United States Patent

[11] 3,613,728

[72] Inventor **Wolf Steiman**
Fairfield, Conn.

[21] Appl. No. **861,697**
[22] Filed **Sept. 29, 1969**
[45] Patented **Oct. 19, 1971**

[73] Assignee **Valve Corporation of America**
Bridgeport, Conn.

[54] **DIAPHRAGM-ACTUATED AEROSOL VALVE**
13 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **137/614.19,** 222/402.24, 251/353
[51] **Int. Cl.** **B65d 83/14,** B65d 39/00, F16k 21/04
[50] **Field of Search** 137/614.19; 251/353; 222/402.24

[56] **References Cited**

UNITED STATES PATENTS

3,144,179	8/1964	Gildone	251/353
2,686,652	8/1954	Carlson	251/353
2,892,576	6/1959	Ward	251/353
3,201,081	8/1965	Lyon	251/353
3,313,459	4/1967	Mizuguchi	251/353
3,519,172	7/1970	Bruce	222/402.24

FOREIGN PATENTS

1,255,997	2/1960	France	251/353

Primary Examiner—Laverne D. Geiger
Assistant Examiner—William H. Wright
Attorney—H. Gibner Lehmann

ABSTRACT: An aerosol valve construction comprising a tubular valve housing in which there is axially movable a valve stem cooperable with a seat in the housing. The valve stem is connected, in one embodiment of the invention, to an actuator button which is carried by an exterior resilient diaphragm having an outwardly crowned shape. Pressing the depress button flattens the diaphragm and depresses the valve stem, effecting an opening of the valve whereby product is discharged through an orifice in the button. The diaphragm tends to restore itself to the full crown shape due to its elasticity and also due to the pressure of product on its underside. When depressing force is removed from the button, the return of the diaphragm raises the valve stem and shuts off the valve. In other embodiments of the invention the resilient diaphragm which carries the depress button has a tubular portion acting as the valve housing and which is provided with a valve seat. The valve stem which extends into the valve housing and which is cooperable with the valve seat, is stationarily mounted. When the depress button is forced downward, flattening the diaphragm, it shifts downward the valve housing (portion of the diaphragm) while the valve stem remains stationary. This results in an opening of the valve. The valve closes when downward force is removed from the button, enabling the diaphragm to raise and restore itself to the original crowned shape or configuration. By use of the resilient crowned diaphragm to restore the valve to the closed position there is not needed the usual helical valve return spring which has been heretofore almost universally used.

