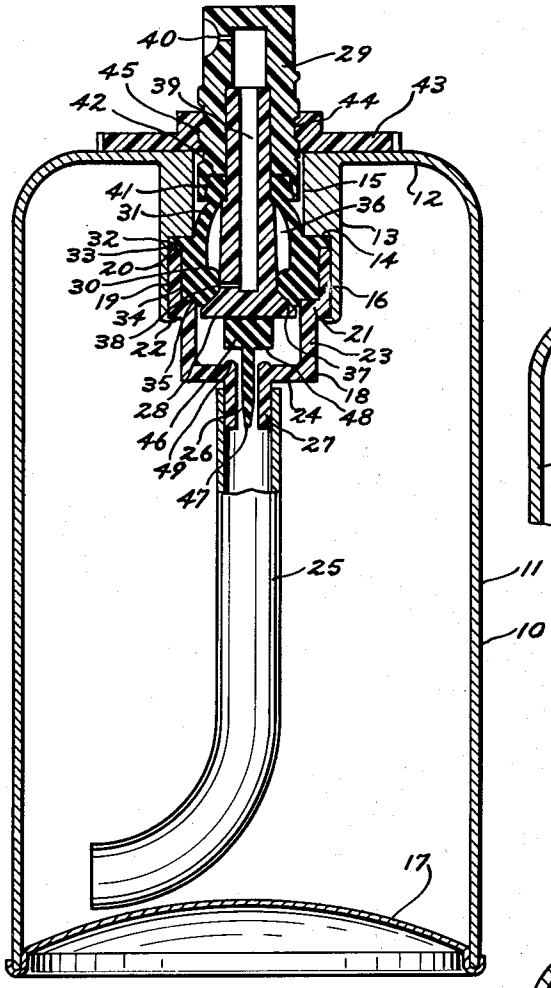
May 8, 1956 G. E. CARLSON ET AL 2,744,665

PRESSURIZED CONTAINER VALVE STRUCTURE

Filed June 16, 1951 2 Sheets-Sheet 1

FIG 1



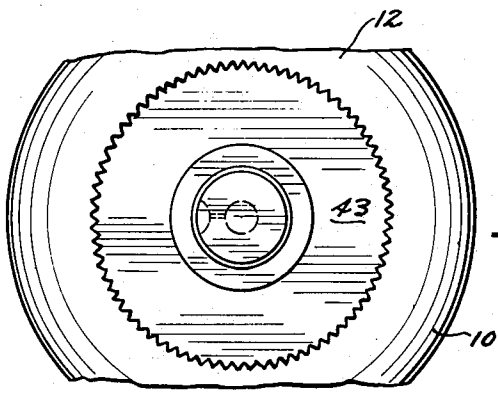


FIG 2

FIG 3

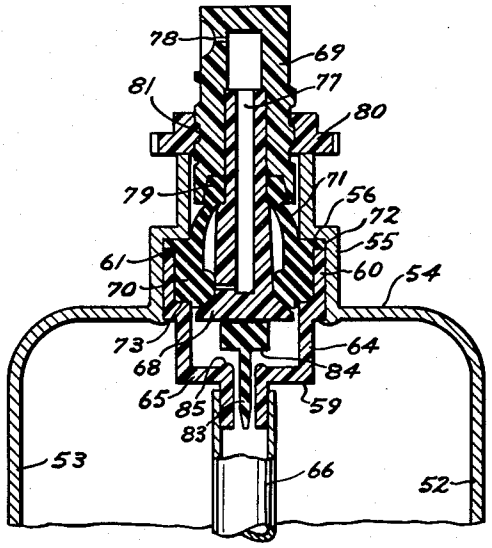
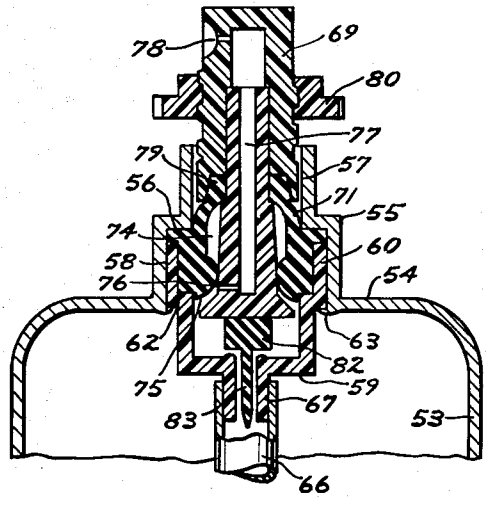


FIG 4



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PRESSURIZED CONTAINER VALVE STRUCTURE

