# United States Patent

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[72] Inventors **Samuel Prussin**
**Los Angeles;**
**Jimmie L. Mason, Hacienda Heights,**
**California**



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[73] Assignee **Dart Industries Inc,**
**Los Angeles, California**
**a corporation of Delaware**


[54] **FLUIDS DISPENSING VALVE WITH FLEXIBLE DIAPHRAGM FOR NOZZLE**
**5 Claims, 8 Drawing Figs.**


[52] **U.S. Cl.** ..... **222/402.21**
[51] **Int. Cl.** ..... **B65d 83/00**
[50] **Field of Search** ..... 222/402.1, 402.13–402.19, 402.2, 402.21–.23, 136, 193, 394



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*Primary Examiner*—Stanley H. Tollberg
*Attorney*—Harold R. Beck



**ABSTRACT:** A fluids dispensing valve disposed to dispense fluids from an aerosol container and having a housing supported in a conventional container cap and a relatively movable fluids dispensing nozzle extending from the housing and outwardly through the cap; said fluid dispensing nozzle having an integral flexible diaphragm sealingly fixed relative to the cap and the valve housing and adapted to provide a seal while also maintaining a flexible connection of the fluid dispensing nozzle and the container cap and valve housing.

This invention relates to a fluids dispensing valve, and more particularly, to a fluids dispensing valve for use with aerosol containers, wherein a fluids dispensing nozzle is provided with an integral diaphragm serving as a flexible support for the nozzle to allow movement thereof for actuating an aerosol valve, and at the same time, to provide a seal around the perimeter of the nozzle to prevent leakage of fluid therearound when the nozzle is used to actuate said fluids dispensing valve.

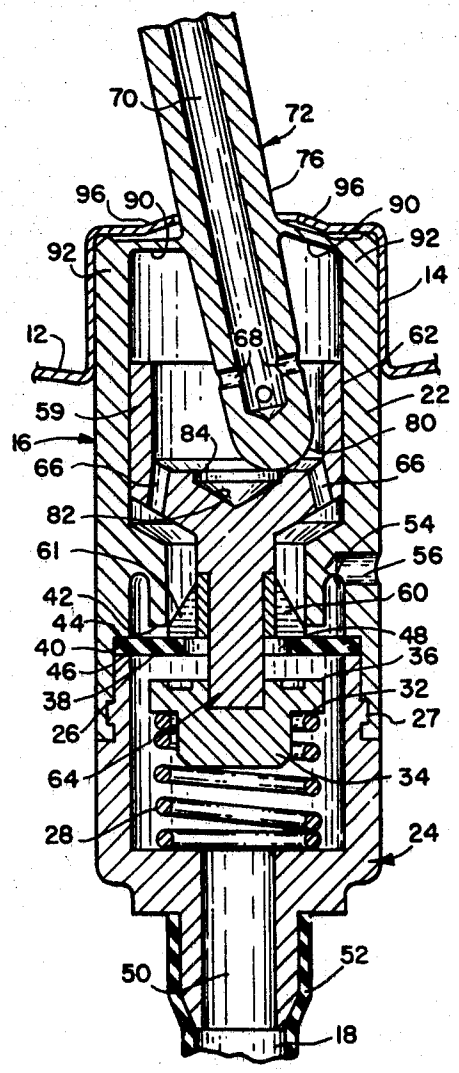



FIG. 1.

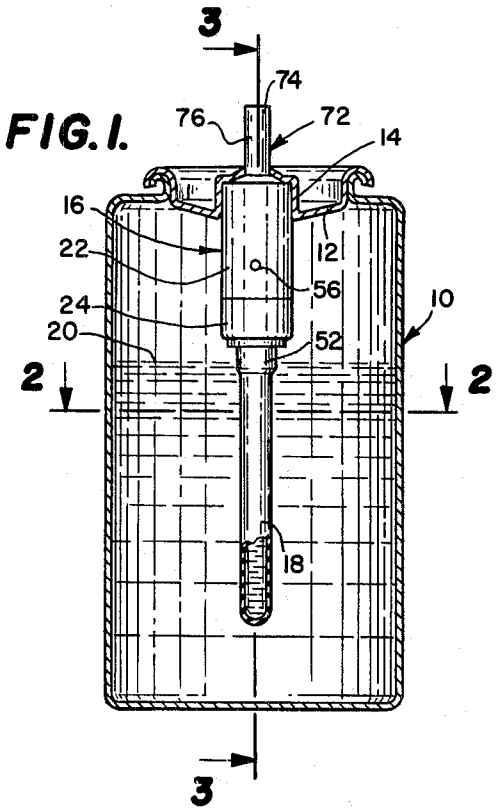
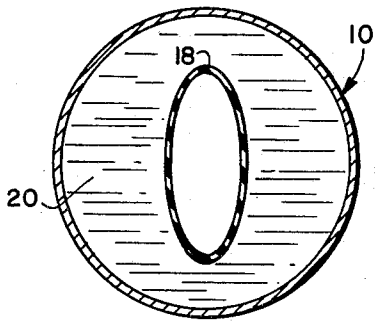



