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SELF-VENTING DISPENSING AND RECHARGING AEROSOL VALVE ASSEMBLY

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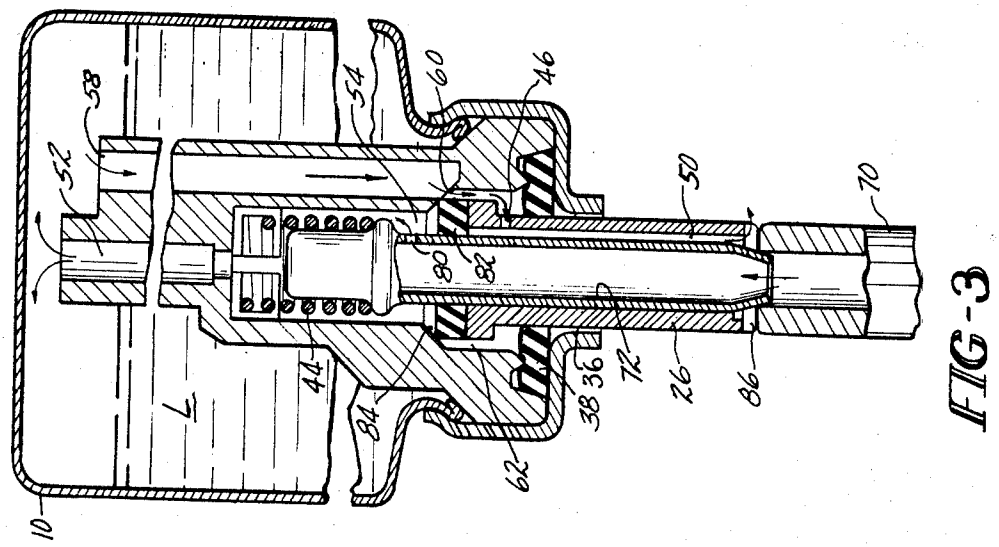

