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SELF-CLOSING VALVE CONSTRUCTION  
FOR A PRESSURIZED CONTAINER  
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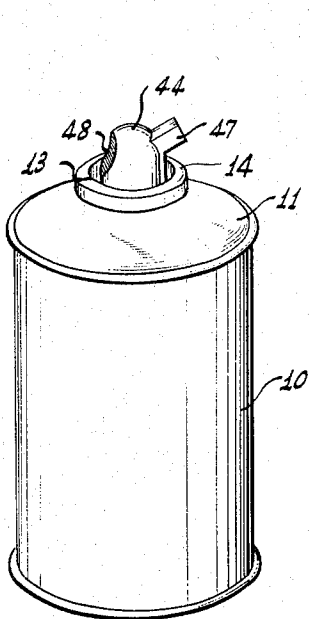


*Fig. 1*

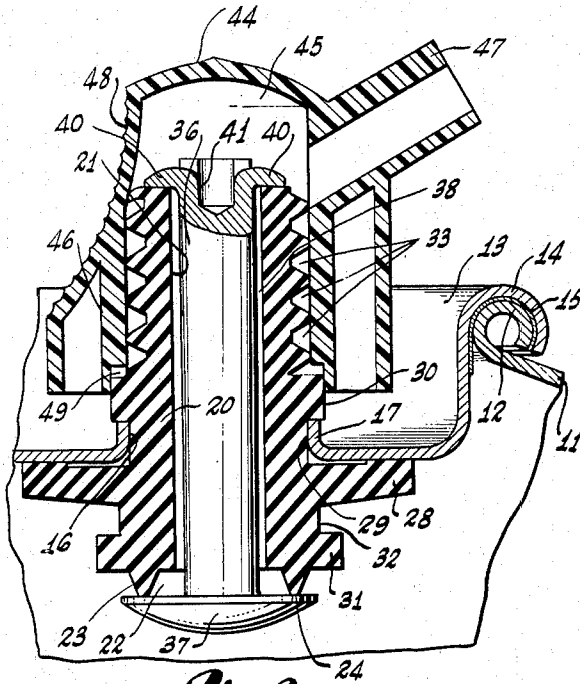


*Fig. 2*

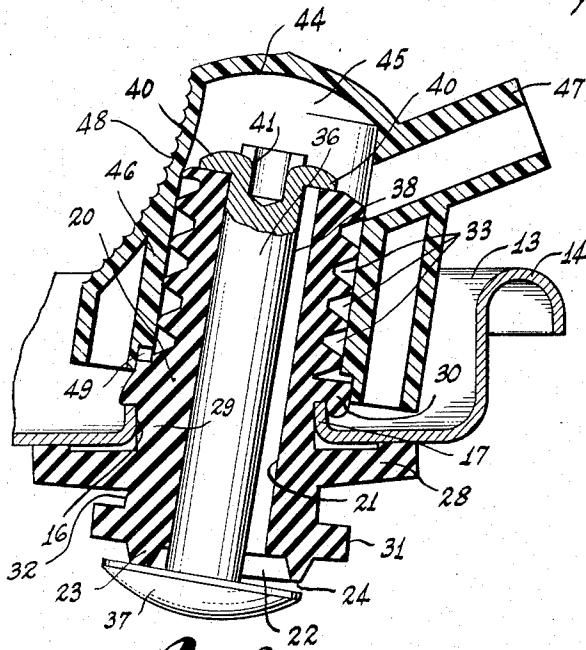


*Fig. 3*

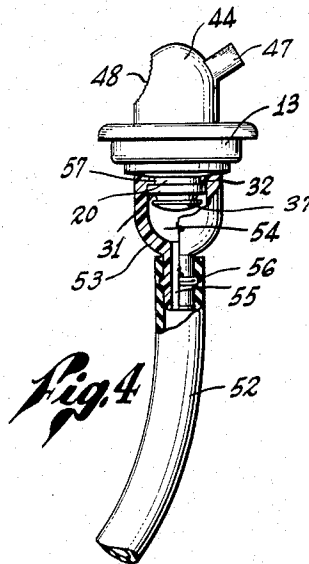


*Fig. 4*

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## SELF-CLOSING VALVE CONSTRUCTION FOR A PRESSURIZED CONTAINER

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3 Claims. (Cl. 222—394)

This invention relates generally to valves and more particularly to a valve having a simplified self-closing construction.