FIG. 2.



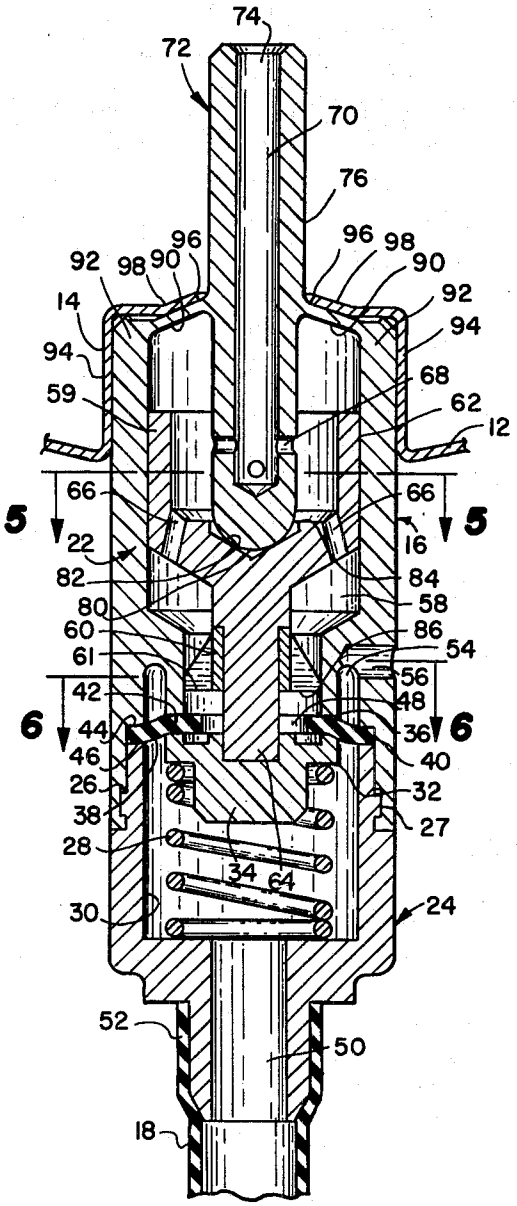
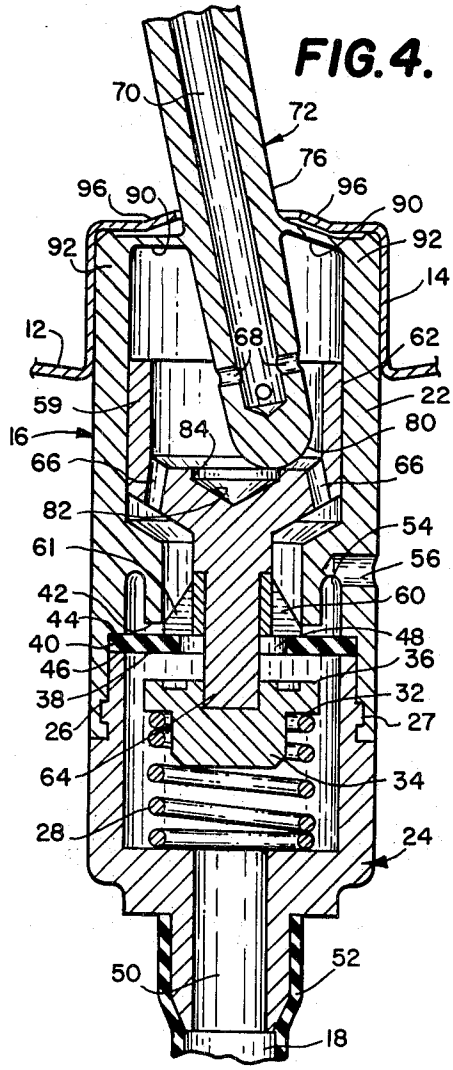




FIG. 3.