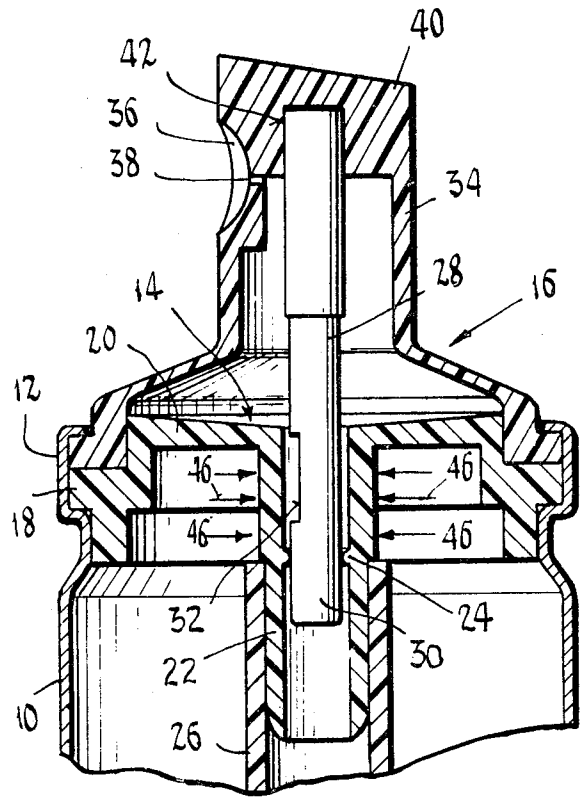


Fig. 1

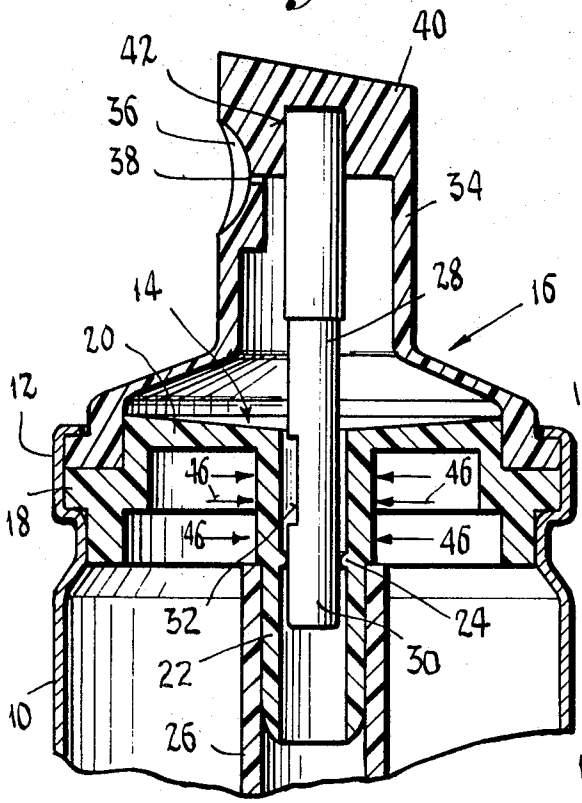


Fig. 2

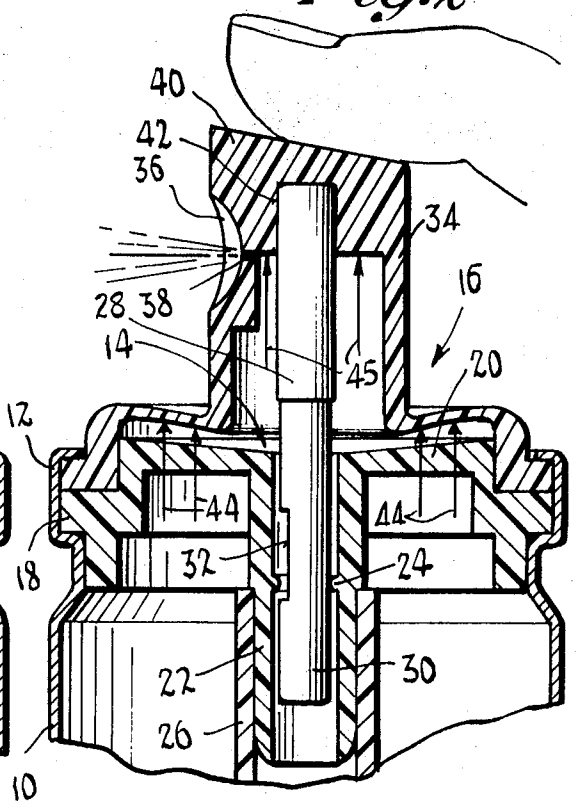


Fig. 4

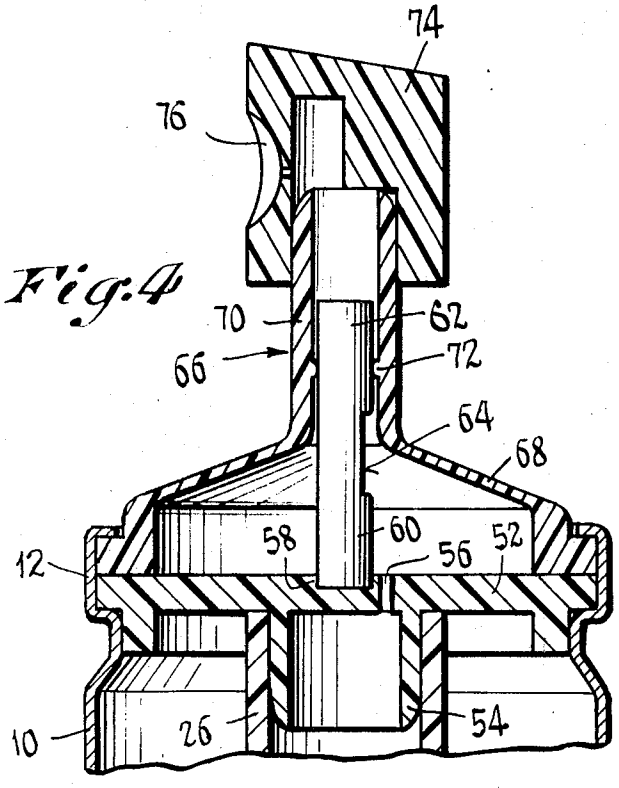
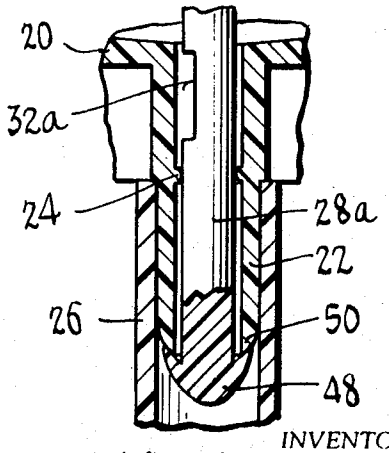


