

SPECIFICATION

An aerosol valve housing

5 The speed of filling an aerosol container with propellant is a significant cost consideration in the total packaging cost. Filling with propellant is generally accomplished in one of two basic methods, namely, the so-called "under-the-cup" method, wherein the mounting cup is loosely lodged in the container opening, the propellant introduced to the container between the mounting cup and the closure bead of the container, and then the mounting cup and container opening bead are crimped. This procedure has been widely utilized, particularly in the United States, in association with the filling of chlorofluorohydrocarbons. The other basic filling method, so-called "around the valve stem," involves passing the propellant exterior to the valve stem and interior of the valve housing; the propellant passage not being solely through the constricting orifices in the valve stem. A typical valve structure of this second type is disclosed in United States Patent No. 3,319,669. While the structure of the aforementioned patent provides an improvement to the original method of filling through the valve stem, the propellant filling rates are not as rapid as desirable; the filling rates being limited by the internal diameter of the dip tube connecting the housing to the interior of the container and by the orifice size of the vapor tap in the housing, if any.

Attempts have been made to circumvent all restricting orifices of the valve unit by having the propellant flow between the valve gasket and the contiguous surface of the mounting cup and then around the housing into the container, so called "around the housing" method. Illustrative of this type are the filling methods and associated valve structures disclosed in United States Patents Nos. 3,158,297 3,838,799 and 4,015,752. Most of the "around the housing" structures have not seen commercial light; while some have received limited commercial acceptance. The principal difficulty with these structures is that to permit sufficient compression of the gasket to enable rapid passage of propellant over the gasket necessitates a loose crimping of the pedestal and housing. Loose crimping is disadvantageous.

The present invention provides a valve unit wherein the aerosol container may be filled, through the mounting cup and assembled valve unit have been affixed in operating position in the container opening through the standard crimping pressure employed in the industry.

In the invention, a filling head and valve unit combination is provided such that during the filling operation, the filling head provides a mechanical force through a stem-actuating member to displace the valve body away from the mounting cup and further, to seal, though not hermetically, the valve stem opening against the entry of propellant.

In its broadest aspect, the valve unit of the present invention has a valve housing having a flexible peripheral flange, the flange having spaced slots or recesses which permit the flow of propellant there-

through during the filling. The peripheral flange is disposed on the valve housing such that in assembling the valve unit to its mounting cup, the indentations on the pedestal of the mounting cup resulting from crimping the pedestal to the valve unit provide a means for affixing the valve housing a valve gasket of the valve unit in sealing relation to the top under surface of the pedestal, and yet allowing the flange to flex inwardly toward the outer wall of the valve housing during filling. The inward flexing of the flange permits the valve housing to be displaced away from the top surface of the pedestal, and concomitantly, for the gasket to be displaced in the same direction, both resulting in a relatively large opening between the top surface of the valve gasket and the under surface of the pedestal during the filling operation. Upon removal of the filling head and the associated propellant pressure and/or mechanical force against the valve unit, the valve unit will return to a position wherein the container contents are sealed to the atmosphere, to be opened and released only upon actuation of the valve during usage of the pressurized package.

In the preferred embodiment, the peripheral flange of the valve housing extends outwardly and downwardly from the outer surface of the valve housing and has a series of slots extending through the top of the flange and within the downwardly extending wall of the flange.

In a second embodiment, the flange comprises a series of outwardly and downwardly extending lugs disposed about the valve housing, the spacing between the lugs providing a flow path for the propellant during filling.

In other embodiments, the flange extends outwardly and upwardly from the valve housing and has a series of slots as in the preferred embodiment, or a series of lugs as described above for the second embodiment.

The present invention, while useful with all types of propellants, chlorofluorohydrocarbons, hydrocarbons, carbon dioxide or nitrous oxide, has a specific utility and advantage when used with hydrocarbons. Presently, in some countries, chlorofluorohydrocarbons aerosol propellant may be discontinued in the near future in all but a limited number of end products due to alleged detrimental environmental impact. This has resulted in the aerosol industry turning to liquefied hydrocarbons as the principal propellant for use in aerosol containers. The 'under the cup' method of filling is not a commercially attractive procedure when filling with hydrocarbons. With the 'under the cup' method, there is always a loss of propellant to the atmosphere accompanying the filling of each container. With hydrocarbons, loss to the atmosphere is not tolerable for safety reasons. Atmospheric presence of hydrocarbons could lead to a hydrocarbon concentration within the combustible hydrocarbon-oxygen concentration range. Thus, utilization of the "under the cup" filling method will necessitate a hydrocarbon recovery system that will add considerable expense to the overall cost of the filling operation.

