Sept. 17, 1957 L. B. DRELL 2,806,739

VALVE AND REMOVABLE SPRAY HEAD THEREFOR

Filed May 3, 1954 2 Sheets-Sheet 1

Fig. 1

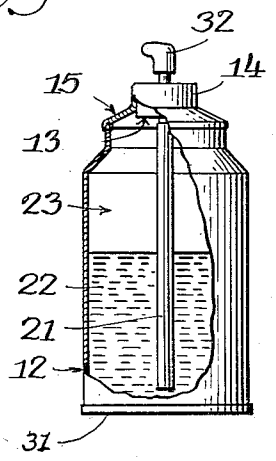



Fig. 2

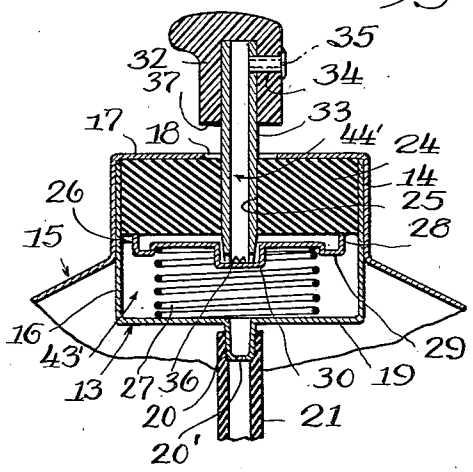



Fig. 5

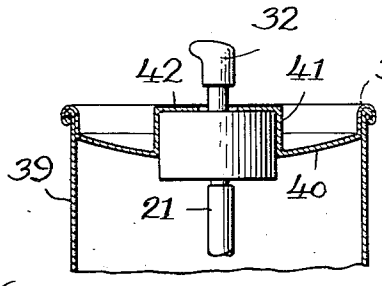



Fig. 3

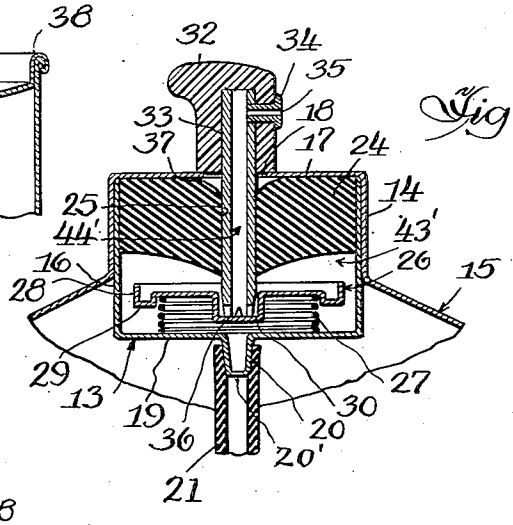
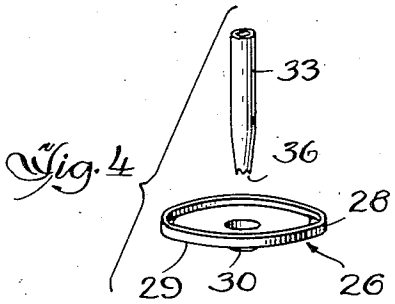



Fig. 4




Inventor,
Leonard B. Drell
By: Schneider & Dressler,
Attys.

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VALVE AND REMOVABLE SPRAY HEAD THEREFOR

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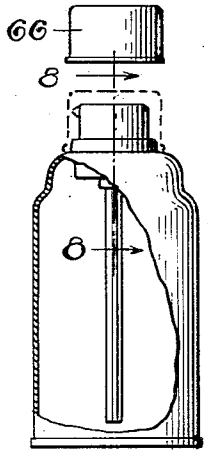