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FIG 5

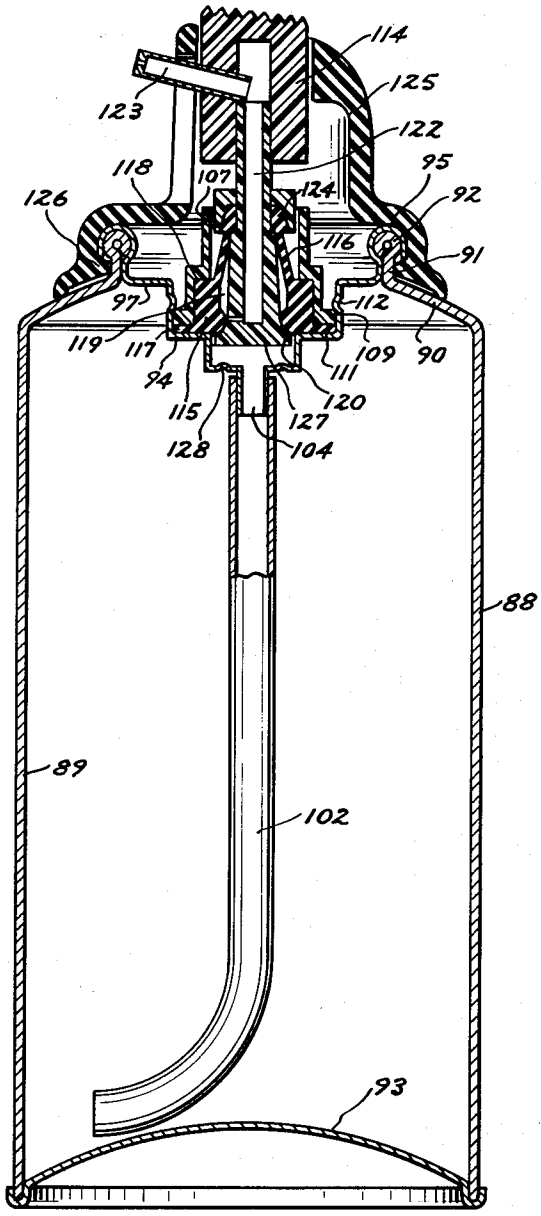


FIG 6

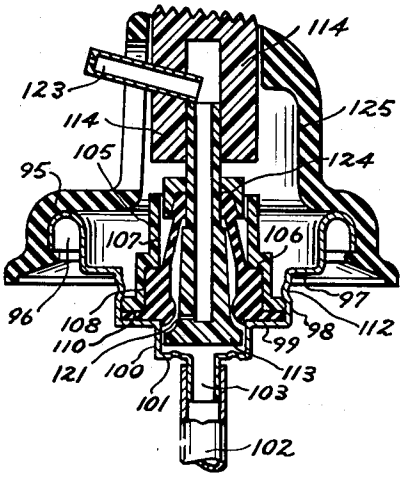
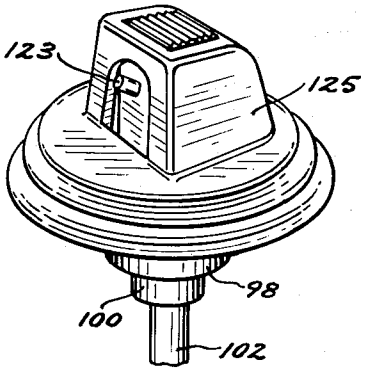


FIG 7



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PRESSURIZED CONTAINER VALVE STRUCTURE

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Application June 16, 1951, Serial No. 232,008

2 Claims. (Cl. 222—394)

The invention herein has relation to a valve apparatus useful for many purposes but devised to be especially useful for controlling flow of fluids under pressure from cans or other containers.

The object of the invention is to provide a socalled aerosol valve which will be of new, simple, inexpensive and efficient construction, and will present improvements over the disclosures of our pending application Serial No. 208,352, for Valve Apparatus, filed January 29, 1951, now Patent Number 2,686,652, dated August 17, 1954.

In the accompanying drawings forming a part of this specification,

Fig. 1 is a vertical central sectional view, partially in elevation and partially broken away, of a valve apparatus made according to the invention;

Fig. 2 is a fragmentary top plan view of the disclosure of Fig. 1;

Fig. 3 is a vertical central sectional view, partially in elevation and partially broken away, of a valve apparatus of modified construction incorporating features and characteristics of the invention;

Fig. 4 is a view corresponding generally with the disclosure of Fig. 3 but showing parts in different positions;

Fig. 5 is a vertical central sectional view, partially in elevation and partially broken away, of a valve apparatus of further modified construction made according to the invention;

Fig. 6 is a view corresponding generally with the disclosure of Fig. 5 but showing parts in different positions; and

Fig. 7 is a perspective view of the valve apparatus of Figs. 5 and 6.

