage when not in use.

The valve mechanism is illustrated in use on a bottle in the embodiment of FIG. 8. Therein a valve seat 74 is provided having an enlarged peripheral flange 76 which is disposed between the lip 78 of the bottle 84 and the web portion 80 of an associated cap 82. The cap 82 may be formed in a manner similiar to the conventional crown cap provided only that a central aperture is formed therein, said aperture being surrounded by the upwardly extending flange 86. The flange 86 is received in an aperture 88 in the seat 74 in a manner identical with that described above. A valve stem and nozzle 90 identical with that shown in FIG. 3, only the plug portion of which is visible in FIG. 8, is inserted in a central aperture in seat 74 and is tiltable to controllably discharge the product along a path as already described. This valve assembly, when applied to a bottle, is an extremely simple assembly. The flange 76 of seat 74 serves as a sealing gasket between the bottle lip 78 and the metal cap 82. There is no displacement of the seat 74 from the metal cap 82 when the nozzle is tilted as said seat is rigidly clamped in place.

A cover may be provided for this embodiment, if desired, said cover being preferably constructed similar to the cover shown in FIG. 3.

From the above description it will be clear that a valve mechanism is herein provided which is simpler in construction and more positive in use than any valves heretofore proposed for the discharge of a liquid product and volatile propellant.

Without further elaboration, the foregoing will so fully explain the character of my invention that others may, by applying current knowledge, readily adapt the same for use under varying conditions of service, while retaining certain features which may properly be said to constitute the essential items of novelty involved, which items are intended to be defined and secured to me by the following claims.

I claim:

1. A dispensing valve for gas-pressure containers, comprising a manually operable tubular dispensing spout having at its outer end a dispensing opening, having at its inner end a valve head, and having a smoothly cylindrical wall portion intermediate the dispensing opening and head, in combination with a resilient tubular sealing member adapted to mount the dispensing spout within a wall of such container and having a bore of sufficient diameter to encompass and accommodate the cylindrical wall portion, the bore having a protruding integral constricting girdle bearing graspingly around the stem cylindrical wall portion for part of its depth, and adapted to maintain surface contact around some part of the cylindrical wall portion regardless of degree of operation of the spout.

2. A dispensing valve for gas-pressure containers, comprising the combination defined in claim 1, the sealing member having an annularly enlarged integral body portion at the level of the constricting girdle, the grasping force of the girdle being increased by the elasticity of the enlarged body portion.

3. A dispensing valve for gas-pressure containers, comprising a tiltable tubular dispensing spout having at its outer end a dispensing opening, having at its inner end a valve head, and having a smoothly cylindrical wall portion intermediate the dispensing opening and head, in combination with a resilient tubular sealing member adapted to mount the dispensing spout within a wall of such container and having a bore of sufficient diameter to encompass and accommodate the cylindrical wall portion, the bore having a protruding integral constricting girdle bearing graspingly around the stem cylindrical wall portion for part of its depth, and adapted to maintain surface contact around some part of the cylindrical wall portion regardless of degree of tilt of the spout.

4. A dispensing valve for gas-pressure containers, comprising the combination defined in claim 3, the sealing member having an annularly enlarged integral body portion at the level of the constricting girdle, the grasping force of the girdle being increased by the elasticity of the enlarged body portion.

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