Fig. 6

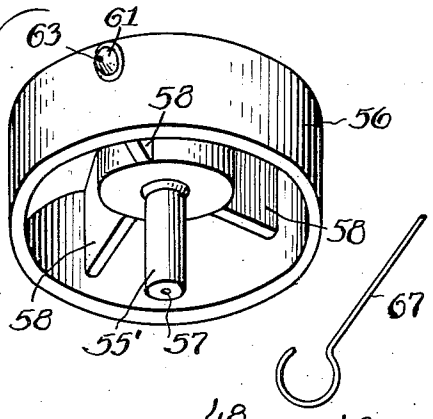



Fig. 7

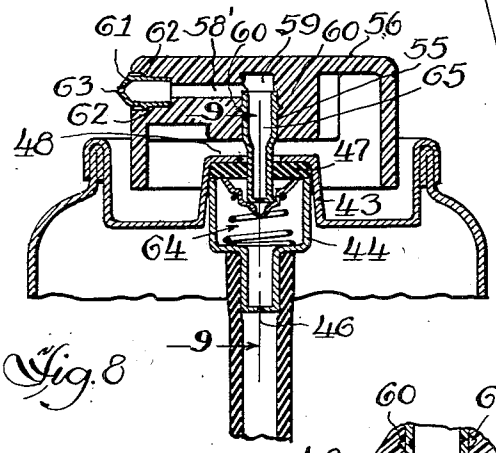



Fig. 8

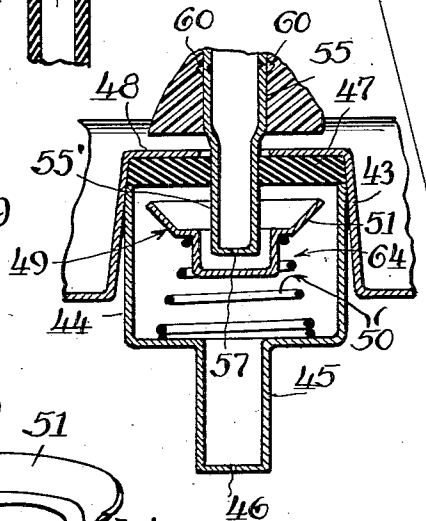
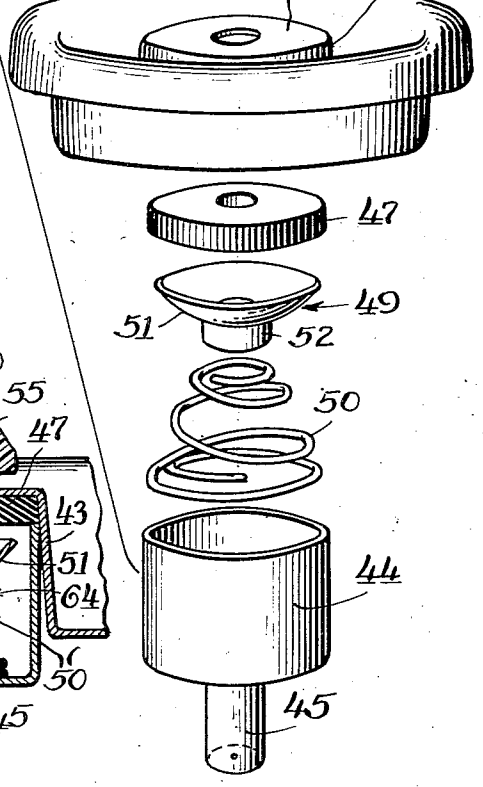



Fig. 9



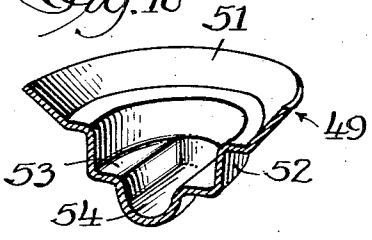




Fig. 10

Inventor,
Leonard B. Drell
By: Schneider & Dressler,
Attys.

United States Patent Office 2,806,739 Patented Sept. 17, 1957



2,806,739

# VALVE AND REMOVABLE SPRAY HEAD THEREFOR

Leonard B. Drell, Glencoe, Ill., assignor to De Mert & Dougherty, Inc., a corporation of Illinois

Application May 3, 1954, Serial No. 427,201

6 Claims. (Cl. 299—95)

This invention relates to valves for pressurized containers or "bombs" for spraying liquids and refers particularly to a self-sealing valve and a removable spray head therefor.

The present application is a continuation-in-part of my copending application, Serial No. 327,271, filed December 22, 1952, now abandoned.

Bombs of the type with which the present invention is concerned comprise a container partially filled with a liquid such as paint, varnish, insecticide, deodorant, or similar material which may be sprayed therefrom, or a foam type product such as shaving cream. The rest of the container is filled with any suitable propellant which exerts pressure against the liquid to force it through the spray head when the valve, which ordinarily seals the container, is opened.