With the present invention, hydrocarbon loss to the atmosphere is substantially non-existent, or so

miniscule as not to present the need for a recovery system.

The valve unit of the present invention has particular significance in the filling of a valve of the type described in U.S.A. Patent application Serial No. 831,270 wherein there is disposed within the valve housing an impact chamber comprising, in general, a plurality of propellant carrying conduits leading to an impact zone into which also leads a substantially perpendicular product conduit.

Embodiments of the present invention as applied to valve units of the type described in U.S.A. Patent application Serial No. 831, 270 will now be described, with reference to the accompanying drawings wherein:-

Figure 1 is an elevational view in section of a valve according to a preferred embodiment of this invention, showing the valve in normal closed position.

Figure 2 is an elevational view in section of the valve and filling head according to the preferred embodiment of this invention, showing the propellant being filled through the filling head and valve.

Figure 3 is a top view of the valve housing along the line 3-3 of *Figure 2*.

Figure 4 is an elevational view of a valve housing of a further embodiment of the invention.

Figure 5 is a top view of the valve housing of *Figure 4*.

Figure 6 is an elevational view of a valve housing of a further embodiment of the invention.

Figure 7 is a top view of the valve housing of *Figure 6*.

Figure 1 shows a mounting cup with assembled valve joined to the bead of a container opening.

The valve unit, generally designated as 10, includes a mounting cup 12 having an upstanding pedestal portion 14 and a beaded portion 16 which affixes to the bead 18 of the container, generally designated as 20. Assembled within the pedestal 14 is a valve housing 22. Valve body 24 is disposed within the housing 22, which housing has an outer wall 23. Spring 26 in the normal closed position of the valve biases the valve body 24 upwardly against the valve gasket 28. Hollow valve stem 30 is an extension of the valve body 24 and when in its normal closed position its openings 32 are sealed by the gasket 28. At the bottom of the valve housing 22 is plug member 34 which at one end serves to position the lower end of the spring 26 and at its other end defines together with the lower end of the valve housing 22 an impact chamber, generally designated as 36. The component members of the impact chamber comprise a housing orifices 38, gaseous propellant conduits 40, a product conduit 42, and an impact zone 44. Extending from the bottom of the valve housing 22 is a housing nipple having a recess which receives a dip tube 48.

The valve housing 22 has an annular flexible flange 50, having an outwardly extending portion 52 and a downwardly extending portion 54, said downwardly extending portion having an upper sloped portion 56 and terminating in a lower sloped portion 58. The outwardly extending portion 52 of the flange 50 is set slightly below the upper edge 60 of the valve housing 22 and forms with the outer wall of the

housing 22 a stepped shoulder 62.

The propellant passages, through the flange 50 are best shown in *Figure 3*. As shown in *Figure 3*, the housing wall 23 has integrally molded to it the outwardly extending portion 52 and the upper downwardly extending slope 56. A series of openings or slots 64 are disposed in the outwardly extending portion 52.

As shown in the drawings the outside diameter 29 of the valve gasket 28 does not, as in the usual case in the type of valve depicted in the drawing, extend to the side wall 15 of the pedestal 14. Having the diameter of the gasket truncated together with the stepped shoulder 62, allows the outer portion of the gasket to flex downwardly into the free space between the side wall 15 of the pedestal 14 and the housing wall 23.

Filling heads of the type generally described in United States Patent No. 3,122,180 may be used with the valve unit of this invention.

When filling an aerosol container with the valve actuator not in place on the valve stem utilizing the valve unit-filling head combination of this invention, the general type of filling head described in United States Patent No. 3,122,180 is modified as described hereafter. Only the modifications and associated structure are discussed, since the remainder of the filling head structure is well within the skill of the art.

In *Figure 2*, the filling head is shown positioned in place for filling on the pedestal 14.

The filling head, to the extent shown, comprises an adaptor generally designated as 72, having an outer wall 73, said wall having a lower shoulder 74. An 'O' ring 76 is disposed on the shoulder 74. Within the wall is a slidable U-shaped member 78 which has its leading edge 80 sloped to compress the 'O' ring 76 against the pedestal 14. Within a recess 82 of the slidable U-shaped member 78 is disposed a slidable stem actuator 84 and spring 85 which biases the stem member 84 toward the sloped edge 80 of the U-shaped member 78. In the face of the stem actuator 84 nearest the sloping edge 80, there is an annular groove 86 disposed to receive the top of the valve stem 30. The stem actuator 84 may be coconvoluted in shape to allow the passage of propellant past the actuator. Propellant enters the filling adaptor through the opening 88.