An illustrative embodiment of the invention is shown herein installed as a dispensing valve for a pressurized container. It will be apparent, however, that the invention may have many other applications and it is not intended to limit its scope by the following description.

In small pressurized containers or cans, a quantity of the flowable product is stored together with a volume of gas under pressure. Upon opening a dispensing or valve structure, the gas drives the flowable product out of the container for use. Such containers are, of course, well known and are suitable for dispensing a variety of products. Different types of valves have been used on the containers and while operable, have many disadvantages from the standpoint of manufacture, filling of the container, and use by the consumer.

Heretofore, in order to provide a valve which is easily operated, the valve has generally been of a floating type held in a closed position by the gas pressure within the container. Upon pressing or tilting the valve stem it is opened from its seat, and upon release is moved to a closed position by the gas pressure. As can be understood, such an action does not provide positive closing under all conditions and leakage of the pressurizing gas occurs.

More important, the use of a valve closed by gas pressure introduces considerable difficulty in the filling of the container. It is necessary that the container be filled with accurate amounts of the product to be dispensed and the pressurizing gas, and this involves elaborate equipment capable of controlling the volume and pressure of the dispensing gas and preventing its leakage.

While the pressurizing gas may be a fluid of different compositions, most of them are of such a type as to change to a liquid state at a low temperature. When in the liquid state, the quantity of pressurizing fluid may be accurately measured and poured or injected into the container along with the product to be dispensed. This may be easily done by conventional filling equipment and without excessive waste or leakage. Such an operation is known in the industry as a cold filling operation, and it will be appreciated that when this is done there is no pressure in the container until the temperature of the dispensing fluid has been elevated to the point wherein there is a change from the liquid to the gaseous state. Consequently, a dispensing valve of the prior type described is held open until the gas pressure in the container is built up, and during this time there is a considerable leakage of gas under low pressure as well as possible contamination of the product.

With the foregoing in mind, it is therefore a major object of this invention to provide a self-closing valve which can be advantageously used on pressurized containers.

An equally important object of the invention is to provide a self-closing valve which does not require any spring means and comprises only a valve body and stem.

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A further object of the invention is to provide a valve of the character described including a resilient body member having a wall portion of relatively high longitudinal compressibility and flange means adapted for sealing engagement with a container wall.

It is also an object of the invention to provide a valve having a valve stem and head movable relative to the body member and held resiliently in seating engagement with the body by cooperating surfaces formed at the end of the stem opposite to the head and the body.

These and other objects and advantages of the invention will become apparent from the following detailed description of a preferred 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 container 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 side elevation partially in section showing the attachment of the valve structure to a dispensing tube for a container adapted to operate in an upright position.

Referring now to the drawings and particularly to Figure 1 thereof, the numeral 10 designates a metal container or can defining an enclosed space which is pressure tight and is adapted to hold a quantity of the product to be dispensed together with a volume of gas under pressure. In a typical container construction, the container 10 has a top portion 11 having a rolled edge 12 as 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 is tightly sealed therewith by a gasket 15. In the center of cap 13 is an opening 16 which is peripherally defined by a short upturned edge 17 formed integrally with the wall of the cap. A preferred embodiment of the invention is mounted within opening 16 to control the flow of material from the container, it being understood that this is merely an illustrative application of the invention.

As seen in detail, a valve body 20 formed of resilient rubber-like material is of elongated generally cylindrical shape and extends through opening 16 from the inside to the outside of container 10. Extended axially through body 20 is a bore 21 which opens at the bottom into an enlarged chamber 22 defined by an annular projecting bead 23 formed integrally with the bottom portion of the body. The edge surface of annular bead 23 forms a downwardly facing valve seat 24, which is within and extends axially toward the inside of the enclosed space.