FIG. 4.



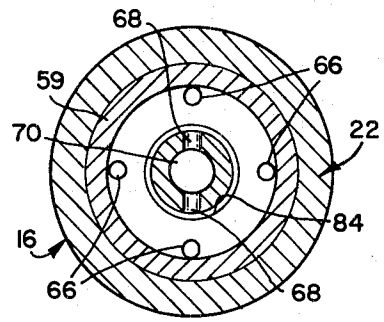




FIG. 5.

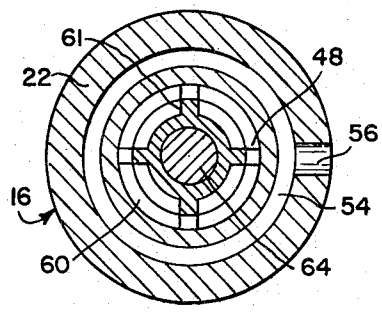



FIG. 6.

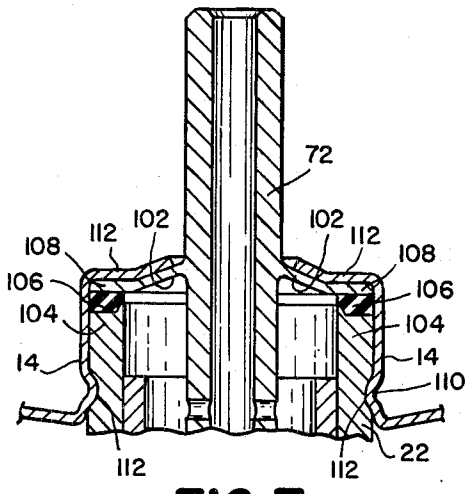



FIG. 7.

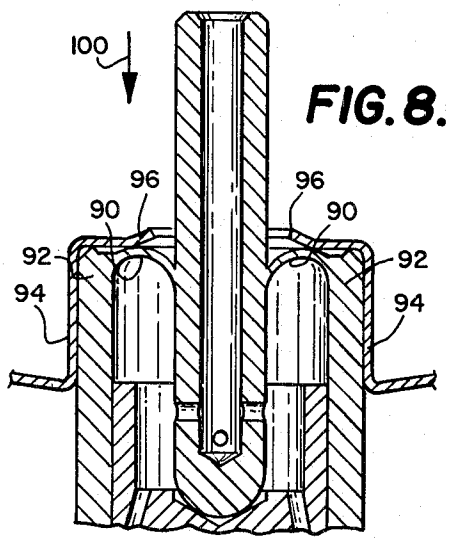



FIG. 8.

# FLUIDS DISPENSING VALVE WITH FLEXIBLE DIAPHRAGM FOR NOZZLE

## BACKGROUND OF THE INVENTION

In various aerosol fluids dispensing valves nozzles, projecting from aerosol containers, are generally movable by the operator in order to actuate a fluids dispensing valves internally of the container in order to dispense fluids through the valve and through the respective nozzles.

In prior art structures, a hollow tubular nozzle has been movably mounted through a seal washer which is compressively engaged with the perimeter of the hollow tubular nozzle in order to prevent leakage of fluids outwardly therearound while the fluids are being dispensed through the nozzle to a location externally of the respective container. Many of the prior art nozzles are tiltable to an axially angular disposition relative to the normal axis thereof and some of the prior art fluids dispensing nozzles are movable axially inward and outward relative to container caps and respective valve housings of aerosol dispensing containers.

In some instances, surrounding seal washers merely flex when the nozzles are tilted to an angular axial position, and in some instances, the nozzle slides through a central opening in the conventional seal washer, however, leakage around such prior art dispensing nozzles at the juncture thereof with a seal washer, which frictionally engages the periphery thereof, has created various problems. The leakage of some aerosol fluids around the dispensing nozzles tends to accumulate and cause various undesirable conditions externally of the respective container cap.