With respect to Figs. 1 and 2 of the drawings and the numerals of reference thereon, a can **10** there shown may be of ordinary or preferred construction. As disclosed, said can is constituted as a hollow member bounded at its sides by a cylindrical wall **11** which merges at its upper end in an annular wall **12** disposed in perpendicular relation to the cylindrical wall **11**. The interior margin of the annular wall **12** is integral with a circular wall **13** extending downwardly in the can **10** in concentric relation to its cylindrical wall **11**. A lower portion of said circular wall **13** is cut away to provide a downwardly facing, interiorly disposed, annular surface **14** contiguous at its interior margin with the lower end of a relatively small internal cylindrical surface **15** bounding an upper portion of the circular wall **13** and at its exterior margin with the upper end of a comparatively large internal cylindrical surface **16** bounding a lower portion of said circular wall. The annular surface **14** is in perpendicular relation to the cylindrical wall **11**. The lower end of the hollow member or can **10** is covered by an upwardly bowed closure wall **17** of circular outline fitted upon and attached to the lower end of the cylindrical wall **11**.

A shell **18** of the valve apparatus is constituted as a cup shape member including a cylindrical upper portion **19** having its external surface engaged against the internal surface **16** of the circular wall **13** and its upper end **20** in

spaced, parallel relation to the annular surface **14**. The lower end of the cylindrical upper portion **19** merges in an interiorly extending annular shoulder **21** in perpendicular relation to said cylindrical upper portion and seated against an annular flange **22** extending inwardly of or from the lower end of the circular wall **13**. In the disclosure as made, the annular flange **22** is provided by crimping the lower end of said circular wall **13** inwardly after the cylindrical upper portion **19** of the shell **18** has been situated in contiguous relation with the internal cylindrical surface **16**. The annular surface **14** and the annular shoulder **21** are in parallel relation and in alined relation longitudinally of the can. The interior marginal portion of the annular shoulder **21** integrally supports a cylindrical lower part **23** of the cup shape member or shell **18** which is below and concentric with the cylindrical upper portion **19**. The lower end of the cylindrical lower part **23** is integral with a base **24** of the cup shape member or shell **18**, and a tube **25**, for delivering fluid under pressure to a lower portion of the interior of said cup shape member or shell, communicates with a lower portion of the interior of the cup shape member or shell by way of an opening **26** through the base **24**. More explicitly stated, a pipe flange **27** integral with the base **24** is fitted into the upper end of the tube **25**. Desirably, the lower end of the tube **25** will terminate in adjacent relation to the bottom wall of the can.

A valve member of the apparatus is constituted as a conical valve **28** integral with an elongated cylindrical stem **29** disposed in spaced, concentric relation to the circular wall **13** of the can **10**.

A valve-seat-providing and sealing-off member of said apparatus is constituted as a hollow body **30** in spaced, surrounding relation to the valve stem **29** and an annular diaphragm **31** integral with said hollow body and in surrounding relation to said valve stem.

The hollow body **30** includes an annular flange portion **32** at an upper portion thereof, adjacent the annular diaphragm **31** and disposed in perpendicular relation to said hollow body, fixedly seated between the annular surface **14** and the upper end **20** of the shell **18**, with the periphery **33** of said annular flange portion engaged against an upper part of the internal cylindrical surface **16**. An external cylindrical surface **34** of the hollow body **30**, at the side of the annular flange **32** opposite the annular surface **14**, is snugly engaged against the internal surface of the cylindrical upper portion **19** of the cup-shape member or shell **18**, with a lower, outer circular portion **35** of said hollow body seated against the annular shoulder **21**, and an annular passageway **36** within the hollow body is contiguous with the stem **29** and the conical valve **28** and the end of said hollow body adjacent said conical valve, but sealed closed adjacent the end of said hollow body opposite the conical valve by said stem **29** and the annular diaphragm **31**. Said annular passageway **36** is bounded at its lower end, or end opposite said annular diaphragm **31**, by a downwardly and outwardly extending, inwardly facing, annular valve seat **37** disposed at the inner side of the conical valve **28**, and said conical valve is in spaced relation to the base **24** of the cup shape member or shell **18**. A lateral port **38** in the valve stem **29** above the conical valve **28** is contiguous at its exterior end with the annular passageway **36** and at its interior end with a longitudinal port **39** in said valve stem, and said longitudinal port is contiguous, at a location above the can, with the interior of an outlet nozzle **40** from said valve stem. As shown, the annular diaphragm **31** includes an upper portion **41** snugly seated in a downwardly facing annular groove **42** in the valve stem **29** thus to cause the annular passageway **36** to be closed at its upper end. Said annular diaphragm **31** is constituted as a resilient member possessing suffi-

cient power normally to retain the conical valve **28** engaged against the annular valve seat **37**.