FIG-3

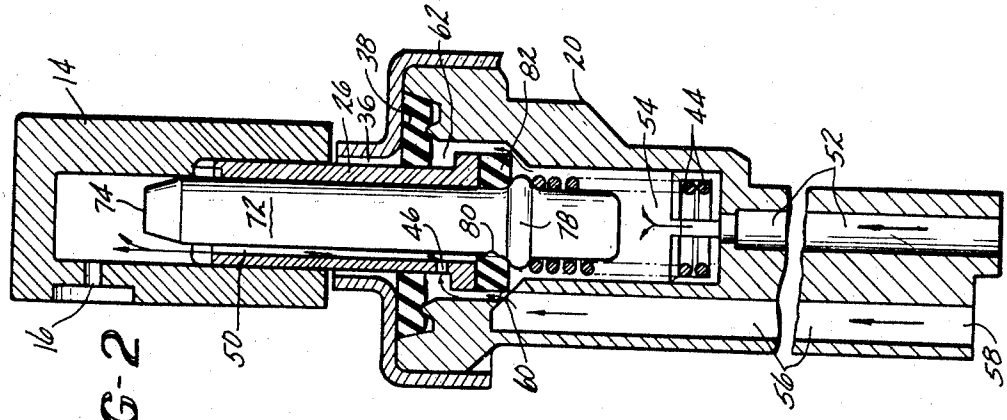

FIG-2

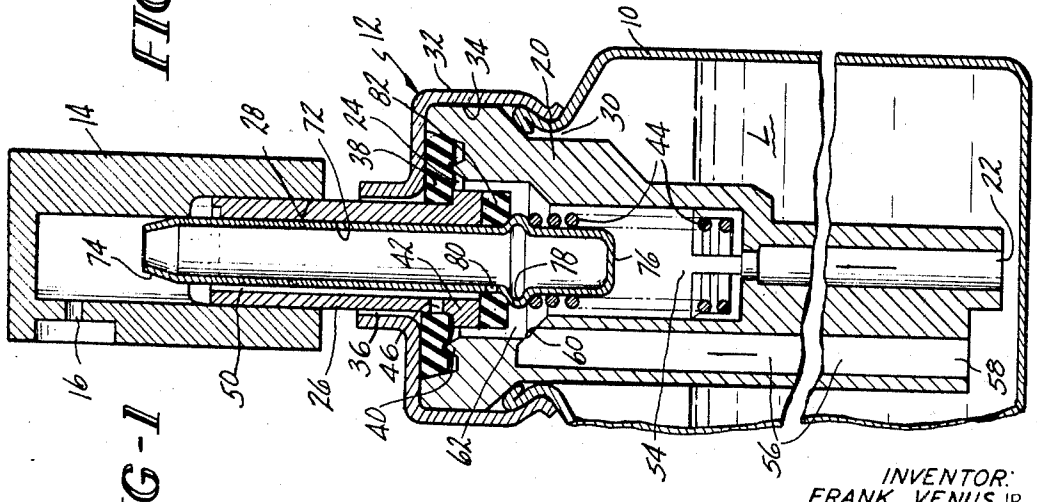

FIG-1

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SELF-VENTING DISPENSING AND RECHARGING AEROSOL VALVE ASSEMBLY

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ABSTRACT OF THE DISCLOSURE

An aerosol valve assembly which, in addition to providing normal dispensing of a fluid product held under pressure in a container, incorporates means for automatically venting to atmosphere, during a filling mode of operation of the valve, the interior of a container to which the valve is attached. A valve stem is provided in which a separate core made accessible by removal of a spray button is axially shifted relative to the stem upon endwise engagement with a filling duct of a recharging device, while the valve stem is itself simultaneously moved to a limiting position. Such movement of the stem and core serves to open a recharging passage through the core and valve housing to the interior of the container, and to provide a separate venting passage through a by-pass in the valve housing and valve stem to atmosphere.

The present invention relates to dispensing and recharging devices for pressurized containers, and more particularly to valve assemblies for small aerosol dispensers adapted to be recharged from a larger or storage unit.

It is commonly known to use aerosol packages of the so-called "mother-daughter" type in which a relatively small capacity aerosol package, comprising a container and a dispensing valve therefor, is designed for easy portability by the user to supply a relatively limited amount of a contained product. The product is expelled under the pressure of a liquified gaseous propellant upon actuation of the valve of the container by the user. In conjunction with such small or portable unit, there is provided a main or storage unit comprising a valved container of substantially larger capacity holding a supply of product and propellant from which the portable unit may be recharged by coupling it to the storage unit. By opening the valves of the storage and portable units when the units are properly interconnected, transfer of product and propellant from the storage unit to the portable unit will take place.

One of the problems in securing an effective means of transferring the product from the storage to the portable unit has been that of venting the portable unit during the transfer operation so that it can receive a maximum charge. If venting is not accomplished, the air which remains in the portable unit upon exhausting the previous charge becomes trapped and builds up a back pressure to the recharging operation. An equilibrium condition is reached in which the pressures of the portable and storage devices are equal, but a significant portion of the capacity of the portable container will be occupied by the trapped air so that the net effective capacity of the portable unit for the desired product is substantially reduced.

One object of the present invention, accordingly, is to provide a new and improved dispensing and recharging valve for use in a portable aerosol package which will automatically vent the container during the recharging mode of operation above described. In this connection it is a purpose to provide a single valve assembly which

will serve both for normal dispensing operation in a customary manner, as well as to function automatically as a controlled venting device for eliminating trapped air in the unit during the filling operation. In furtherance of this objective, a valve design is presented which provides a recharging passage through the valve assembly which is separate from the venting passage so that each may function independently in the recharging mode of operation.

It is a further object of the invention to accomplish the foregoing venting action of the valve assembly with minimum manipulation by the user.

Since dispensing valves of the aerosol type are expendable it is a further purpose of the invention to provide a design in a dispensing and recharging valve which is simple, inexpensive and the manufacture of which lends itself readily to mass production.

Various other objectives, as well as features and advantages of valves of the invention, are apparent from the following description and accompanying drawings illustrative of one embodiment.