## SUMMARY OF THE INVENTION

The present invention relates to a novel fluids dispensing valve, wherein a hollow tubular fluids dispensing nozzle is provided with an integral diaphragm seal structure. This diaphragm seal structure is flexible and extends radially outward from the hollow tubular dispensing nozzle and surrounds the same and is sealingly fixed to a respective container cap and/or a respective valve housing which contains a valve normally actuated by the fluids dispensing nozzle. In accordance with one species of the invention, the flexible diaphragm which is integral with the hollow tubular fluids dispensing nozzle is also integral with a surrounding valve body which contains a valve adapted to be actuated by the fluids dispensing nozzle. And in accordance with another species of the invention, the perimeter of the foregoing flexible diaphragm, which is integral with the fluids dispensing nozzle, is sealingly secured at its periphery to the container cap and to valve housing wherein a valve is actuated by said fluids dispensing valve. In accordance with the last mentioned species of the invention, a compressible seal gasket is compressively engaged with the respective valve housing and the perimeter of the flexible diaphragm. These elements are held compressively engaged by means of an indented portion of the container cap engaging a corresponding groove in the perimeter of the respective aerosol valve housing in which the said nozzle and integral diaphragm are mounted.

The hollow tubular valve actuating fluids dispensing nozzle of the invention, having an integral radially and outwardly directed diaphragm which surrounds the nozzle, provides for flexible support of the nozzle during movement relative to the valve housing and during actuation of a fluids dispensing valve, while at the same time, providing an efficient seal surrounding the fluids dispensing nozzle.

Accordingly, it is an object of the present invention to provide a very simple and economical fluids dispensing nozzle and diaphragm seal structure, wherein the diaphragm seal structure is flexible and sealingly secured to an aerosol container cap and valve housing.

Another object of the invention is to provide an aerosol valve having a novel hollow tubular dispensing nozzle and integral surrounding flexible diaphragm seal which readily permits easy actuation of a dispensing valve by movement of the dispensing nozzle due to the flexibility of the diaphragm seal, and which at the same time, insures against leakage at an area directly surrounding the fluids dispensing nozzle at its movable portion in relation to an aerosol container cap and valve housing.



Further objects and advantages of the invention may be apparent from the following specification, appended claims and accompanying drawings:

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an axial sectional view of a pair of fluids dispensing containers disposed in concentric relation with each other and showing a fluids dispensing valve of the invention in connection therewith;

FIG. 2 is a plan sectional view taken from the line 2–2 of FIG. 1;

FIG. 3 is an enlarged axial sectional view of the fluids dispensing valve of the invention taken from the line 3–3 of FIG. 1, showing novel fluids dispensing nozzle and diaphragm seal structure of the invention and showing the respective fluids dispensing valve in closed position;

FIG. 4 is a view similar to FIG. 3, showing the fluids dispensing nozzle of the invention and its integral diaphragm disposed to hold an aerosol valve in open position, and showing the diaphragm portion, which is integral with the fluids dispensing nozzle, in flexed position;

FIG. 5 is a sectional view taken from the line 5–5 of FIG. 3;

FIG. 6 is a sectional view taken from the line 6–6 of FIG. 3;

FIG. 7 is a fragmentary sectional view similar to FIG. 3, but showing a modification of the invention; and

FIG. 8 is a sectional view similar to FIG. 4, but showing the nozzle and integral diaphragm structure of the invention flexed in a different direction than that as shown in FIG. 4 to permit axial actuation of the nozzle rather than tiltable actuation thereof as shown in FIG. 4.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The dispensing nozzle and integral diaphragm seal structure of the invention is usable with a great variety of fluids dispensing valves which may be operated either by tiltable action of the nozzle or by axial movement thereof, and in accordance therewith, the following description of the valve mechanism is only by way of example.

An outer hollow container **10** is provided with an enclosure end structure **12** of substantially conventional form. Supported in the central portion **14** of the enclosure end structure **12** is a valve housing **16** of the invention. Carried by the valve housing **16** is an inner container **18** which is of generally collapsible character. This container **18** may be of thin flexible plastic material and may collapse in response to pressure of fluid **20** in the outer container **10**.