Fig. 3



INVENTOR
Wolf Steiman
BY
AGENT

Fig. 5

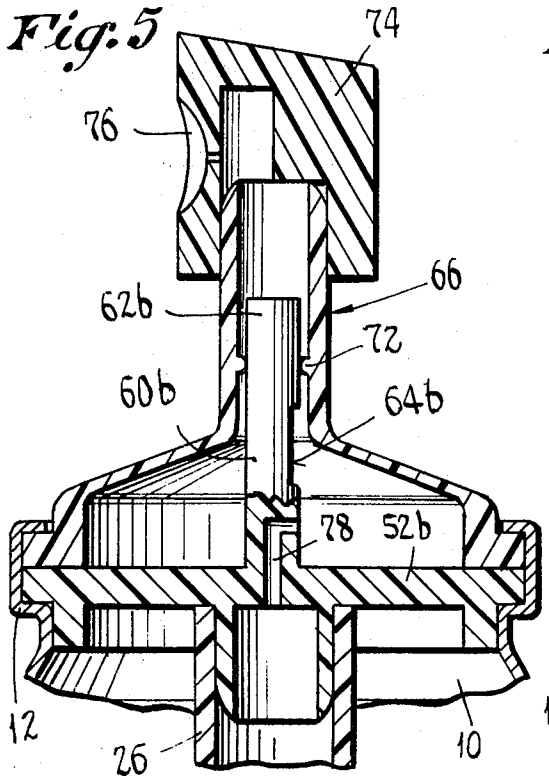


Fig. 6

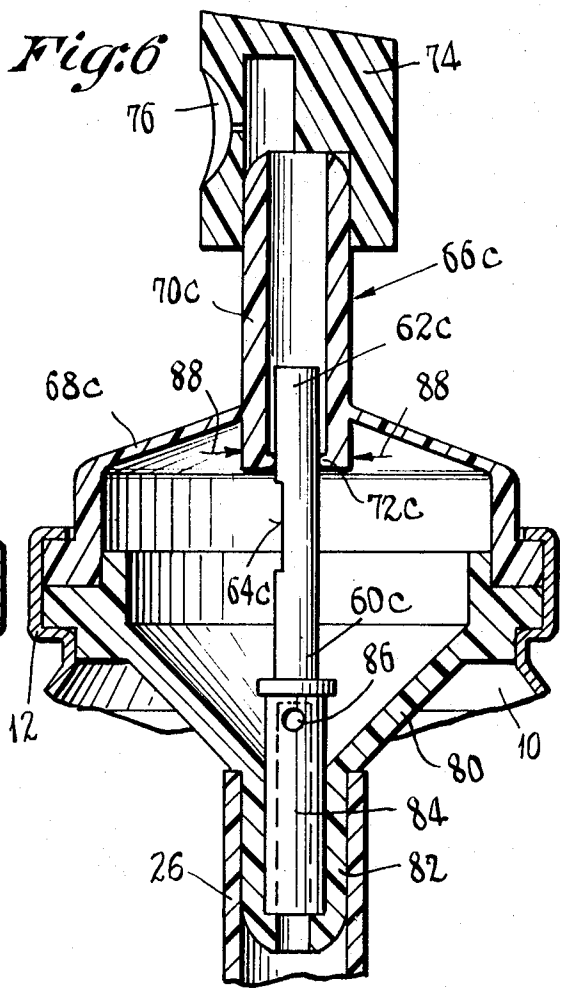
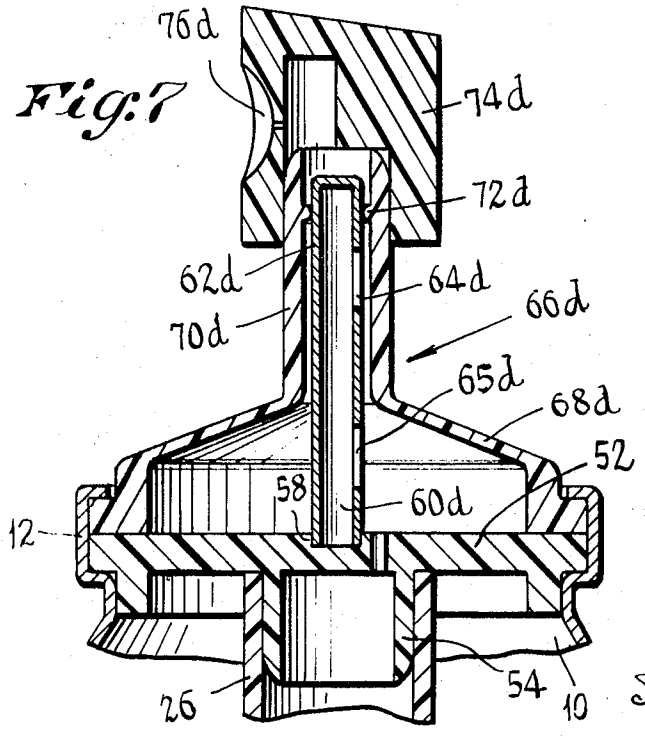