Pressurized bombs presently in use have relatively expensive and complicated valves. In the structure embodying the present invention, few moving parts are required and the structure is both inexpensive and highly efficient.

A bomb employing the valve and spray head of the present invention may be easily and readily filled either by conventional refrigeration or pressure filling methods. After filling, the gas pressure holds the valve closed so the bomb can be sealed without an outside cap on the top. Inasmuch as the spray head is removable and need not be inserted until immediately before use, the top of the bomb may be sealed with aluminum foil or similar material that will clearly indicate tampering.

The spray heads need not be assembled with the bombs until they are to be delivered to the user. This arrangement facilitates stacking so that the bombs may be packed, shipped, stored and displayed more efficiently. It is impossible for people to try out the bomb by spraying some of its contents and the purchaser always receives a full bomb. The psychological effect of attaching the spray head in the presence of the purchaser is very advantageous in building customer good will.

The subsequent attachment of the spray head also makes it possible for a manufacturer of different types of products to use the same type valve and container for each of his products with but slight modifications for different products dispensed from the bomb. The valve of the present invention accurately controls the throughput and can be adjusted to vary the throughput when different products are used in the bomb. This is accomplished by providing an expansion chamber or chambers and restricted entrance passageways to the expansion chambers which act as metering devices to aid in adjusting the micron size of the spray. The valve is so constructed that the metering devices may be varied in size to achieve the most effective results for each product to be dispensed. The spray head orifice may also be varied in size and this orifice cooperates with the metering devices to help control the power, dispersion, micron size and wetness of the product emerging from the head. Thus the valve and spray head may be tailored for a



particular product rather than adapting the product to fit the restrictions imposed by the valve.

The valve for sealing the bomb contains a rubber gasket and a sealing means or valve seat held against the gasket by resilient means and the pressure of the gas in the bomb. The removable spray head has a dispensing tube which fits very snugly in the gasket to prevent leakage therebetween when the valve is open, and the movement of the dispensing tube is limited to prevent breaking the seal between the tube and the gasket.

The structure by which the above and other advantages of the invention are attained will be described in the following specification, taken in conjunction with the accompanying drawings illustrating preferred structural embodiments of the invention, in which:

Fig. 1 is a side elevational view of a bomb embodying the invention, with a portion of the side wall of the container broken away to show the interior structure;

Fig. 2 is an enlarged fragmentary cross sectional view of the valve and removable spray head and dispensing tube;

Fig. 3 is a view similar to Fig. 2, showing the valve in open position;

Fig. 4 is a detail perspective view of the valve seat and the dispensing tube;

Fig. 5 is a fragmentary cross sectional view showing a modified shape for the top portion of the bomb;

Fig. 6 is a side elevational view of another embodiment of the invention, with a portion of the side wall broken away to show the interior structure;

Fig. 7 is an exploded perspective view showing the various parts making up the valve and spray head of the modification shown in Fig. 6;

Fig. 8 is an enlarged fragmentary cross sectional view taken along lines 8—8 of Fig. 6 and showing the valve in closed position;

Fig. 9 is an enlarged fragmentary cross sectional view taken along lines 9—9 of Fig. 8 showing the valve in open position; and

Fig. 10 is a broken-away enlarged perspective view of the form of valve seat employed in the modification shown in Figs. 6–9.

In the drawings, referring to the embodiment shown in Figs. 1–4, the reference numeral 12 indicates a container having a valve housing comprising a lower portion 13 and an upper portion 14. The upper portion 14 is a cylindrical neck which snugly embraces lower portion 13. Portion 14 is part of container top 15 which is crimped to the body of the container. The frictional fit between the neck 14 and the side wall 16 of the lower portion 13 holds the valve housing portions in place, with the upper edge of side wall 16 abutting the underside of the top wall 17. Top wall 17 is provided with a central aperture 18 for a purpose hereinafter described. The bottom wall 19 of the valve housing is provided with a depending nipple 20 which is tapered to fit within the upper end of a dip tube 21. Nipple 20 is preferably provided with a restricted passageway or meter hold 20' which acts as a metering device and will vary in size, depending upon the product to be dispensed from the bomb. The lower portion 13 of the housing is preferably made from a single metal stamping and meter hold 20' may be readily punched therein by a suitable punch of desired diameter.

