Dec. 4, 1956 W. R. O'DONNELL 2,772,820

VALVE FOR AEROSOL DISPENSER

Filed Nov. 20, 1953 2 Sheets-Sheet 1

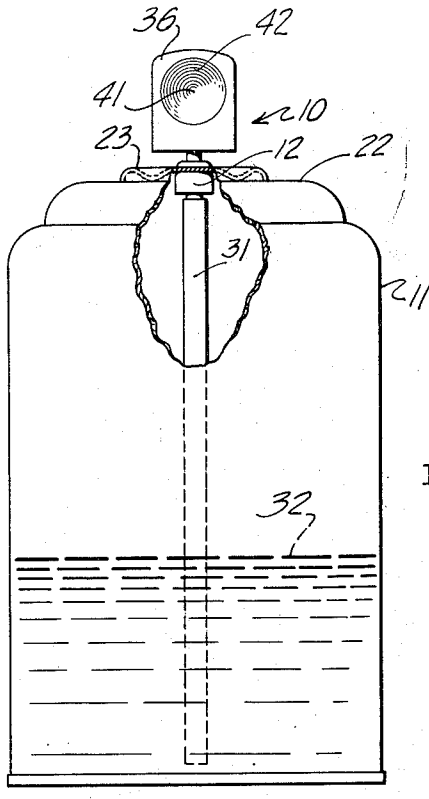


Fig. 1

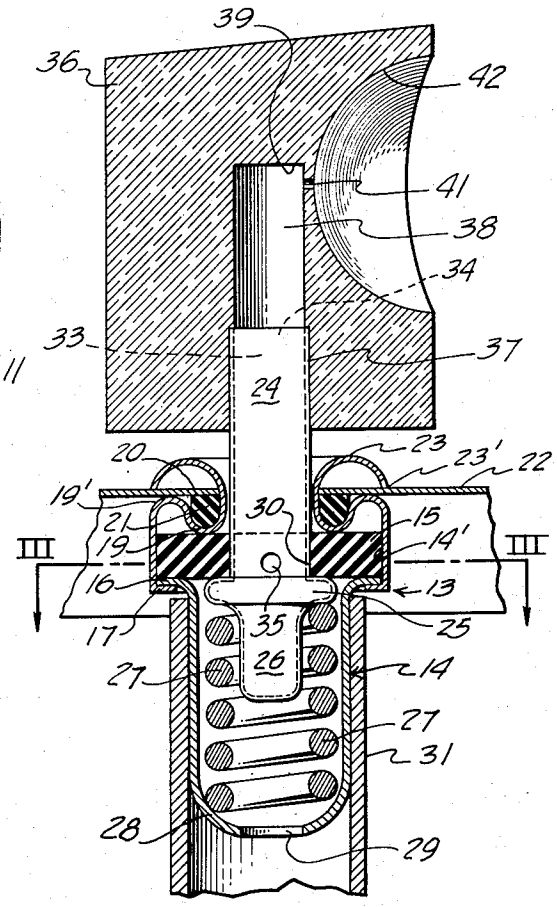


Fig. 2

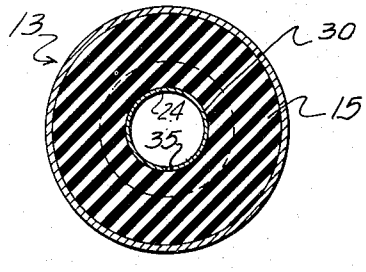


Fig. 3

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VALVE FOR AEROSOL DISPENSER

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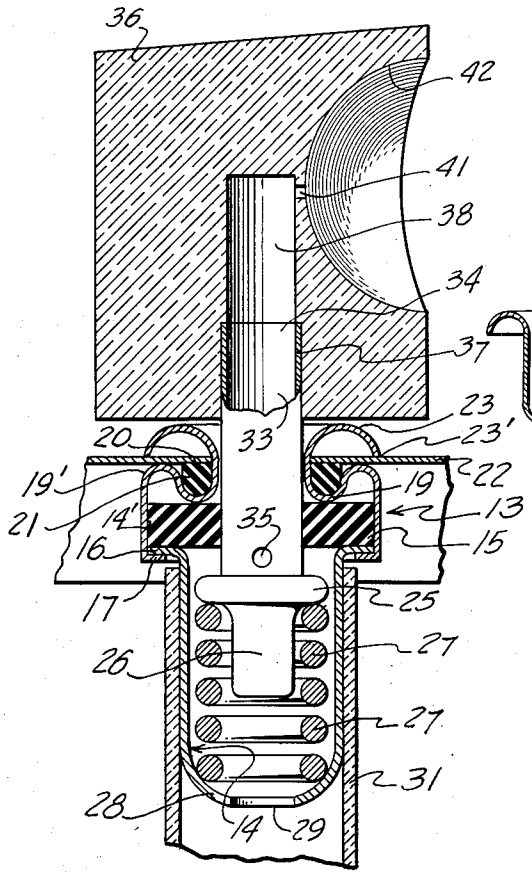
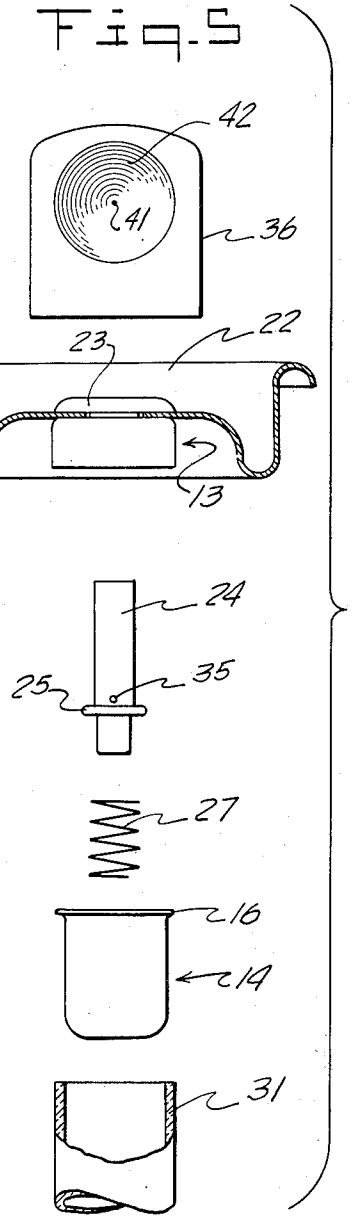


Fig. 4

Fig. 5



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VALVE FOR AEROSOL DISPENSER

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Application November 20, 1953, Serial No. 393,420

3 Claims. (Cl. 222—394)

The present invention relates to dispensers and relates more particularly to an improved valve construction to control the discharge of a solution from a container as a fine mist or aerosol spray.

As is well known, various forms of aerosol spray dispensers have been used including a container and a manually controlled valve for the discharge of a spray of finely divided material. The character of the discharge, controlled by the valve, differs with different mixtures employed. It is desirable therefore to provide a valve that will operate effectively for various aerosol products which may include airborne insecticides, deodorants, air sanitizers as well as for lacquers, waxes, paints, etc. which are discharged for deposit on a surface.

Valves of this type although in the nature of a precision instrument of diminutive proportions, must be made available at relatively low cost and of simple construction capable of meeting the demands of high speed production including fabrication of the parts and assembly into an operating unit. The finished valve unit must be positive and effective in operation and conveniently controlled with a minimum of manual effort.

An object of the present invention is to provide a valve of simple construction for dispensing or dispersing spray from a liquid under pressure.

Another object of the invention is to provide a spray dispensing valve capable of manufacture at relatively low cost and capable of convenient and effective manual operation.