Fig. 7



INVENTOR.
Wolf Steiman
BY
H. Gibner Steiman
AGENT

Fig:8

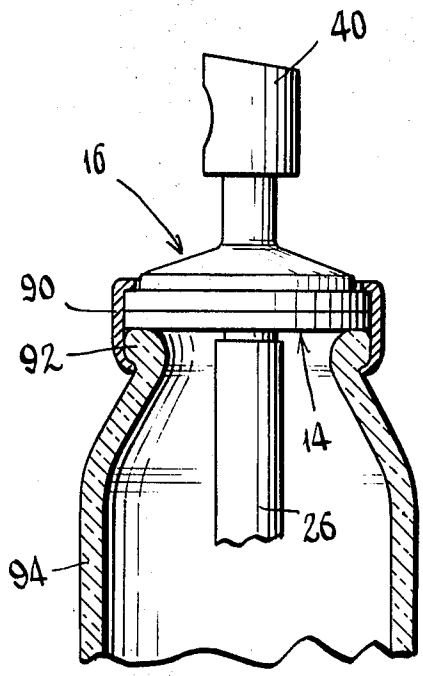


Fig:9

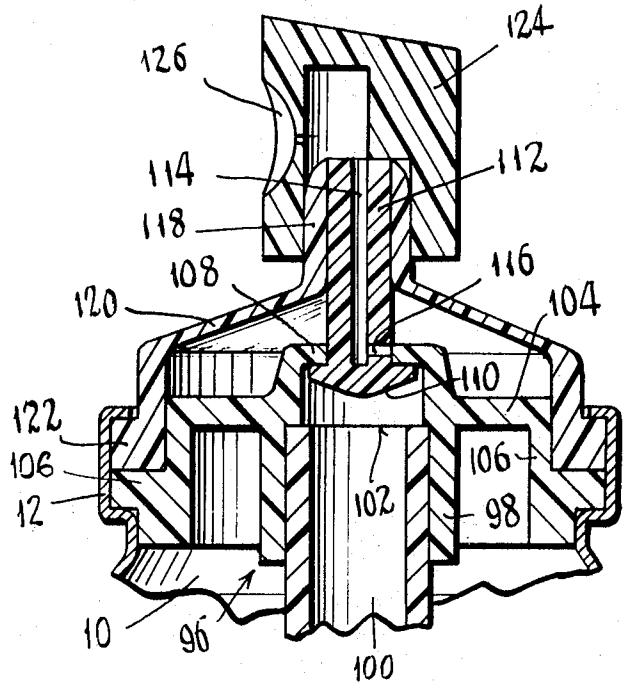
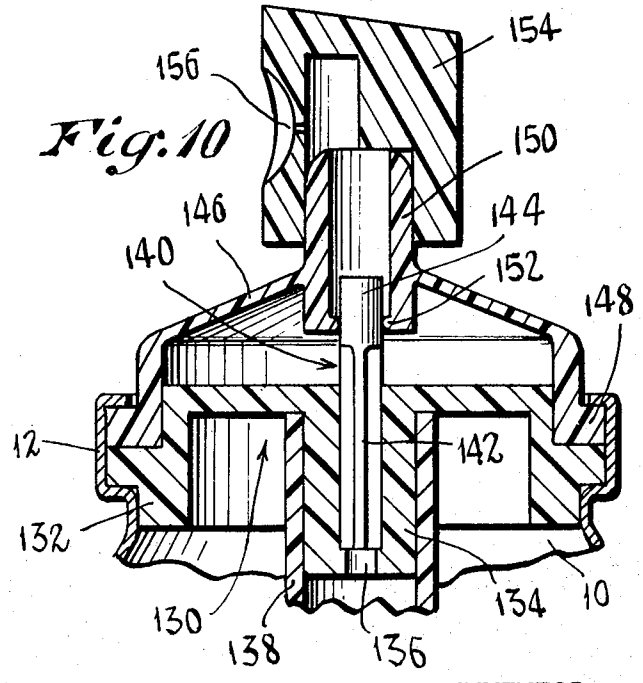


Fig:10



INVENTOR.
Wolf Steiman
BY
H. Gibbs Ehmann
AGENT

DIAPHRAGM-ACTUATED AEROSOL VALVE

CROSS-REFERENCES TO RELATED APPLICATIONS

1. Copending application of Wolf Steiman, Ser. No. 843,906 filed June 30, 1969, entitled "Tilt-slide Action Aerosol Valve," and having common ownership with the present application.

BACKGROUND

This invention relates to aerosol valves such as are employed in small hand-held dispensers and the like, and more particularly to valves of the springless type wherein the return or closing movement of the valve member is effected by the resilience of molded plastic parts which are so constituted that they serve other functions in addition to that of a spring, as for example where they serve as a valve housing, or as a discharge passage for the aerosol product and the like.

Heretofore various aerosol valves have been proposed and produced wherein a movable valve stem is rockable or tiltable, and is returned to the normal, valve-closing position by engagement with a resilient portion of the valve housing in which the stem is mounted. Other valve constructions have utilized resilient portions of a valve housing or valve-supporting member to effect the return or closing movement of the valve parts. While, under some special circumstances these prior aerosol valves have operated satisfactorily, they could not be considered as entirely reliable under all general conditions of use, nor wholly leakproof during their shelf life, or during packing, storage and transportation. In some part, the deficiencies of these prior valves were due to the molded resilient pieces losing their elasticity or taking a permanent set whereby the return spring action became defective. Also, some prior valves were not especially rugged and could be permanently deformed or rendered inoperative if excessive forces were utilized during their operation, or if the user did not properly follow the intended movements to secure the opening of the valve.

SUMMARY

The above drawbacks and disadvantages of prior noncoil spring aerosol valves are obviated by the present invention, one object being the provision of an improved valve for pressurized containers, wherein adequate reliability of functioning is had as regards proof against leakage, and proper functioning of the valve is had for many, varied conditions of use and over an extended period of time. This is accomplished by the provision of novel valve parts some of which are resilient and acted on by the pressurized product of the container in such a manner as to improve the seal and prevent leakage. The valve parts are in part controlled by a diaphragm-shaped member which carries the depress button and which is also connected to the valve parts so as to effect the opening and closing of the latter. The diaphragm-shaped member is resilient and constitutes the support for the depress button, having a crowned configuration whereby it will readily restore itself to an original valve-closing shape upon removal of operating force from the button. Moreover, the return or restoration of the diaphragm-shaped member to the valve-closing condition is aided by the pressurized product existing in or issuing from the dispenser, thereby eliminating reliance on only the resilience of the diaphragm to do the valve closing.

In one embodiment of the invention the diaphragm controls the movement of a valve stem which is axially movable in a stationary valve housing. In other embodiments of the invention, the diaphragm controls the movements of a valve housing which surrounds the valve stem, the latter being stationarily mounted and immovable.

Other objects and advantages of the invention reside in the provision of an improved "springless" aerosol valve in accordance with the foregoing, which is especially simple in construction, easily and economically molded of plastic substance, comprised of relatively few parts, and which is especially rugged and reliable in operation whereby it is not subject to malfunctioning or leakage during storage, shipment, shelf life, or due to rough or improper usage.

Still other features and advantages will hereinafter appear.

In the accompanying drawings:

FIG. 1 is a fragmentary axial sectional view of a pressurized aerosol dispenser having incorporated in it the improved "springless" aerosol valve as provided by the invention. The dispenser and valve are shown in the nondispensing condition.

FIG. 2 is a view like that of FIG. 1, but showing the valve shifted to the dispensing condition.

FIG. 3 is a fragmentary axial sectional view of a "springless" aerosol valve constituting a modification of the invention.

FIG. 4 is an axial sectional view of a "springless" aerosol valve constituting another embodiment of the invention.

FIG. 5 is an axial sectional view of an aerosol valve constituting yet another embodiment of the invention.