The valve housing **16** and the valve structure of the invention contained therein are shown on a large scale in FIG. **3** of the drawings. The valve housing **16** is preferably constructed of plastic or other suitable material and includes a pair of axially concentric housing parts **22** and **24** which are telescopically connected together at **26**. The housing portion **24** is provided with a cylindrical male portion fitted in a hollow cylindrical female portion of the housing part **22**. These parts, at the telescopic connection **26**, are interlocked by suitable annular ridge and groove structure **27** which is deflectably snapped together so that the housing parts **22** and **24**, when assembled, are capable of withstanding substantial axial pressure of a valve operating spring **28** supported in a hollow bore portion **30** of the housing part **24**. This spring **28** bears on an annular ridge **32** of a poppet valve member **34**, tending to hold an annular valve portion **36** of the poppet valve member **34** against a first side **38** of a flexible valve element **40**. This flexible valve element **40** is substantially annular in form and is provided with opposite sides, one of which is engagable by the annular valve portion **36** of the poppet valve **34**, and the other of which is engaged by a stationary annular seat portion **42**

disposed within the interior of the housing part 22, as will be hereinafter described in greater detail.

A peripheral portion of the flexible valve element 40 is securely clamped between opposed ledges 44 and 46 of the housing parts 22 and 24, respectively.

The spring 28 being a compression spring tends to force the annular poppet valve portion 36 against one side of the flexible valve element 40 and to thus deflect it such that the opposite side of the flexible valve element 40 is securely and sealingly engaged with the annular seat 42 of the housing part 22.

The flexible valve element 40 is provided with a central opening 48 which forms a fluid passage, as will be hereinafter described in detail.

The housing part 24 is provided with a hollow passage neck 50, around which an open end portion 52 of the collapsible container 18 is fitted. Thus, the hollow portion 50, together with the bore 30 of the housing part 24, forms a passage means communicating with the same side of the flexible valve element 40 that is engaged by the annular valve portion 36 of the poppet valve 34.

The housing part 22 is provided with an annulus 54 therein which also communicates with a port 56 in the side wall of the housing part 22. The port 56 and the annulus 54 provides communication of fluids in the outer container 10 with a side of the flexible valve element opposite to that communicating with the bore 30 of the housing part 24. Thus, separate fluid passage means communicate with opposite sides of the flexible valve element 40 to conduct separate fluids, one of which flows between the annular valve portion 36 of the poppet valve 34 and the flexible valve element 40; and the other which flows between the seat 42 and the flexible valve element.

The fluid which flows from the container 18 through the hollow passage 50, bore 30, and over the annular valve element 36 also flows through the opening 48 in the flexible valve element, as indicated by arrows in FIG. 3. The fluids then flow into an outlet area of the housing part 22, this area being generally indicated at 58. A valve actuator 59 is mounted in the area 58 and provided with a sleeve 60 having a plurality of radial guide fins 61 and an enlarged peripheral portion 62 for maintaining axial alignment of the actuator 59 with the flexible valve element 40. A lower stem portion 64 carries the poppet valve member 34, and thus, this poppet valve member 34 is maintained in axial alignment with the flexible valve element 40 and the seat 42.

As shown in FIG. 6 of the drawings, the fins 61 are radially disposed and spaced apart to permit flow of fluids from the annulus 54 and the bore 30 upwardly into the outlet area 58, wherein the actuator member 59 is provided with openings 66 through which the fluids may flow subsequently to gain access to openings 68 through which the fluids successively flow into a bore 70 of a dispensing nozzle 72. This nozzle is tiltably or axially movably mounted, as will be hereinafter described. This nozzle 72 is provided with an open end 74 through which fluids may ultimately be dispensed to a use area.

The normally inner end portion of the nozzle member 72 is provided with spherical cam surface 80 bearing in a recessed cam surface 82 of the valve actuator 59. This recess 82 is provided with an upstanding ledge 84.

This ledge 84 is annular and is adapted to be engaged by a central portion of the spherical cam surface 80, as shown in FIG. 4 of the drawings, and to cause the valve actuator 59, together with the poppet valve 34 to be moved into the position, shown in FIG. 4. In this position, the annular valve portion 36 is moved away from the flexible valve element 40 to permit fluids under pressure, in the bore 30 and the annulus 54, to cause the flexible valve element 40 to seek an intermediate position between the spaced apart annular valve portion 36 and the seat 42. In this manner, the flexible valve element 40 seeks a substantially centered position between the seat 42 and the annular valve portion 36 to allow substantially equal amounts of the respective fluids in the bore 30 and the annulus 54 to flow at opposite sides of the flexible valve element 40. Thus, the invention accomplishes concurrent proportional dispensation or flow of the separate fluids at opposite sides of the flexible valve element 40, this flow then proceeds such that one of the fluids passes through the opening 48, as hereinbefore described, in the flexible valve element 40, and both fluids then pass into the outlet area 58 in which the actuator 59 is disposed.