In the drawings,

FIG. 1 is a vertical sectional view through a valve assembly and associated container, the valve being shown in normal closed position, parts being omitted or broken away for purposes of clarity of illustration;

FIG. 2 is a view similar to that of FIG. 1 except that the valve is shown in its open or dispensing position; and

FIG. 3 is a view illustrating the valve in the recharging mode of operation.

Referring to FIG. 1, a portable container **10** is fitted with a dispensing valve assembly indicated generally at **12** having an actuator and dispensing button **14**, whereby the contents L of the container may be discharged through the orifice **16** of the actuator button upon axially depressing the button to the position shown in FIG. 2.

Valve assembly **12** comprises a tubular housing **20** of molded plastic or the like. Housing **20** has a stepped inner wall and is open at its axially opposite ends to provide a first passage through the valve housing and having an inlet **22** and an outlet **24** in the housing.

A first valve means compromising a tubular valve stem **26**, again of molded plastic or the like, is received in outlet **24** of the housing and is axially reciprocable within limits in the housing. The stem has a portion normally projecting out of housing **20**, and the actuator button **14** has a socket **28** for the reception of the upper end of stem **26** with a friction fit forming a peripheral seal about the upper end of the stem.

Valve assembly **12** is secured in the mouth **30** of container **10** by a mounting flange **32** which encloses an enlarged head **34** of the housing and is crimped about the lip of container mouth **30** to seal the valve assembly to the container **10** in well known manner. Flange **32** includes a central portion which overlies the outlet **24** of the housing and is formed with a central aperture **36** which loosely encircles the projecting valve stem **26** and acts as a guide therefor. A resilient annular grommet **38** is clamped between the central portion of flange **32** and a first step or shoulder **40** in outlet **24** of the housing. Grommet **38** closely encircles valve stem **26** to form a fluid tight but sliding seal therewith.

At the inner end of valve stem **26** there is formed an annular enlargement **42**. This enlargement abuts upwardly against grommet **38** under the urging of a helical spring **44**, as will be more fully explained presently. A port **46** is formed in the side wall of stem **26**, immediately above its head or enlargement **42**, and the port is normally obturated by the inner wall of grommet **38**, as seen in FIG. 1.

By depressing actuator button **14**, as seen as FIG. 2, valve stem **26** slides relative to grommet **38** and provides

communication through port 46 between the interior of container 10 and a dispensing passage 50 of stem 26. The latter communicates in turn with spray orifice 16 of the actuator button 14. Interiorly of the valve housing, communication with port 46 is provided by either of two routes, the first of which comprises inlet 22 of a duct 52 at the inner end of valve housing 20, leading to an inner chamber 54 of the housing within which helical spring 44 is disposed, and from there around the lower end of stem 26 to an adjacent outer chamber 62 in which the outlet port 46 of the stem is then disposed. An alternate passage is provided by means of a by-pass 56 formed in housing 20, generally paralleling duct 52. The remote end 58 of by-pass 56 is open in the interior of container 10 adjacent inlet 22, while the opposite end of the by-pass communicates through a port 60 with outer chamber 62 of housing 20. Fluid entering inlet 58 of by-pass 56 may thus pass through port 60 to outer chamber 62 and thus out through valve stem port 46 and passage 50 for discharge from the spray head 14.

So much of the valve construction already described is generally conventional of aerosol valves and more particularly of the vapor-vent type, with certain noted differences as will appear hereinafter.

In order to make provision for recharging of container 10 through valve assembly 12, the generally conventional valve construction just described is modified to include a venting arrangement which automatically comes into play in the recharging mode of operation. Recharging of container 10 is accomplished by removing actuator button 14 from the end of valve stem 26 and then connecting or coupling the free end of the stem endwise to a recharging nozzle 70 (see FIG. 3) connected to a storage container (not shown).

Valve assembly 12 is provided with a second valve means comprising a core 72 which, in the illustrated embodiment, is a drawn metal tube open at its outer end 74 and closed at its inner end 76. Core 72 extends through valve stem 26 and projects somewhat beyond the opposite ends of the stem with the stem and core in telescoping relation. The diameter of core 72 is such as to make a free sliding fit within the stem so that the core may be axially reciprocated, within limits, relative to the stem. The normal dispensing passage 50 is thus disposed between and longitudinally along the stem and core throughout their common extent. In order to increase the size of the outlet passage without making too loose a fit between the stem and core, one or the other may be rabbeted along the adjacent surfaces or other provision made to get spacing between them.