Body 20 as shown is, in effect, a grommet having flange means for making direct sealing engagement with the wall of cap 13 surrounding opening 16. For this purpose, a large flange 28 projects from the circumference of body 20 and is adapted to engage against the inner or lower surface of the wall of cap 13. Above flange 28 body 20 has a short cylindrical wall portion 29 of the same diameter as opening 16 and length as lip 17, and this wall portion joins an upper flange 30 adapted to override the edge of lip 17 and seat tightly thereon. For a purpose as will hereinafter be described, it may also be desirable to form body 20 with a projecting flange or collar 31 at the extreme lower end thereof so that there is a groove 32 defined between collar 31 and the flange 28.

The portion of body 20 above flange 30 is of reduced external diameter and formed with a plurality of spaced circumferential grooves 33, defining circumferential ribs, which further reduces the wall thickness of the body to define a bellows-like wall which has relatively high axial

compressibility and is yet resilient and capable of returning to its original shape after deformation.

Extending through body bore 21 is a valve stem 36 which is formed integrally with an enlarged head 37 on its lower end. Stem 36 is formed of rigid material, and head 37 is of such a size as to engage against the lower cover valve seat 24. The diameter of stem 36 is considerably less than that of bore 21 so that an annular passageway 38 is defined therebetween. It can also be understood, that stem 36 is slidable longitudinally relative to body 20 and is free for limited lateral movement.

On the upper or outer end of stem 36 are projecting means in the form of a pair of opposed ears 40 which project radially and are adapted to engage against the upper end surface of body 20. The ears 40 may be easily formed by providing a socket 41 in the end of stem 36 and stamping or pressing outwardly a portion of the wall of the stem surrounding the socket. It should be noted that while ears 40 override the end of body 20 they do not extend fully around stem 36 and thus do not at any time close the upper end of passageway 38. As may be seen from the drawing and the preceding description, the generally radial laterally projecting ear members are so shaped as to provide a permanent opening from the bore to the exterior of the container to maintain the adjacent end of the bore open at all times, the ear members are integral with said stem, and the upper or outer end surface of the resilient body is adapted to engage the ears. It may also be noted that the radial dimension of said ear members is greater than the radius of the bore at the outer end.

As will be remembered, it is an important object of the invention to provide a valve which is self-closing and does not depend for a closing action upon the gas pressure within container 10. This is accomplished in the following manner. The normal uncompressed length of body 20 between its upper end surface and the lower seat 24 is made more than the length of stem 36 between head 37 and the projecting ears 40. That is, in order to assemble the valve in the position shown in Figure 2, it is necessary to axially compress body 20 to fit between head 37 and ears 40. As this is done, the head 37 is forced firmly and resiliently upwardly against valve seat 24. In actual construction, stem 36 is fitted into bore 21 and the ears 40 pressed out over the upper end of body 20 in the manner previously described. Body 20 is then forced upwardly through opening 16 until flanges 28 and 30 seat in place.

It should also be noted, that the axial compression of body 20 not only forces valve head 37 into engagement with seat 24 but also tends to force flanges 28 and 30 into tighter sealing engagement with the main wall surface of cap 13 and the lip 17. In this way any leakage of the pressurizing gas from the container is positively prevented.

Fitted over the outer end of body 20 is a dispensing nozzle 44 which is typically of molded plastic and may be designed for decorative as well as functional purposes. The interior of nozzle 44 has a chamber 45 open at the bottom and defined by a cylindrical wall 46 of a size to fit tightly around the upper portion of body 20, and whereby said nozzle is fitted tightly over the ribs defined by circumferential grooves 33. Leading outwardly from chamber 45 at one side is a spout 47 and opposite thereto is a recessed thumb plate 48 having a non-slip surface adapted for engagement with the thumb. At the bottom end, chamber wall 46 may have an enlarged seat 49 adapted to fit over flange 30 for additional sealing engagement.

With the valve structure as described, it can be seen that valve head 37 is normally held upwardly against seat 24 in the position shown in Figure 2 so that the container is fully closed and both the flowable product and the pressurizing gas are prevented from escaping. The seating action of valve head 37 is not dependent upon the

pressure of the gas within the container and thus is unaffected by storage under very low temperatures. It can further be seen that the self-closing construction of the valve permits the use of a cold filling operation in filling the container and makes the filling more accurate and convenient as was previously discussed.