It will be appreciated that when the poppet valve member 34 is moved into partially open position or fully opened position, that the flexible valve element, due to fluid pressure on opposite sides thereof, will seek an intermediate position between the seat 42 and the annular valve element 36, regardless of the degree to which the valve is opened, and therefore, the valve will provide for concurrent proportional flow of the separate fluids at opposite sides of the flexible valve element, regardless of the degree of opening of the valve.

It will be appreciated, however, that when the spherical portion 80 of the nozzle member 76 engages the annular edge 84 of the valve actuator 59, that the valve may be forced to a completely open position, and that the ends 86 of the fins 60 may pass down to and in engagement with the flexible valve element 40 to force it away from the seat 42 at a distance equal to approximately one-half of the actuating distance of the poppet valve 34. Thus, rapid or snap action opening operation of the valve may be accomplished to actuate the flexible valve element 40 away from the seat 42, if desired.

The aerosol dispensing valve structure, as hereinbefore described, is by way of example only with respect to the subject matter of the present invention, which involves a flexible diaphragm nozzle support and seal which is integral with a fluids dispensing nozzle and which is operable either tiltably or axially to actuate a valve mechanism such as any well known or conventional valve mechanism which is operable by use of a manually tiltable or axially movable nozzle structure.

Referring to FIGS. 3, 4 and 8, it will be seen that the nozzle 72 of the invention is provided with an integral flexible diaphragm structure 90 which is also integral with a normally upper end portion 92 of the valve body portion 22. This valve body portion 22 is substantially larger in diameter than the periphery 76 of the nozzle 72, and the diaphragm structure therefore extends radially outward and in a surrounding relation with the periphery 76 of the nozzle 72 to its integral relation with the valve housing portion 92.

The valve housing portion 22 is secured in a substantially cup-shaped portion 94 of the container cap, and this cup-shaped portion 94 is normally inverted when the container 10 is in normal upright position, as shown in FIG. 1. The normally upper portion of the cup-shaped portion 94 is provided with a central opening 96 which is slightly larger than the perimeter 76 of the nozzle 72 in order to allow the nozzle to flex angularly, as shown in FIG. 4, relative to its normal axis. The opening 96 being surrounded by a slightly conical portion 98 of the cup-shaped portion 94, and this slightly conical portion 98 normally supports the flexible diaphragm portion 90 in a slightly conical disposition, as shown in FIG. 3 of the drawings.

The hollow tubular nozzle 72, together with the diaphragm portion 90 and the housing part 22, may be molded in one piece and of suitable plastic material which has tough flexible character to allow normal flexing of the diaphragm portion 90 when the nozzle 72 is movably actuated. It will be seen that the nozzle 72 may be tiltably actuated, as shown in FIG. 4, or it may be axially moved in accordance with the direction of an arrow 100, as shown in FIG. 8 of the drawings, in order to open the valve mechanism, as hereinbefore described.

As shown in FIG. 4, the flexible diaphragm portion 90 is deflected in an unsymmetrical relation to the conical portion 96 of the cap 14, this being due to the tiltable operation of the nozzle 72, as shown in FIG. 4, however, when the nozzle 72 is moved axially in the direction of the arrow 100, as shown in FIG. 8 of the drawings, the flexible diaphragm portion 90 deflects in a symmetrical manner away from the conical portion 96.

In the modification, as shown in FIG. 7, the nozzle 72 is provided with an integral diaphragm portion 102 which is similar to the integral diaphragm portion 90; this diaphragm portion 102 surrounds the perimeter of the nozzle 72 and extends radially outward to a position overlying an end 104 of the valve housing part 22. A rubberlike gasket 106 is compressively engaged between the end 104 of the housing part 22 and a peripheral portion 108 of the diaphragm portion 102.

The end 104 of the housing part 22 is maintained in compressive relation to the gasket 106 to hold the gasket 106 in the perimeter 108 of the diaphragm portion 102 in clamped compressed relation to each other by means of a crimped portion 110 of the cap 14. This crimped portion 110 engages an annular indented portion 112 of the housing part 22, and thus the housing part 22 at its end 104 is maintained in clamped relation to the gasket 106 and the peripheral portion 108 of the diaphragm portion 102 which is held in abutted relation to the normally upper end 112 of the cap 14.