Core 72 is bulged outwardly adjacent its closed end to form an annular enlargement 78. The core is also provided with a port 80 in its side wall disposed immediately above enlargement 78. A resilient annular grommet 82 encircles core 70 above enlargement 78 and makes a sliding seal with the surface of the core.

In the non-recharging mode of operation, as seen in FIGS. 1 and 2, core 72 is biased by spring 44 to compress enlargement 78 against the undersurface of grommet 82 to effect sealing abutment therewith and also to block port 80. The spring bias imposed on the core is transmitted, in turn, through grommet 82 to valve stem 26, biasing its annular enlargement 42 against the undersurface of resilient grommet 38, as previously described. Grommet 82 serves also to close the inner end of discharge passage 50 between the telescoping stem and core. Inner and outer longitudinal feed passages, e.g., 50 and 72, are thus provided in the composite stem of the valve assembly.

With the spray button 14 in position, depression of the button to effect dispensing moves both stem 26 and core 72 so that there is no relative motion between them. The flow of product outwardly through the valve is thus effected as already described.

In recharging container 10, actuator button 14 is removed and the container is inverted and placed in end-to-end relation to recharging nozzle 70. The tip of core 72 may desirably be frustoconical so as to be receivable in and make a line-contact seal with the inner surface of the recharging nozzle (FIG. 3). Upon depressing the aerosol package against nozzle 70, core 72 is first moved axially inwardly relative to stem 26 until abutment occurs between the tip of nozzle 70 and the corresponding tip of stem 26. Thereafter, further depression moves both the core and stem inwardly relative to valve housing 20 until abutment occurs between the inner face or edge of grommet 82 and shoulder or step 84 separating inner chamber 54 from outer chamber 62 in the housing. When such abutment occurs, grommet 82 forms a peripheral seal with shoulder 84 at a point located entirely below or inwardly of port 60.

As will be seen in FIG. 3, the last-stated position of the valve assembly produces an interruption of the free communication between the alternate routes of fluid flow through the valve housing. Thus recharging fluid from nozzle 70 passes inwardly through core 72, through port 80 which is now open to inner chamber 54 of valve housing 26. The recharging fluid product then passes to duct 52 and is emptied into the container 10 at the inlet 22 of such duct.

Air trapped in container 10 above liquid L is exhausted, during the foregoing recharging operation, through inlet 58 of by-pass 56 and port 60 in the valve housing, and from there through port 46 in stem 26, passing outwardly through discharge passage 50 to the outer end of the stem. To facilitate its escape there, the end of stem 26 is provided with one or more transverse slots 86 or similar depressions to prevent a flush fit between the abutting ends of the respective valve stems.

While the invention has been described in detail in connection with a preferred embodiment, it will be apparent that modifications and variations in the structure may occur to those skilled in the art. Such modifications include the use of separate, tandem or coaxial flexible or semiflexible dip tube assemblies in place of the integrally molded passage 52 and by-pass 56 arrangement here shown, suitable coupling nipples being formed on the valve housing to make connection to the dip tubes. Similarly, the first valve means comprising stem 26 and grommet 38 may be replaced by a toggle valve of conventional design as a substitute for the axially actuated type of valve shown here. Such modifications as this which do not result in a change in function or departure from the spirit of the inventive concept are accordingly intended to be comprehended within the scope of the following claims.

What is claimed is:

1. In an aerosol valve assembly incorporating means to permit charging of fluid through said assembly into an associated container, as well as to permit controlled discharge from such container, the combination which comprises:

a tubular housing having a first passage therethrough with open inlet and outlet ends;

a first valve means positioned in and projecting from the outlet end of said first passage in said housing and means biasing said first valve means normally to block the flow of fluid therethrough, said first valve means being shiftable against said bias and relative to said housing to open said valve and allow fluid to flow therethrough;

a second valve means disposed within and supported by said first valve means, said second valve means being normally biased to closed position to prevent flow of fluid therethrough but having a projecting member externally accessible independently of said first valve means, said member constituting a duct normally open at its outer end and closed at its inner end and being axially shiftable against said bias relative to said first valve means;

an actuating button forming a removable operator for

said first valve means, said button having a socket frictionally receiving the projecting end of said first valve means, and a discharge orifice in said button in communication with said socket, said button enclosing the projecting portion of said second valve means whereby actuation of said button to open said first valve means produces no relative motion between said first valve means and said second valve means;

a by-pass in said valve housing having an inlet adjacent the inlet of said first passage in said housing and a port communicating said by-pass with the interior of said valve housing to provide alternate interconnected routes of communication through said housing;

a lateral port formed in said duct member adjacent the closed end thereof and a resilient valve member slidably carried by said duct and normally obturating said port;

said resilient valve member being shiftable with simultaneous shifting of both said first and second valve means by said actuating button to engage said valve housing and block the interconnection between said by-pass and first passage in said valve housing;

said duct member being accessible on removal of said actuating button to permit manual shifting of said duct independently of said first valve means, whereby to open said port in said duct to communication with the inlet end of said first passage in said valve housing and establish separate routes of flow through said valve housing.

2. An aerosol valve assembly as defined in claim **1**, wherein said first and second valve means comprise substantially coaxial tubular telescoped members, said members being spaced along their common extent at least at one point on their periphery to provide separate inner and outer longitudinal passages opening into said socket of said actuating button.

3. An aerosol valve assembly as defined in claim **2**, wherein a single biasing means is provided which acts on both said coaxial tubular telescoped members to urge said first and second valve means to closed position.

4. An aerosol valve assembly as defined in claim **2**, wherein the projecting end of said outer tubular member is provided with a lateral passage disposed within the confines of said actuating button socket and communicating with said outer longitudinal passage formed by said telescoping tubular members.

5. In a dispensing and recharging valve assembly for an aerosol container incorporating venting means operative automatically in the recharging mode, wherein said valve assembly includes

(a) a tubular valve housing having a stepped inner wall open at its axially opposite ends to provide inlet and outlet openings in said housing,

(b) a tubular valve stem received in the outlet end of said housing and axially reciprocable therein, said stem having a portion normally projecting from said housing and being open at said end,

(c) a mounting flange carried by said housing and cooperating therewith to support said valve assembly in the mouth of a container,

(d) closure means at the outlet of said housing aper-

tured to receive the projecting portion of said stem therein and including a resilient annular grommet encircling said valve stem to form a sliding seal therewith, said grommet being clamped in said housing outlet between a portion of said closure means and a first step in said housing,

(e) an annular enlargement on said valve stem adjacent its inner end which forms a sealing abutment with said grommet in the closed position of said valve;

(f) and a port in the wall of said valve stem above said annular enlargement, said port being disposed outside said sealing abutment in the closed position of said valve but being brought into communication with the interior of said valve housing when said stem is axially depressed to allow dispensing of fluid through said valve assembly for discharge from the open end of said valve stem; the improvement which comprises:

(1) a core extending through said tubular valve stem and projecting relative thereto so as to be externally accessible externally of said core independently thereof, said core being reciprocable within said valve stem and forming an axially extending passage with said stem,

(2) said core having a longitudinal duct open at its outer end and being closed at its inner end, and an annular enlargement intermediate the ends of said core,

(3) an annular sealing grommet encircling said core above the enlargement therein and forming a sliding seal about said core and also a closure for the inner end of the axial passage between said stem and core,

(4) a port disposed above said enlargement in said core, said port communicating with the longitudinal duct in said core,

(5) spring means engaging said core and normally urging it axially outward of said stem to cause sealing abutment of said core and valve stem enlargements with their respective sealing grommets,

(6) said housing having a second step formed in its inner wall below said first step to provide a shoulder normally spaced from the underside of said sealing grommet on said core but engaged by said grommet when said valve stem is fully depressed to form a seal therewith,

(7) and a lateral venting passage in said valve housing opening into the interior thereof intermediate said first and second steps.

References Cited

UNITED STATES PATENTS

3,357,603 12/1967 Kitabayashi ------ 222—402.16

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