In using the container, the nozzle 44 is pressed downwardly or tilted to the side as seen in Figure 3. Because of its resilient character, the body 20 is deformed and a portion of valve head 24 is moved off of seat 24. This allows the gas within the container to drive the flowable product out through passageway 38 into chamber 45 and thence through spout 47. Once the gas has moved above head 37 its pressure aids in holding the head away from seat 24 and the latter may move even further from its seat. Upon release of thumb pressure on nozzle 44, the valve returns to the position shown in Figure 2 with head 37 held tightly against seat 24. Because of its bellows-like construction, the upper wall portion of body 20 facilitates the axial compression of body 20 and allows a more complete opening of the valve with very light thumb pressure.

From the foregoing it can be seen that I have provided a self-closing valve which is comprised of only two parts, a valve body and a relatively movable valve stem, and does not require any separate spring means. This container is very economical and highly desirable for a throw-away container of the type illustrated.

In Figure 4 I have shown the manner in which the valve structure may be connected to a dispensing tube mounted to extend into the bottom of the container. As can be appreciated, it is necessary to drive the flowable product ahead of the pressuring gas in order to exhaust the contents of the container before the pressuring gas has escaped. Since the flowable product is generally heavier than the gas, it tends to collect in the bottom of the container. Thus the container has to be inverted if the product contents are to be driven out ahead of the gas in a simple type of container. Sometimes, it is quite desirable if the container can be handled in an upright position and a dispensing tube is therefore connected to the valve structure so that only the contents from the bottom of the container may pass out through the valve.

Figure 4 illustrates how the preferred embodiment of valve just described may be conveniently coupled to a dispensing tube. The tube 52 is connected to a coupling bulb 53 having an inner and upwardly open chamber 54. Both the tube 52 and bulb 53 may be formed of a suitable plastic material and connected together by a collar 55 and groove 56. Bulb 53 is of an internal diameter such as to just fit around the previously mentioned collar 31 formed on the lower end of body 20. At the top of bulb 53 is an inwardly projecting flange 57 which is adapted to fit into the groove 32 defined between collar 31 and flange 28, and in assembly, flange 57 is forced into position to thus lock the dispensing tube firmly in place.

While I have thus described in considerable detail a preferred embodiment of the invention, it can be understood that modification can be made without departing from the scope of the invention. Therefore, I do not wish to be restricted to the foregoing except as defined in the appended claims.

I claim:

1. In a dispensing valve for a pressurized container, the improvement which comprises: a generally cylindrical resilient unitary body member of longitudinal compressibility comprising a grommet portion having an annular groove defined by annular flanges on said resilient body, said flanges retaining said body member mounted in, and said groove in engagement with, an opening in said container, said body member having an elongated portion located outside the container and a portion located inside the container, said elongated portion comprising spaced circumferential grooves therein defining spaced circumferential ribs, thereby defining a bellows-like portion, said

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body member having a bore therethrough and a valve seat comprising an annular bead projecting axially toward the inside of said container; a rigid valve member having a stem extending slidably through said bore and free for limited lateral movement in relation to said resilient body member to define a passageway between said stem and said bore, said valve member having a head adapted to engage said valve seat, said valve member having at least one generally radial laterally projecting ear member, said ear member being so shaped as to provide a permanent opening from the bore to the exterior of the container, said ear being integral with said stem, in engagement with the upper end surface of the resilient body, and having a radial dimension greater than the radius of said bore at the outer end thereof, the normal uncompressed length of said resilient body member between said seat and said ear member being greater than the length of said valve member between said head and said ear member; whereby

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said head is normally held resiliently against said seat and is movable away from said seat upon tilting of said grommet portion of the resilient body and expansive longitudinal force of said compressed body member is exerted only on said valve head and ear member providing a self-closing valve structure.

2. The structure of claim 1 in which a pair of substantially identical radially opposed ear members is provided.

3. The structure of claim 1 in which a dispensing nozzle is fitted tightly over said circumferential ribs.

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