The lower end of dip tube 21 is spaced a short distance from the bottom 31 of the container so that the liquid 22 to be dispensed may be forced into the lower end of the tube by the pressure of a propellant gas sealed in the container. Any suitable propellant may be employed to dispense the liquid and such propellants are well known in the art and do not constitute a part of the present invention. The propellant may be a chlor-

inated fluorinated methane or ethane. A portion of the propellant is always present in gaseous form above the liquid level (in the area indicated by the numeral **23**) and exerts pressure on the liquid; the remainder of the propellant is in liquid form and is mixed with the liquid **22** to be dispensed.

A gasket **24**, of rubber or other suitable resilient material, is positioned in the upper end of the valve housing and is held in place by frictional contact with the side wall **16**. The gasket is provided with a centrally disposed vertical bore **25**, aligned with aperture **18**, for a purpose hereinafter described. A sealing means or valve seat **26** is normally held against the underside of gasket **24** by resilient means, preferably a coiled tension spring **27**. The valve seat may assume any suitable shape. In addition to the shape shown in the drawing in Figs. 2–4, I have found a funnel shaped valve seat to be particularly effective (see the modification shown in Figs. 7–10). The valve seat has an upstanding peripheral edge **28** which seals the outer edge of the valve seat to the gasket. The portion of the valve seat adjacent the outer edge may be shaped to form an annular flange **29** which provides a seat for the upper end of spring **27** and prevents lateral displacement thereof. The lower end of spring **27** bears against the bottom wall **19** of the valve housing. The valve seat **26** may also be provided with a centrally disposed cup **30** for a purpose hereinafter described.

The bombs as above described may be filled in accordance with conventional methods and shipped and stored in the condition described. A spray head **32** having a downwardly extending dispensing tube **33** is required to operate the valve, but need not be inserted until the bomb is ready to be discharged. By shipping and/or storing the bombs without attached spray heads, the possibility of accidental discharge is eliminated.

The spray head **32** and dispensing tube **33** may be made in one piece or two pieces which are secured together as a unit. This unit may be formed of metal, or a plastic such as polyethylene, or other suitable material. If made of polyethylene, since polyethylene cannot be accurately drilled, the spray head is provided with a plug insert **34**, having a discharge orifice **35**. If the insert is made of metal, discharge orifice **35** is punched directly into the metal. The size of the orifice will vary, depending upon the product to be dispensed, but for products which are to be sprayed, orifice **35** is of restricted dimensions relative to the interior of dispensing tube **33**. Orifice **35** cooperates with passageway **20'** in controlling throughput through the valve.

The lower end of dispensing tube **33** is provided with a passageway through the tube wall, as for example by one or more serrations, as indicated at **36**, to allow for the flow of fluid and to prevent tube **33** from being sealed against the surface of the cup **30**. This structure also insures immediate communication between the interior of tube **33** and the contents of the container, whenever the valve seat is disengaged from the gasket.

The outside diameter of tube **33** and the diameter of cup **30** are so dimensioned that the lower end of the tube is always centered in the cup. The vertical bore **25** of gasket **24** is slightly smaller than the outside diameter of dispensing tube **33** which is forced therethrough. The tight fit between the dispensing tube **33** and the bore **25** prevents any liquid from leaking therebetween when the valve is open.

The interior of the housing below gasket **24** is large and constitutes an expansion chamber **43'** into which the product to be dispensed must pass after it travels through meter hole **20'**. The interior of dispensing tube **33** will constitute a second expansion chamber **44'**, when the lower portion of tube **33** is restricted, as for example by making serrations **36** very small.

Expansion chambers **43'** and **44'** are of particular importance where the product must be dispensed in a fine spray of minute particle size. For example, in dispensing an insecticide the spray is preferably an aerosol of colloidal dimensions and this is achieved by forcing the insecticide through meter hole **20'**, into expansion chambers **43'** and **44'** and then outwardly through orifice **35** into the atmosphere. It is manifest that the sizes of passageway **20'** and orifice **35** may be varied to obtain a proper particle size for the particular produce to be dispensed. Thus, if a protective coating such as paint is to be dispensed, the sizes of passageway **20'** and orifice **35** will be selected to obtain proper surface coverage without running; or if a foam type product is to be dispensed, meter hole **20'**, serrations **36** and orifice **35** will preferably each be made larger to permit a foam to be emitted at a suitable rate. The selection of proper sized openings for the meter hole **20'**, serrations **36** and orifice **35** are readily determined by those skilled in the art.