The components of the valve unit in *Figure 2* are similarly numbered and conform to the component description of *Figures 1* and *3*.

When the filling adaptor is positioned on the mounting cup, as shown in *Figure 2*, the spring 85 urges the stem actuator 84 against the valve stem 30, until the spring 26 compresses and bottoms the valve body 24 through the spring 26, against the shoulder 27 in the bottom of the valve housing 22. Thereafter, additional urging of the spring 85 will displace the valve unit, including the valve housing, away from the top of the pedestal 14.

Utilizing a spring 85 having an expansive force sufficient to urge the valve housing a distance of .015" - .025" has been found satisfactory to accomplish the rapid filling of the container with propellant.

Essentially sealing off the valve stem through

contacting with the stem actuator, forecloses a pressure surge through the stem orifices that may tend to dislodge the gasket from its normal orientation vis-a-vis the valve stem-body openings.

- 5 While the mechanical force provided through the filling head described herein is preferred, the valve housing of this invention may be filled with a conventional filling head wherein the head seals onto the pedestal of the mounting cup. In such a
10 system, the valve housing is displaced away from the top surface of the pedestal through the propellant pressure in the head.

- During filling, the propellant flows through the adaptor port 88 and into the interior of the adaptor
15 72, from there the flow is through the central opening in the pedestal of the mounting cup, between the gasket and pedestal, and through the openings or slots in the flange to the container. Termination of propellant flow and withdrawal of the
20 filling head allows the valve housing and gasket to return to the normal sealed position shown in Figure 1.

- Other embodiments hereinafter described differ only in respect to the construction of the flange on
25 the valve housing. Thus, in Figures 4-7 only the flange modification is shown. In other respects the housings of the embodiments of Figures 4-7 are similar to the housing of Figures 1-3.

- In Figure 4 the valve housing 22' has a wall 23' from which extends a flange, generally designated
30 as 90, comprising a series of flexible lugs 92, said lugs having an outwardly extending portion 94 and an upwardly extending portion 96.

- Figure 5 best shows the slots 98 between the lugs
35 92 which provide a flow passage for the propellant.

- In Figure 6 the valve housing 22'' has a wall 23'' from which there is a flange generally designated as
100, comprising a series of flexible lugs 102, said lugs having an outwardly extending portion 104 and
40 a downwardly extending portion 106.

- Figure 7 best shows the slots 108 between the lugs
102.

- The filling adapter can also be used for filling an aerosol container with the valve actuator already
45 placed on the valve stem. In such use a filling head, such as is described in United States Patent No. 3,122,180, may be used.

- The travel distance of the adapter before the ultimate positioning is adjusted such that the inner
50 sleeve first contacts the shoulder on the periphery of the actuator and thereafter there is an additional travel distance of .015" - .025" which permits seating of the flange of the actuator against the pedestal while simultaneously moving the valve housing by
55 flexing of the flange on the valve housing. The adjustment of the travel distance may be accomplished through lengthening the valve stem or shortening the height of the actuator.

60 CLAIMS

1. A valve unit for controlling flow from a pressurised container and which comprises a container closure member having a pedestal member
65 enclosing a valve housing and an associated valve

- gasket, and wherein the valve housing is urged against the gasket to provide a seal between the closure member and the gasket by crimping the pedestal member, and wherein the valve housing
70 has a flange member integral with its outer wall and having spaced slots or recesses to permit the flow of propellant therethrough during filling of the container with propellant, the flange member being disposed on the outer side wall of the valve housing
75 and below an upper gasket contacting surface of the housing and having a flexible outer surface inclined downwardly and inwardly to form a mating surface with the inner surface of the crimped portion of the pedestal member so as to displace downwardly
80 during filling.

2. A valve unit according to claim 1, wherein the flange member has a portion which extends outwardly from the housing outer wall and a portion which has the flexible outer surface and which
85 extends substantially perpendicular from the outwardly extending portion.

3. A valve unit according to claim 2, wherein the outwardly extending portion of the flange member is positioned nearer the gasket contacting surface of the housing than the end of the perpendicularly extending portion.
90

4. A valve unit according to claim 2, wherein the outwardly extending portion of the flange member is positioned further away from the gasket contacting surface of the housing than the end of the perpendicularly extending portion.
95

5. A valve unit according to any of claims 1-4, wherein the flange member is annular.

6. A valve unit according to any of claims 1-5, wherein the flange member comprises a series of lugs.
100

7. A valve unit according to any of claims 1-4, wherein the valve housing has an internal shoulder which engages a movable valve body within the housing when the valve body has been moved a
105 predetermined distance into the valve housing, whereby further such movement of the valve body causes flexure of the flange member to allow the valve housing to move away from sealing relationship with the gasket.