Other objects and advantages of the invention will be more clearly understood by reference to the following description together with the accompanying drawings in which:

Fig. 1 is an elevational view of a container provided with a valve constructed in accordance with the present invention; the container being partly in section to expose a portion of the valve structure;

Fig. 2 is enlarged vertical cross-sectional view of the valve in closed position;

Fig. 3 is a view taken on line III—III in Fig. 2;

Fig. 4 is a view similar to Fig. 2 but shows the valve parts in position for spray discharge; and

Fig. 5 is an exploded view showing the individual valve parts.

It will be understood that the drawings showing the present discharge valve have, for the sake of clearness, been made on an enlarged scale as compared to the actual valve. Valves of the type to which the present invention relates are relatively small but by reason of the novel combination of the correlated elements the present valves operate with accuracy and reliability for the purpose intended.

One practical example of the present valve is indicated as a whole by the reference character **10** as applied to a container **11** in Fig. 1.

The valve proper or valve unit includes a sheet metal housing **12** comprising what may be termed an upper section **13** and a lower section **14**. Upper sheet metal

section **13** is cylindrical and the inner surface of the wall thereof is in contact with the edge **14'** of a sealing disk **15** of a selected resilient material which, as will be later described, serves to close a passage having the function of one element of a slide valve.

The disk **15** is held in a fixed position relative to housing **13** between an inturned flange **16** at the upper end of lower section **14** which is in contact with one surface of disk **15** and in turn is engaged by flange **17** integral with upper section **13**.

The upper surface of disk **15** is engaged by an annular boss **18**, substantially semi-circular in transverse cross-section, and formed from the sheet metal wall of housing **13**. As will be evident the shaping or forming operation to produce the boss **18** may be so regulated as to cause the boss to compress the disk between the boss and flange **16** to a selected degree. The boss **18** being of sheet metal provides an annular channel **19** to receive a resilient packing ring **21**. One edge of the packing ring is rounded to conform to and contact with the inner surface of the channel **19**. The other edge **20** of the ring **21** is flat for intimate contact with the under surface of a cover or cap **22**. The valve proper is secured to a wall of the cap **22** by a hollow annular bead **23** which is crimped to engage the outer surface of the cover wall and compress the packing ring **21** into intimate contact with the channel **19** and the wall of the cap **22**. As the packing is compressed to provide a seal the under surface of cover **22** engages an annular rib **19'** constituting a part of the wall of sheet metal section **13**. Thus when bead **23** is formed from the sheet metal wall of the housing it clamps the cover between the bead edge **23'** and the rib **19'** to secure the housing to the cover.

The housing therefore, including sections **13** and **14**, constitutes a valve casing held in fixed relation to cover **22** and in which a piston **24** is reciprocal endwise while in contact with the surface of a center bore or aperture **30** in disk **15** and in combination with disk **15** constitutes what may be termed a slide valve as hereinafter described.

The piston **24** is in the form of a drawn or swaged seamless tubular member with a stop collar **25** and a stem or extension **26** axially disposed with respect to a helical spring **27**. One end of the spring engages stop collar **25** and the other end engages bottom wall **28** of housing section **14**. Said bottom wall being provided with an inlet passage or aperture **29**. The lower section **14** of the valve housing may be cylindrical for insertion into one end of a dip tube **31** of any suitable flexible material as for example polyethylene or the like.

A mixture to be dispensed under pressure passes through aperture **29** is normally sealed against discharge by reason of the sealing relation between the piston **24** and disk **15**. This sealing contact between the piston surface and the bore **30** is made more effective by reason of the tension of spring **27** which causes stop collar to force the material of the disk into contact with boss **18** whereby the resilient material of the disk is distorted thereby increasing the degree of contact between the disk and the piston surface. Normally therefore under the action of the spring **27** the container is sealed against the escape of any material even though subjected to a substantial pressure.