When a product is to be dispensed from the bomb, the spray head **32** is pressed down as far as it will go. The downward movement of the dispensing tube causes the rubber gasket to stretch, as shown in Fig. 3, so that its central portion is pulled down with the dispensing tube without breaking the seal between the dispensing tube and the gasket. If the dispensing tube were moved downwardly far enough, it would slide relative to the rubber and the seal would be broken. To insure the maintenance of a seal, the bottom edge **37** of the spray head is spaced from top wall **17** a distance which is less than the distance the rubber gasket **24** will stretch without breaking the seal between the gasket and the dispensing tube. Bottom **37** abuts the top wall **17** to prevent movement of the dispensing tube relative to the gasket sufficient to break the seal.

The downward movement of the dispensing tube that is permitted is sufficient to cause the lower end of the dispensing tube to press the valve seat **26** downwardly, against the pressure of the propellant gas and the spring **27**, out of sealing engagement with gasket **24**. Any downward movement which causes edge **28** to disengage from the gasket is sufficient to open the valve and when this occurs, as shown in Fig. 3, the gas **23** forces liquid **22** upwardly and outwardly through tube **21**, orifice **20'**, expansion chambers **43'** and **44'** and discharge orifice **35**. The pressure of the gas in the bomb is maintained by evaporation of liquid propellant. When the finger pressure is released from the spray head the pressure of the gas and spring **27** forces the valve seat **26** upwardly, sealing peripheral edge **28** against gasket **24** and instantly stopping the discharge through orifice **35**.

It will be noted that expansion chamber **43'** is positioned below valve seat **16** so that when the valve is closed (Fig. 2) expansion chamber **43'** is not exposed to the atmosphere. This prevents solids dissolved in liquid **22** from oxidizing inside the valve and clogging the valve, and this is particularly important when products such as paints or resins are being used. In my structure, the only parts exposed to the air when the valve is closed are the spray head and dispensing tube and in the event that tube **33** or orifice **35** should become clogged, these parts may be readily removed and cleaned in a suitable solvent and/or by mechanical means such as a needle.

In the embodiment of Fig. 5 the valve structure is the same as in the other embodiment and is not specifically described. The only difference between the two embodiments is that in Fig. 5 the top **38** of the container **39** is depressed, as indicated at **40**, and then extends upwardly to form a cylindrical neck **41**, similar to neck **14**. The neck **41** terminates in a horizontal flange **42** flush with the upper edge of the side wall of the container and is provided with a centrally disposed aperture similar to aperture **18**. The container of Fig. 5 is easier to stack than the container shown in Figs. 1–3.

The embodiment shown in Figs. 6–10 is particularly useful for dispensing paints and other protective and decorative coatings that have a tendency to clog other valves and spray heads. It may be employed with equal

efficiency, however, in the spraying of any other product, including foams.

As in the other embodiments, the container top is provided with a cylindrical neck 43 which forms the upper portion of the valve housing and frictionally engages the lower portion 44 of the valve housing. A nipple 45 depends downwardly from the valve housing and is provided with a meter hole 46. The meter hole may be varied in size to accommodate different products. A resilient gasket 47 is positioned in the upper portion of the housing.

A sealing means or valve seat 49 is normally held against gasket 47 by a tension spring 50 and also by the pressure of the propellant within the container. The valve seat has a peripheral edge 51 and a depending cup 52. The bottom 53 of the cup is provided with a trough 54 extending downwardly therefrom (see Fig. 10). Valve seat 49 is disengaged from gasket 47 by downward pressure on spray head 56 which is attached to dispensing tube 55.

The lower end 55' of the dispensing tube is of reduced dimension and is smaller in diameter than the inside diameter of cup 52. Entrance into the dispensing tube is provided through meter hole 57 in the bottom wall of the dispensing tube and the meter hole may be varied in size, depending upon the product to be propelled from the container. The dispensing tube seats on the cup bottom 53, with meter hole 57 over trough 54. The trough is narrower than the bottom of the dispensing tube to provide a firm seat, but is also longer than the diameter of the lower portion 55' to insure immediate communication between the interior of the dispensing tube and the contents of the container whenever the valve seat is disengaged from the gasket. This structure also enables the container to be easily filled through the valve by conventional pressure filling means. In the event that the valve seat 49 is forced downwardly into contact with nipple 45 during the pressure filling operation, the trough, which is slightly longer than the interior diameter of the nipple, prevents the valve seat from sealing off meter hole 46.