FIG. 6 is an axial sectional view of a "springless" aerosol valve constituting still another embodiment of the invention.

FIG. 7 is an axial sectional view of a "springless" aerosol valve constituting a further embodiment of the invention.

FIG. 8 is a fragmentary axial sectional view of a pressurized aerosol bottle having incorporated in it the improved "springless" valve of the invention.

FIG. 9 is a fragmentary axial section of s poppet-type aerosol valve according to the invention.

FIG. 10 is a fragmentary axial section of a slide-type aerosol valve with simplified valve stem part.

Considering first FIGS. 1 and 2, there is illustrated a metal container 10 adapted to carry a pressurized product, said container having a shouldered top end portion 12 which is spun or crimped around an assemblage comprising a valve housing part 14 and a diaphragm member 16. The top end portion 12 is seen to have a channel-shaped cross-sectional configuration after being crimped as above explained. The valve housing 14 is also constituted as a support member disposed below the diaphragm member 16 and engageable with the container 10, and as such it has the form of an inverted cup with an outer rim portion 18 and a transverse wall 20 from which latter there depends a tubular formation 22 provided with an internal annular valve seat portion or shoulder 24. The tubular formation 22 carries a siphon or dip tube 26 which extends to the bottom of the container 10. Axially or vertically movable in the tubular formation 22 of the valve housing part 14 is a valve stem part 28 having a lower cylindrical valve portion 30 normally engaged with the valve seat or shoulder 24 for the nondispensing condition of the valve as illustrated in FIG. 1. In this FIG. upward flow through the dip tube 26 and housing portion 22 is prevented by the closed valve. In its side, the valve stem 28 has a notch or relief 32 which is positioned at the annular shoulder 24 for the depressed, dispensing position of the valve stem 28 as illustrated in FIG. 2.

In the embodiment of FIGS. 1 and 2 the diaphragm member 16 is also constituted as the depress button, said member having a tubular upstanding central portion 34 in the form of a cylindrical boss, provided with an external, side recess 36 and a discharge orifice 38. The top wall 40 of the button portion 34 has a central bore 42 in its underside, in which the valve stem 28 is rigidly mounted. The diaphragm member 16 is molded of plastic substance having a resilient characteristic whereby the molded member is resilient and flexible, and may be depressed to flatten it as illustrated in FIG. 2. Normally the diaphragm member has a crown shape as shown in FIG. 1. Accordingly, the diaphragm member 16 can function as a return spring, tending to raise the button 34 and the valve stem 28 to the valve-closing position of FIG. 1 after depressing force (illustrated in FIG. 2 as being applied by a finger) has been removed from the button. Accordingly there is not needed a helical valve return spring such as has characterized the large majority of aerosol valves in the past. In addition to the resilience of the diaphragm member 60 tending to close the valve upon removal of depressing force, the diaphragm member is aided by the pressure of the product being

discharged. This pressure exists at the underside of the diaphragm and is indicated by the arrows **44**. Accordingly, there is had added assurance that the valve will close after removal of the depressing force, and dependence is not had solely on the resilience of the diaphragm member.

The valve housing **14** is also molded of resilient plastic substance, and by such organization there is had an improved resistance to leakage of product from the container when the valve is in the closed condition of FIG. **1**. It will be observed that for such condition, the pressure of the product in the container **10** will also be manifested around the tubular configuration **22** of the valve housing at those areas located above the annular valve seat or shoulder **24**. Such inward radially directed sealing pressures are indicated by the arrows **46** in FIG. **1**. The inward radial pressures tends to reduce the diameter of the annular valve shoulder **24**, causing such shoulder to more tightly and snugly engage the cylindrical portion **30** of the valve stem **28**, making for a leak-resistant or leakproof valve assemblage.

It will now be understood that, it accordance with the foregoing, I have provided an improved springless aerosol valve construction wherein leakage is prevented by inward radial pressures exerted by the pressurized product on the annular internal valve seat portion. In conjunction with this the return of the valve part to its closing position is effected by a molded resilient part which also has other functions (in the present case constituting the depress button and also the support for the valve stem, and constituting the top member of the assemblage which is clamped by the top rim of the container **10**). The construction illustrated is especially simple, having relatively few parts which may be easily, economically molded and assembled. Moreover, the construction is rugged and reliable in its operation, and the closing of the valve and prevention of leakage for the closed valve condition are aided by the pressure of the propellant or product contained within the can **10**.

Another embodiment of the invention is illustrated in FIG. **3**. This embodiment is similar to that already described above, with the exception that the valve stem **28***a* is provided at its bottom extremity with a valve head **48** of conical configuration, adapted to engage the bottom edge **50** of the tubular formation **22** of the valve housing. The closed condition of the valve is illustrated in FIG. **3**, and it will be seen that a second seal is provided by virtue of the valve head **48** engaging the bottom edge **50** of the valve housing **14**. The valve head **48** constitutes a poppet valve, as distinguished from the slide valve **24**, **30** illustrated in FIGS. **1** and **2**. With the construction of FIG. **3** having both a slide valve and a poppet valve there is had added insurance against leakage.

Another embodiment of the invention is illustrated in FIG. **4**. In this FIG. the assemblage which is clamped by the rim of the pressurized container **10** comprises a flat disklike support member **52** having a tubular depending portion **54** over which the dip tube **26** if fitted. The disk **52** has a discharge passage **56** which is eccentrically disposed. At its center, the disk **52** has a recess **58** in which there is fitted and cemented a valve stem **60** having at its upper end a cylindrical valving portion or head **62**, and having a side notch or relief **64** below the head **62**.