The piston **24** being tubular provides a central passage or chamber **33** which extends from an orifice **34**, at one end of the piston, to a transverse or lateral passage having an inlet orifice **35** in the cylindrical wall of the piston. The orifice **35** is so positioned as to be closed by surface of aperture **30** in disk **15** when flange **25** of piston **24** is maintained in contact with one side of disk **15** under the expansive action of spring **27**. Thus the valve is closed against the discharge of pressurized mixture.

The upper end of piston **24** may be provided with a

solid body member of suitable material to serve as finger piece 36 and having pocket 37 to tightly fit the upper end of piston 24. The finger piece or press knob is formed with an internal passage 38 which may have the same diameter as the chamber of passage 33 of the piston and in axial alignment therewith and provides a continuation of the chamber 33. This passage 38 is closed at end 39 and is open to the atmosphere by means of a lateral passage 41 of reduced diameter preferably of .019 of an inch in diameter for the discharge of finely divided material. The orifice of passage 38 is disposed in concave surface 42 formed in the body member or finger piece to serve as a reflector for the dispensed material.

As set forth above the spring 27 engages stop flange 25 and holds the piston 24 in its upper position with inlet orifice 35 closed by the wall of the aperture of disk 15. Thus the escape of material under pressure is prevented. When the finger piece is moved in opposition to the action of spring 27, to move the piston 24, the orifice 35 is moved out of contact with the disk 15 to permit the passage of pressurized material to expand and pass through the expansion chamber composed of passages 33 and 38 and be discharged from orifice 41. Release of the finger piece results in a closure of the valve since under the action of the spring the piston is moved to return orifice 35 to position intermediate opposite sides of disk 15.

Although it is important to provide a valve which is readily operable for opening and closing a discharge passage, it is equally important to mount the valve in such manner that its connection to the container avoids any leaks.

It is desirable with valves of the type employed for spray discharge to locate the valve within the container to prevent damage during shipment or general handling. As shown, and pointed out above the present valve is contained in a housing comprising two united sections 13 and 14 mounted on the under side of a cover or cap 22. Thus when the cover is secured to the rim of the container the major portion of the valve proper is within the container.

With this arrangement it is necessary to effectively seal the valve housing to the cover and the present invention as shown provides a multiple seal against leakage of the container during storage.

The disk 15 while serving in conjunction with piston 24 as a slide valve also serves as a seal by contact, on its lower surface, with flange 16 of section 14 of the valve housing. This seal is augmented by a second seal effected through contact between boss 18, formed from section 13 of the valve housing, and the upper surface of disk 15. A third seal is produced by the packing ring or gasket 21 in contact with the under surface of the cover 22.

As will be evident, section 13 of the valve housing being of sheet metal may be initially cyclindrical and as it is shaped to form annular rib 19', channel 19 seats on the surface of disk 15 in effective sealing relation by compressing the disk between the wall of channel 19 and flange 16 of the lower section 14. The formation of the annular bead 23 may then be effected to compress the packing ring 21 into sealing relation with the under surface of cover 22 and to draw annular rib 19' into tight contact with the under surface of the cover 22 thereby rigidly securing the valve housing in fixed alignment relative to the cap or cover 22.

As above described the piston 24 is readily moved by finger piece 36 to open and close the inlet orifice 35. The cylindrical aperture in the resilient disk 15 through which the cylindrical piston surface moves may be of a diameter slightly less than the outside diameter of the piston to effectively close the orifice 35 when covered by the wall of the aperture. As stated hereinabove this intimate contact between the piston surface and the aperture wall is increased by the compressive force applied to opposite sides of the disk resulting from the pressure exerted by spring 27. Under the action of the spring the flange 25 is forced against the lower side of the resilient disk 15. The boss 18 at the opposite side of the disk contacts the surface thereof and resists bodily movement of the disk.