Spray head 56 may be made of any suitable material, but is preferably molded from a suitable plastic such as polyethylene. The shape of the spray head is unimportant; if fabricated as shown in Figs. 6–9, the spray head is preferably provided with a plurality of reinforcing ribs 58. One of the ribs contains a horizontal passageway 58'. A vertical passageway 59 communicates with passageway 58'. Tube 55 is frictionally engaged in passageway 59. Nibs 60 serve to firmly secure tube 55 so that when the spray head is removed from gasket 47, tube 55 will remain in place in the spray head, as shown in Fig. 7. Tube 55 may be rather easily removed from the spray head, if desired. This is advantageous for cleaning purposes and also allows for the substitution of dispensing tubes with different orifice sizes to accommodate various products.

Product is dispensed outwardly from the spray head through nozzle 61 which is frictionally engaged in passageway 58' and more firmly secured therein by means of nibs 62. The nozzle is provided with an orifice 63. The size of orifice 63 will vary with the product to be propelled from the container; for spray products the orifice will be small while in the case of foams, the orifice will be large, or the nozzle may even be eliminated. For spray products I have found that a cone-shaped nozzle, as shown, is particularly effective in giving a more uniform spray pattern and also in preventing drip down the side of the container.

When a spray product is to be dispensed through the valve of the present invention, orifice 63 and meter holes 46 and 57 are made small. This creates a first expansion chamber 64 in the housing between meter holes 46 and 57 and a second expansion chamber 65 in the spray head and dispensing tube between meter hole 57 and orifice 63. The presence of two expansion chambers and the variability of orifice size at the inlet and outlet of each expansion chamber allows for complete control of spray from the valve and uniformity of spray pattern and particle size for any product, heretofore unobtainable. The shape of nozzle 63 assists in this uniformity.

When employed for the spraying of paints or similar protective and decorative coatings, the valve is much more efficient than valves heretofore known in the art. A uniform spray pattern is obtained and paint may be easily applied without running. Expansion chamber 64 is never exposed to the atmosphere, and paint cannot harden therein. While a protective cover 66 (Fig. 6) may be placed over the spray head, such covers are never air tight and as a result the spray head and dispensing tube are exposed to the atmosphere. The spray head and dispensing tube, however, are easily removed from the valve and from one another and these parts may be readily cleaned in a solvent or by means of a pointed object, for example a wire 67 that can be attached to the dispensing tube when the valve is assembled. Furthermore, meter holes 46 and 57 and orifice 63 are punched through a single relatively narrow thickness of material so that there is little surface to which the paint can adhere to clog these openings. Normally, the pressure within the container is sufficient to blow out any paint collecting at these points.

Although I have described certain embodiments of my invention in considerable detail, it will be understood that the description thereof is intended to be illustrative rather than restrictive, as many details may be modified or changed without departing from the spirit or scope of my invention. Accordingly, I do not desire to be restricted to the exact construction described, except as limited by the appended claims.

I claim:

1. A valve for pressurized containers comprising a housing having a restricted inlet at the bottom and an outlet at the top, an annular gasket in said housing adjacent said outlet, a sealing means below said gasket, said sealing means having an annular rim and a depending cup, a trough in said cup, means normally acting against said sealing means to press said rim into sealing relationship with said gasket and thereby close the said outlet, a spray head having a depending tube passing through the opening in said gasket and being seated on said cup over said trough, the external diameter of said tube being less than the internal diameter of said cup and the length of said trough, said tube having a meter hole in its bottom wall normally positioned over said trough, said spray head having a restricted discharge orifice, the area between said restricted inlet and said meter hole constituting a first expansion chamber, the area between said meter hole and said restricted discharge orifice constituting a second expansion chamber, whereby downward movement of said spray head forces said tube against said sealing means and thereby moves it and said annular rim out of sealing engagement with said gasket to provide communication between said first and second expansion chambers.