Clamped with the disk **52** is a valve housing **66** comprising a crowned diaphragm portion **68** at the center of which there is an upstanding tubular valving portion **70** provided with an annular valve shoulder or seat **72**. Mounted on the tubular portion **70** is a depress button **74** having a discharge orifice **76**. Normally for the closed condition of the valve in FIG. **4**, the annular shoulder **72** engages the cylindrical portion **62** of the valve stem **60**. When the button **74** is depressed, the shoulder **72** is shifted downward as the diaphragm portion **68** flattens, until the shoulder is located at the notch **64** permitting the passage of product up through the valve housing and out at the discharge orifice **76**. With this construction, the pressure of the product at the underside of the diaphragm portion **68** tends to return such portion to its crowned shape upon removal of depressing force from the button **74**. Accordingly, reliance is not placed solely on the resilience of the diaphragm portion **68** to effect closing of the valve.

Another embodiment of the invention is illustrated in FIG. **5**. This embodiment is similar to that of FIG. **4** in general, with the exception that the valve stem **60***b* in FIG. **6** is constituted as an integral part of the disk **52***b*. The stem **60***b* at its base has an angle-shaped passage **78** through which product flowing upward in the dip tube **26** passes. The valve stem **60***b* has a cylindrical valving portion **62***b* engaged with the annular shoulder **72** of the valve housing **66**, as with the embodiment of FIG. **4**. A side notch **646** of the valve stem provides for the upward passage of product when the depress button **74**, diaphragm portion **68** and valve housing **66** are forced downward.

Yet another embodiment of the invention is illustrated in FIG. **6**. In this FIG. the valve housing **66***c* comprises a tubular portion **70***c* carried by a diaphragm portion **68***c*. At its lower end, the tubular portion **70***c* has an annular valve shoulder or seat **72***c* which is engageable with the cylindrical upper portion **62***c* of the valve stem **60***c*. The stem **60***c* has a side notch or relief **64***c* to provide for passage of the product when the diaphragm portion **68***c* is flattened to bring the valve seat **72***c* alongside the notch **64***c*.

The support for the valve stem **60***c* comprises a conical support member **80** having at its apex a tubular depending portion **82** on which the dip tube **26** is fitted In the tubular portion **82** the lower hollow end **84** of the valve stem **60***c* is carried, the bore of the hollow end **84** communicating with a side opening **86** through which product passes to the chamber below the diaphragm portion **68***c*.

Operation of the embodiments of FIGS. **5** and **6** is generally similar to that already described above for the previous embodiments. In each instance, the pressure of the product on the underside of the diaphragm portion tends to restore such portion to its initial crowned configuration wherein it effects closing of the valve. In FIG. **6**, pressure of the product directed inwardly as indicated by the arrows **88** tend to reduce the diameter of the annular valve seat **72***c* whereby such seat hugs more tightly the cylindrical upper portion **62***c* of the valve stem **60***c*, thereby to provide a tighter closing valve action by which the likelihood of leakage is further minimized.

Another embodiment of the invention is illustrated in FIG. **7**, wherein the support member or disk **52** carries on its hollow depending tubular portion **54** the dip tube **26**. The valve housing **66***d* has a diaphragm portion **68***d*, and an upstanding tubular portion **70***d* on which the depress button **74***d* is carried. Within the confines of the button **74***d* the tubular portion **70***d* is provided with an annular valve shoulder or seat **72***d* which is engageable with the outside cylindrical surface of the upper portion **62***d* of the valve stem **60***d*. The valve stem **60** *d* is hollow and resilient, said stem having a pair of side slots **64***d*, **65***d* and the lower extremity of the stem being cemented in the central recess **58** of the support disk **52**. With this construction, the pressure of the product on the underside of the diaphragm portion **68***d* tends to return such portion to its normal crowned configuration after depressing force is removed from the button **74**, thereby aiding the tendency for the plastic material to raise the button the close the valve. The valve stem **60***d* is stationary and at all times has pressure of the product applied against the inside walls of its bore. When the valve is in the closed position of FIG. **11** such pressure against the portion of the stem located above the valve seat **72***d* will tend to radially expand the stem, thereby making a tighter seal with the seat and tending to minimized the likelihood of leakage. When the button **74***d* is depressed, the annular seat **72***d* will be shifted alongside the slot **64***d* of the valve stem, enabling product to pass upward through the valve stem and out of the orifice **76**.

In the embodiment of FIG. **8** the valve housing **14** and diaphragm member **16** are shown as clamped by a metal ring or ferrule **90** to the top rim **92** of a pressurized container in the form of the bottle **94**. Thus, the valve is shown as having utility

in connection with various types of containers. In FIGS. 1 and 2, the container 10 is constituted as a metal can, whereas in FIG. 8 the container 94 is in the form of the glass or similar bottle.

Another embodiment of the invention is illustrated in FIG. 9. This embodiment also features a poppet-type valve such as is shown in FIG. 3, but with a slightly different construction of valve stem. In FIG. 9 there is shown a tubular valve housing 96 constituted of rigid plastic substance, the valve housing comprising a tubular body portion 98 in which a dip tube 100 is press-fitted, being positioned by an internal annular shoulder 102 in the bore of the housing portion 98. The housing 96 also constitutes a support member, and comprises a top wall 104 and an annular mounting flange 106 connected to the periphery of the wall 104 and adapted for engagement with the lip portion of a container.

The housing portion 98 has an inwardly extended annular flange 108 at its upper end, constituting a valve seat which is engaged by the head portion 110 of a poppet-type valve constituted of resilient plastic substance such as polyethylene. The poppet valve includes a hollow valve stem 112 having a bore 114 which communicates with a side passage 116 disposed immediately above the valve head 110.