Whereas in spray discharge valves as heretofore constructed the manual actuation of the valve required an appreciable amount of effort owing to the arrangement of the valve control elements, the present valve may be actuated with a light touch of the finger on the finger piece. This is due to the present novel arrangement of the parts whereby the valve control element is a single slide member, freely movable to open and close a discharge passage.

As stated hereinabove, discharge valves employed for dispensing a fluid under pressure are of relatively small size. In fact the housing 12 of the valve such as shown and described as one embodiment of the present invention has its greatest diameter (section 13) of about .300 of an inch outside diameter. The disk 15 which is incased in housing section 13 has a thickness of about .050 of an inch. The other parts being in proportion will give an understanding as to the size of the valve. By reason of the present construction wherein the several parts are formed from sheet metal an economy of space is attained.

Furthermore it is important to provide an adequate expansion chamber. By reason of the sheet metal fabricated parts a relatively large space is, in the present case, available as an expansion chamber since the interior of the tubular piston may be used. As will be evident when considering the proportions of a valve of this type the effective utilization of the limited space available is important for successful operation.

Although a preferred embodiment of the invention is shown and described herein it is to be understood that modifications may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. A spray discharge valve for dispensing a fluid from a container, comprising a cover member for said container, said cover member having an aperture, a sheet metal tubular valve housing disposed in said aperture, one end of said housing having the wall thereof crimped to form annular surfaces for contact with opposite surfaces of said cover member to support said housing within said container, a disk of flexible material positioned in said housing and having a central aperture, a tubular member slidably fitting said disk aperture, said tubular member being closed at one end to provide a chamber, an annular flange formed from the wall of said tubular member and disposed intermediate the ends of said tubular member, a tension member for normally holding said flange in contact with one surface of said disk, said tubular member having a lateral passage in the wall thereof positioned to be closed by the wall of said disk aperture when said annular flange is in contact with said disk, the other end of said housing having an aperture for the passage of fluid to said chamber when said annular flange is moved from contact with said disk, a packing ring surrounding the perimeter of the aperture in said cover, said crimped wall of said housing retaining said packing ring in sealing relation to said cover aperture.

2. A spray discharge valve for dispensing a fluid from a container, comprising a cover member for said container, said cover member having an aperture, a sheet metal tubular valve housing disposed in said aperture, one end of said housing having the wall thereof crimped to form annular surfaces for contact with opposite surfaces of said cover member to support said housing within said container, a disk of flexible material positioned in said housing and having a central aperture, a tubular member slidably fitting said disk aperture, said tubular member being closed at one end to provide a chamber, an annular flange intermediate the ends of said tubular mem-

ber, a tension member for normally holding said flange in contact with one surface of said disk, said tubular member having a lateral passage in the wall thereof positioned to be closed by the wall of said disk aperture when said annular flange is in contact with said disk, the other end of said housing having an aperture for the passage of fluid to said chamber when said annular flange is moved from contact with said disk, a packing ring surrounding the perimeter of the aperture in said cover, said crimped wall of said housing retaining said packing ring in sealing relation to said cover aperture and with an annular surface of said wall in contact with a surface of said disk.

3. A spray discharge valve for dispensing liquid from a container comprising a resilient sealing disk, said disk having a circular aperture, a sheet metal cylindrical tubular piston reciprocal axially in contact with the wall of said aperture, said tubular piston being closed at one end and providing an expansion chamber, an inlet orifice in the wall of said piston, said piston having an annular flange formed from the wall thereof and adjacent to said

inlet orifice, a tension member for normally holding said flange in contact with one side of said disk to position said inlet orifice in contact with the wall of said disk aperture, a cover member for said container, a sheet metal housing section enclosing and supporting said disk within said container, an annular bead formed from the wall of said section for contact with one side of said cover member and an annular rib formed from the wall of said section for engaging the other side of said cover member to secure said valve to said cover, and a packing ring surrounding said piston and held in contact with a surface of said cover by said bead and rib.

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