2. A valve for pressurized containers comprising a housing having a restricted inlet at the bottom and an outlet at the top, an annular gasket in said housing adjacent said outlet, a sealing means below said gasket, said sealing means having an annular rim and a depending cup, a trough in said cup, means normally acting against said sealing means to press said rim into sealing relationship with said gasket and thereby close the said outlet, a spray head having a depending tube passing through the opening in said gasket and being seated on said cup over said trough, the external diameter of said tube being less than the internal diameter of said cup and the length of said trough, said tube having a meter hole in its bottom wall normally positioned over said trough, said spray head having a cone shaped nozzle and a restricted discharge

orifice at the apex of said nozzle, the area between said restricted inlet and said meter hole constituting a first expansion chamber, the area between said meter hole and said restricted discharge orifice constituting a second expansion chamber, whereby downward movement of said spray head forces said tube against said sealing means and thereby moves it and said annular rim out of sealing engagement with said gasket to provide communication between said first and second expansion chambers.

3. A valve for pressurized containers comprising a housing having a restricted inlet at the bottom and an outlet at the top, an annular gasket in said housing adjacent said outlet, a sealing means below said gasket, said sealing means having an annular rim and a depending cup, a trough in said cup, means normally acting against said sealing means to press said rim into sealing relationship with said gasket and thereby close the said outlet, a spray head having a depending tube passing through the opening in said gasket and being seated on said cup over said trough, said tube being in frictional engagement with both said gasket and said spray head and being removable from each, the external diameter of said tube being less than the internal diameter of said cup and the length of said trough, said tube having a meter hole in its bottom wall normally positioned over said trough, said spray head having a cone shaped nozzle and a restricted discharge orifice at the apex of said nozzle, the area between said restricted inlet and said meter hole constituting a first expansion chamber, the area between said meter hole and said restricted discharge orifice constituting a second expansion chamber, whereby downward movement of said spray head forces said tube against said sealing means and thereby moves it and said annular rim out of sealing engagement with said gasket to provide communication between said first and second expansion chambers.

4. A valve for pressurized containers comprising a housing having an inlet at the bottom and an outlet at the top, an annular gasket in said housing adjacent said outlet, a sealing means below said gasket, said sealing means having an annular rim and a depending cup, a trough in said cup, means normally acting against said sealing means to press said rim into sealing relationship with said gasket and thereby close the said outlet, a spray head having a depending tube passing through the opening in said gasket and being seated on said cup over said trough, said tube being in frictional engagement with said gasket and being removable therefrom, the external diameter of said tube being less than the internal diameter of said cup and the length of said trough, said tube having a passageway in its bottom, said spray head having a discharge orifice in communication with the interior of said tube, whereby downward movement of said spray head forces said tube against said sealing means and thereby moves it and said annular rim out of sealing engagement with said gasket to provide communication between said inlet and said discharge orifice.

5. A valve for pressurized containers comprising a housing having an inlet at the bottom and an outlet at the top, an annular gasket in said housing adjacent said outlet, a sealing means below said gasket, said sealing means having an annular rim and a depending cup, a trough in said cup, means normally acting against said sealing means to press said rim into sealing relationship with said gasket and thereby close the said outlet, a spray head having a depending tube passing through the opening in said gasket and being seated on said cup over said trough, the external diameter of said tube being less than the internal diameter of said cup and the length of said trough, said tube having a passageway in its bottom, said spray head having a discharge orifice in communication with the interior of said tube, whereby downward movement of said spray head forces said tube against said sealing means and thereby moves it and said annular rim out of sealing engagement with said gasket to provide communication between said inlet and said discharge orifice.

6. A valve for pressurized containers comprising a housing having an inlet at the bottom and an outlet at the top, an annular gasket in said housing adjacent said outlet, a sealing means below said gasket, said sealing means having an annular rim and a depending cup, a trough in said cup, means normally acting against said sealing means to press said rim into sealing relationship with said gasket and thereby close the said outlet, a spray head having a depending tube passing through the opening in said gasket and being seated on said cup over said trough, said tube having a passageway in its bottom, said trough extending past an edge of said tube bottom to provide communication between said cup and the passageway in said tube bottom, said spray head having a discharge orifice in communication with the interior of said tube, whereby downward movement of said spray head forces said tube against said sealing means and thereby moves it and said annular rim out of sealing engagement with said gasket to provide communication between said inlet and said discharge orifice.

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