The valve stem 112 is press-fitted in a collar 118 of a resilient diaphragm 120 provided with a annular peripheral rim portion 122 which is engaged with the rim 106 of the valve housing 96. Carried by the diaphragm collar 118 is a depress button 124 having a discharge orifice 126. With the above construction, the diaphragm 120 and the vapor pressure within the diaphragm tend to maintain the parts in the raised valve-closing position illustrated. In such position the poppet valve head 110 is sealingly engaged with the valve seat 108, and the internal pressure of the container, exerted against the valve head 110 also aids the diaphragm 120 to maintain the valve tightly closed. Thus there is but very little likelihood of leakage past the valve head 110. The space within the diaphragm 120 constitutes essentially dead space or unoccupied area which is normally not active in the functioning of the valve. When the button 124 is depressed, the side opening 116 of the valve 110, 112 will be shifted downward past the valve seat 108 so as to communicate with the space within the dip tube 100. A discharge will thus occur, through the hollow valve stem and through the depress button 124, emerging at the orifice 126. When finger pressure is removed from the button 124, the diaphragm and valve stem will be restored to the raised position wherein the poppet valve head 110 will sealingly engage the annular valve seat 108 to effectively shut off the flow of product. By virtue of the valve head 110 being resilient and the valve seat 108 being of rigid plastic a tight and effective seal is had at all times.

Another embodiment of the invention is illustrated in FIG. 10. In this FIG. there is shown a disclike supporting member 130 of resilient plastic substance, having a peripheral mounting portion 132 and a central tubular valve stem supporting portion 134 provided with a central bore 136 communicating with the interior of a dip tube 138 press fitted on the tubular portion 134. Rigidly carried by the support member 130 is a valve stem 140 having a ribbed or fluted stem portion 142 and a valve head portion 144. The ribbed stem portion 142 enables communication to be established between the area above the support member 130 and the interior of the dip tube 138. A resilient diaphragm 146 is provided, having a peripheral rim portion 148 engaged with the rim 132 of the support member 130. The diaphragm 136 has a central valve body portion 150 provided with an annular valve seat 152 at a point spaced below the diaphragm 146. The valve seat portion 152 is cooperable with the valve head 144 of the valve stem 140. On the collar 150 there is carried a depress button 154 having a discharge orifice 156. The valve stem 140 is constituted of rigid plastic substance, and is readily accommodated by the resilient plastic construction of the support member 130. Engagement between the valve head 144 and the seat 152 as shown in FIG. 10 prevents egress of product from the container. The pressure of the product under the diaphragm 146 will be directed radially inwardly on that portion of the collar 150 which is located below the diaphragm 146, thus tending to cause the valve seat 152 to tightly hug the valve head 144 so as to prevent leakage. When downward pressure is applied to he depress button 154, the diaphragm 146 will be depressed, shifting the valve seat 152 downward past the head 144 and onto the ribbed stem portion 142 of the valve stem.

Flow of product can now occur upward through the dip tube 138, past the ribbed stem 142 and out through the diaphragm collar 150 and channels of the button 154. When operating force is removed from the button 154, the diaphragm 146 will resume its raised, valve-closing position, being aided by the pressure of the product on the underside of the diaphragm.

It will now be understood that in the various embodiments of the invention, restoring action of the diaphragm portion of the valve is assisted by the pressure of the propellant or product as it exists against the underside of the diaphragm. Also, in a number of embodiments of the invention the pressure of the product on the valve stem or valve housing tends to effect a tighter seal or closing of the valve so as to minimize leakage when the dispenser is not being used.

In all forms of the invention relatively few components are involved, these being moldable in simple cavities and being easily and quickly assembled. The operation of the valve is simple and reliable, and the construction is rugged so as to withstand various conditions of storage, shipment and use.

Variations and modifications are possible without departing from the spirit of the invention.

I claim:

1. An aerosol valve construction comprising, in combination:
   a. a valve adapted to be mounted at the mouth of a pressurized container and having a circular valve seat part and a valve stem part disposed in the seat part and relatively axially movable with respect to the seat part,
   b. said parts having cooperable portions engageable and disengageable with each other in response to said relative axial movement, thereby to close or open the valve,
   c. a crowned, resilient diaphragm and means for mounting the diaphragm across the mouth of the pressurized container whereby the underside of the diaphragm can be pressurized,
   d. a depress button connected to actuate the diaphragm for flattening the latter in response to downward force applied to the button, and
   e. a connection between the button and diaphragm on the one hand and one of said valve parts on the other hand for shifting the latter to open said valve in response to downward button movement and corresponding flattening movement of the diaphragm,
   f. a support member below the diaphragm, fixedly mounting the other of said parts below said diaphragm,
   g. the restoring force of the diaphragm effecting a crown-forming movement thereof and a consequent closing of said valve,
   h. a tubular housing part carrying the valve seat part said housing and seat parts being resilient and radially compressible,
   i. the exterior of said housing part where the seat part engages the valve stem part being exposed to the pressurized interior of the pressurized container to cause it and the seat part to more forcibly engage the stem part.

2. A valve construction as in claim 1, wherein:
   a. the housing part has an internal annular valve shoulder constituting said seat portion.

3. A valve construction as in claim 1, wherein:
   a. the diaphragm and depress button are integral with each other,
   b. said button comprising an inverted cup upstanding from the center portion of the diaphragm.