It will be seen that the modification as shown in FIG. 7, provides for similar action of the nozzle 72 and flexure of the integral diaphragm thereof, as compared to the flexural positions of the diaphragm 90, shown in FIGS. 4 and 8.

It will be seen that the integral diaphragm structures 90 and 102, as hereinbefore described, prevent leakage around the perimeter of the nozzle 72 when moved in various positions or directions to actuate the valve structure internally of the valve housing, and that fluids dispensed by the valve mechanism of the invention move upward around the normally inner end of the nozzle 72 and during this time the integral condition of the diaphragm portion effectively prevents leakage around the perimeter of the nozzle 76, all as hereinbefore described.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to without departing from the spirit of the invention.

We claim:

1. In an aerosol fluids dispensing valve, the combination of: a container; a container cap thereon; a fluids dispensing valve housing having a fluids dispensing valve means therein, said housing supported by said cap and extending into said container; said cap having a portion to which said valve housing is secured, said cap having a central opening in the normally upper portion thereof; a dispensing nozzle extending through said opening in said cap, said nozzle disposed to operate said valve means, said opening in said cap adapted to permit said nozzle to move therein, said nozzle having a flexible diaphragm portion, said diaphragm integral with and surrounding said nozzle and adapted to flex radially outward from the perimeter of said nozzle when said nozzle is moved relative to said cap, said diaphragm portion integrally sealingly fixed to said housing and said cap, said nozzle having a fluids dispensing passage therein, said passage communicating with the interior of said housing inwardly relative to said diaphragm portion, said passage having an outlet disposed outwardly relative to said diaphragm and said cap and adapted to deliver fluids from said container to an area externally relative thereto; said diaphragm portion communicating with fluids at the interior of said housing and serving as a seal to prevent leakage of fluids around the exterior of said nozzle when said nozzle is moved relative to said cap and when fluids are passing through said valve means and said nozzle.

2. In an aerosol fluids dispensing valve, the combination of: a container; a container cap thereon; a valve housing having a fluids dispensing valve means therein, said housing supported by said cap and extending into said container; said cap having a generally and normally inverted cup-shaped portion in which said valve housing is secured, said cup-shaped portion having a central opening in the normally upper portion thereof; said valve housing having an integral dispensing nozzle extending through said central opening in said cap, said nozzle disposed to operate said valve means, said opening in said cap adapted to permit said nozzle to move therein, said nozzle and said housing at their integral connection with each other having a flexible diaphragm portion, said diaphragm portion surrounding said nozzle and adapted to flex when said nozzle is moved relative to said cap to actuate said valve means, said nozzle having a fluids passage therein, said passage communicating with the interior of said housing inwardly relative to said diaphragm portion, said passage having an outlet disposed outward relative to said diaphragm portion and said cap and adapted to deliver fluids from said container to an area externally relative thereto, said diaphragm portion communicating with the fluids at the interior of said housing and serving as a seal to prevent leakage of fluids around the exterior of said nozzle when said nozzle is moved relative to said cap, and when fluids are passing through said valve means and said nozzle.

3. The invention, as defined in claim 1, wherein: said cap is provided with an indented means clamping said housing and said diaphragm portion therein to maintain a sealed relation at a peripheral portion of said diaphragm relative to said housing and said cap.

4. The invention, as defined in claim 3, wherein: a compression gasket sealingly engages said diaphragm generally near its peripheral portion at which it is clamped in said cap and relative to said housing.

5. In an aerosol fluids dispensing valve, the combination of: a container; a fluids dispensing valve disposed and adapted to deliver aerosol fluids from said container; a valve housing for said valve mounted in said container; fluids dispensing valve means in said valve housing; a fluids dispensing nozzle extending from the interior of said valve housing to the exterior of said container and adapted to deliver fluids to a position externally of said container; said nozzle having an integral flexible diaphragm portion surrounding said nozzle and sealingly connected to said valve housing to prevent leakage of fluid around said nozzle, while said nozzle is moved to actuate said valve means and while said diaphragm portion flexes to permit said movement, said flexible diaphragm being integrally connected to said housing.