8. A valve unit constructed and arranged substantially as hereinbefore described and shown in Figures 1-3 or with reference to Figure 4 and 5 or 6 and 7 of the accompanying drawings.



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contacting with the stem actuator, forecloses a pressure surge through the stem orifices that may tend to dislodge the gasket from its normal orientation vis-a-vis the valve stem-body openings.

- 5 While the mechanical force provided through the filling head described herein is preferred, the valve housing of this invention may be filled with a conventional filling head wherein the head seals onto the pedestal of the mounting cup. In such a system, the valve housing is displaced away from the top surface of the pedestal through the propellant pressure in the head.

- During filling, the propellant flows through the adaptor port 88 and into the interior of the adaptor 72, from there the flow is through the central opening in the pedestal of the mounting cup, between the gasket and pedestal, and through the openings or slots in the flange to the container. Termination of propellant flow and withdrawal of the filling head allows the valve housing and gasket to return to the normal sealed position shown in Figure 1.

- Other embodiments hereinafter described differ only in respect to the construction of the flange on the valve housing. Thus, in Figures 4-7 only the flange modification is shown. In other respects the housings of the embodiments of Figures 4-7 are similar to the housing of Figures 1-3.

- In Figure 4 the valve housing 22' has a wall 23' from which extends a flange, generally designated as 90, comprising a series of flexible lugs 92, said lugs having an outwardly extending portion 94 and an upwardly extending portion 96.

- Figure 5 best shows the slots 98 between the lugs 92 which provide a flow passage for the propellant.

- In Figure 6 the valve housing 22'' has a wall 23'' from which there is a flange generally designated as 100, comprising a series of flexible lugs 102, said lugs having an outwardly extending portion 104 and a downwardly extending portion 106.

- Figure 7 best shows the slots 108 between the lugs 102.

- The filling adapter can also be used for filling an aerosol container with the valve actuator already placed on the valve stem. In such use a filling head, such as is described in United States Patent No. 3,122,180, may be used.

- The travel distance of the adapter before the ultimate positioning is adjusted such that the inner sleeve first contacts the shoulder on the periphery of the actuator and thereafter there is an additional travel distance of .015" - .025" which permits seating of the flange of the actuator against the pedestal while simultaneously moving the valve housing by flexing of the flange on the valve housing. The adjustment of the travel distance may be accomplished through lengthening the valve stem or shortening the height of the actuator.

60 CLAIMS

1. A valve unit for controlling flow from a pressurised container and which comprises a container closure member having a pedestal member enclosing a valve housing and an associated valve

- gasket, and wherein the valve housing is urged against the gasket to provide a seal between the closure member and the gasket by crimping the pedestal member, and wherein the valve housing has a flange member integral with its outer wall and having spaced slots or recesses to permit the flow of propellant therethrough during filling of the container with propellant, the flange member being disposed on the outer side wall of the valve housing and below an upper gasket contacting surface of the housing and having a flexible outer surface inclined downwardly and inwardly to form a mating surface with the inner surface of the crimped portion of the pedestal member so as to displace downwardly during filling.

2. A valve unit according to claim 1, wherein the flange member has a portion which extends outwardly from the housing outer wall and a portion which has the flexible outer surface and which extends substantially perpendicular from the outwardly extending portion.

3. A valve unit according to claim 2, wherein the outwardly extending portion of the flange member is positioned nearer the gasket contacting surface of the housing than the end of the perpendicularly extending portion.

4. A valve unit according to claim 2, wherein the outwardly extending portion of the flange member is positioned further away from the gasket contacting surface of the housing than the end of the perpendicularly extending portion.

5. A valve unit according to any of claims 1-4, wherein the flange member is annular.

6. A valve unit according to any of claims 1-5, wherein the flange member comprises a series of lugs.

7. A valve unit according to any of claims 1-4, wherein the valve housing has an internal shoulder which engages a movable valve body within the housing when the valve body has been moved a predetermined distance into the valve housing, whereby further such movement of the valve body causes flexure of the flange member to allow the valve housing to move away from sealing relationship with the gasket.

8. A valve unit constructed and arranged substantially as hereinbefore described and shown in Figures 1-3 or with reference to Figure 4 and 5 or 6 and 7 of the accompanying drawings.