4. A valve construction as in claim 1, wherein:

a. the underside of the depress button is subjected to the pressurizing experienced by the underside of the diaphragm, thereby to assist the latter in restoring itself to its crowned configuration upon removal of actuating force from the button.

5. A valve construction as in claim 1, and further including:

a. a housing part carrying said seat part,

b. a second valve comprising a valve head on the end of the stem part and an annular seat engageable by said head and disposed at one end of said housing part,

c. said first-mentioned valve being closed when the second valve closes.

6. A valve construction as in claim 1, wherein:

a. the housing part has a lower portion which depends from the center of the diaphragm,

b. said seat part comprising an internal annular bead disposed in said lower housing portion.

7. A valve construction as in claim 1, wherein:

a. the valve stem part comprises a cylindrical head portion and a ribbed stem portion,

b. said stem portion being fixedly mounted in a bore of said support member,

c. said bore of the support member constituting a passage between the opposite sides of the member.

8. An aerosol valve construction comprising, in combination:

a. a valve adapted to be mounted at the mouth of a pressurized container and having a circular rigid, inverted cup-shaped valve seat part and a resilient valve stem part disposed in the seat part and relatively axially movable with respect to the seat part,

b. said parts having cooperable portions engageable and disengageable with each other in response to said relative axial movement, thereby to close or open the valve,

c. a crowned, resilient diaphragm and means for mounting the diaphragm across the mouth of the pressurized container whereby the underside of the diaphragm can be pressurized,

d. a depress button connected to actuate the diaphragm for flattening the latter in response to downward force applied to the button, and

e. a connection between the button and diaphragm on the one hand and the valve stem on the other hand for shifting the latter to open said valve is response to downward button movement and corresponding flattening movement of the diaphragm,

f. a one-piece molded plastic support member below the diaphragm, having integral therewith the valve seat part at a location below said diaphragm,

g. the restoring force of the diaphragm effecting a crown-forming movement thereof and a consequent closing of said valve,

h. the support member including an integral valve housing part and an integral mounting flange, the latter being disposed broadside and in spaced relation to said diaphragm,

i. peripheral portions of said mounting flange and diaphragm being engaged with each other, and

j. means positively clamping together against separation said peripheral portions the mounting flange and diaphragm.

9. An aerosol valve construction comprising, in combination:

a. a valve adapted to be mounted at the mouth of a pressurized container and having a circular valve seat part and a valve stem part disposed in the seat part and relatively axially movable with respect to the seat part,

b. said parts having cooperable portions engageable and disengageable with each other in response to said relative axial movement, thereby to close or open the valve,

c. a crowned, resilient diaphragm and means for mounting the diaphragm across the mouth of the pressurized container whereby the underside of the diaphragm can be pressurized,

d. a depress button connected to actuate the diaphragm for flattening the latter in response to downward force applied to the button, and

e. a connection between the button and diaphragm on the one hand and one of said valve parts on the other hand for shifting the latter to open said valve in response to downward button movement and corresponding flattening movement of the diaphragm,

f. a support member below the diaphragm, fixedly mounting the other of said parts below said diaphragm,

g. the restoring force of the diaphragm effecting a crown-forming movement thereof and a consequent closing of said valve,

h. said housing part being integral with the diaphragm and comprising a tube extending upward from a center diaphragm portion,

i. said depress button being mounted on said housing part.

j. said stem part being stationary,

k. said support member comprising a base attached to peripheral portions of the diaphragm and disposed in spaced broadside relation thereto,

l. said stem part being carried by said base,

m. said base having a conical body portion and a depending tubular extension at its apex,

n. said stem part having a hollow portion carried in said extension and constituting a passageway between opposite sides of the body portion.

10. An aerosol valve construction comprising, in combination:

a. a valve adapted to be mounted at the mouth of a pressurized container and having a circular valve seat part and a valve stem part disposed in the seat part and relatively axially movable with respect to the seat part,

b. said parts having cooperable portions engageable and disengageable with each other in response to said relative axial movement, thereby to close or open the valve,

c. a crowned, resilient diaphragm and means for mounting the diaphragm across the mouth of the pressurized container whereby the underside of the diaphragm can be pressurized,

d. a depress button connected to actuate the diaphragm for flattening the latter in response to downward force applied to the button, and

e. a connection between the button and diaphragm on the one hand and one of said valve parts on the other hand for shifting the latter to open said valve in response to downward button movement and corresponding flattening movement of the diaphragm,

f. a support member below the diaphragm, fixedly mounting the other of said parts below said diaphragm,

g. the restoring force of the diaphragm effecting a crown-forming movement thereof and a consequent closing of said valve,

h. said housing part being integral with the diaphragm and comprising a tube extending upward from a center diaphragm portion,

i. said depress button being mounted on said housing part,

j. said stem part being stationary,

k. said seat part being diaposed in said housing part,

l. a portion of the stem part where it engages said seat part being hollow,

m. said stem part being resilient and the hollow thereof being pressurized when the valve is closed, thereby to radially expand it against said seat part to minimize leakage of the valve.

11. A valve construction as in claim 10, wherein:

a. the support member comprises a base attached to peripheral portions of the diaphragm and disposed in spaced broadside relation thereto,

b. said stem part being carried by said base,

c. said stem part having at least one slot in its sidewall, connecting the hollow of the stem with the exterior thereof.

12. A valve stem construction as in claim 8, and further including:

a. a container, said means for clamping together peripheral portions of the mounting flange and diaphragm comprising a rim portion of the container.

13. A valve stem construction as in claim 8, wherein:

a. the means positively clamping together the peripheral portions of the mounting flange and diaphragm comprise an annular metal ring structure having a channel-shaped cross-sectional configuration.