A locking element for retaining the conical valve **28** and the annular valve seat **37** in engaged relation is constituted as a nut **43** having an internal thread **44** engaged with an external thread **45** upon an upper portion of the valve stem **29** above the annular diaphragm **31**. The nut **43** will be of size to be readily and easily fitted upon the valve stem **29**. The conical valve **28** and the annular valve seat **37** can be retained in engagement by turning the nut **43** down against the annular wall **12** of the can, as it is shown in Fig. 1, and the valve stem **29** can be released to be vertically movable in the can by turning said nut to position where in spaced relation to the annular wall **12** of said can.

When it is desired to dispense fluid under pressure from the can, the conical valve **28** will be unseated in response to depression of the valve stem **29** against resilient action of the annular diaphragm **31**. Upon release of said valve stem, said annular diaphragm will immediately react to cause said conical valve to be seated against the annular valve seat. When the conical valve is seated, the exterior end of the lateral port **38** is engaged against and closed by the annular valve seat. When the conical valve **28** and the annular valve seat **37** are in separated relation, flow from the can **10** will be by way of the tube **25**, the shell **18**, the annular passageway **36** and the ports **38** and **39** to the outlet nozzle **40**.

The lower surface of the conical valve **28** fixedly supports a valve element constituted as a body **46** and a guide stem **47** loosely slidable in the opening **26** through the pipe flange **27** upon the base **24** of the shell **18**. The body **46** includes a flat surface **48** at its lower side, in surrounding relation to the guide stem **47** and parallel relation to said base **24**, to be engaged against and removed from an annular valve seat **49** provided by the base **24** in surrounding relation to said opening **26**. The construction and arrangement will be such that the flat surface **48** will be removed from the annular valve seat **49**, as in Fig. 1 of the drawings, when the conical valve **28** and the annular valve seat **37** are in engagement, and that said flat surface **48** can be engaged with said annular valve seat **49** in response to inward or downward manual movement of the valve stem **29**, thus to preclude flow of fluid under pressure from the tube **25** into the cup shape member or shell **18**. The valve stem **29** can be manually actuated from its position where the conical valve **28** and the annular valve seat **37** are engaged to its position where the flat surface **48** and the annular valve seat **49** are engaged in any interval of time which may be predetermined thus to cause flow of a corresponding amount of fluid under pressure from the hollow member or can **10**. Flow will commence with separation of the elements **28**, **37** and discontinue with engagement of the elements **48**, **49**, and upon release of the valve stem **29**, the annular diaphragm **31** will quickly react, aided by pressure of fluid in the hollow member or can, to return the conical valve **28** to position where engaged against the conical valve seat **37**.

The only parts of the valve apparatus with which fluid under pressure being dispensed can come into contact are the tube **25**, the shell **18**, the body **46** and the guide stem **47** of the valve element, the hollow body **30** and the annular diaphragm **31** of the valve-seat-providing and sealing-off member, and the valve member constituted as the conical valve **28** and the elongated valve stem **29**. As shown, all of the parts of the apparatus to be contacted by fluid under pressure are of non-metallic material, thus to insure that there will be no occurrence of electrolytic action. The hollow body **30**, the annular diaphragm **31**, the valve body **46** and the guide stem **47** are of molded rubber, and the tube **25**, the shell **18** and the member comprising the conical valve **28** and the elongated valve stem **29** are of plastic material.

Referring to Figs. 3 and 4, numeral **52** represents a

hollow member or can bounded at its sides by a cylindrical wall **53** which merges at its upper end in an annular wall **54** disposed in perpendicular relation to the cylindrical wall **53**. The interior margin of the annular wall **54** is integral with a circular wall **55** extending upwardly in concentric relation to said cylindrical wall **53**. A lower portion of said circular wall **55** is shaped to provide a downwardly facing, interiorly disposed, annular surface **56** contiguous at its interior margin with the lower end of a relatively small internal cylindrical surface **57** bounding an upper portion of the circular wall **55** and at its exterior margin with the upper end of a comparatively large internal cylindrical surface **58** bounding a lower portion of said circular wall **55**. The annular surface **56** is in perpendicular relation to the cylindrical wall **53**. The lower end of the hollow member or can **52** may be covered in the same manner as is the lower end of the hollow member or can **10**, or in any other ordinary or preferred manner.

A shell **59** of the valve apparatus of Figs. 3 and 4 is constituted as a cup shape member including a cylindrical upper portion **60** having its external surface engaged against the internal surface **58** of the circular wall **55** and its upper end **61** in spaced, parallel relation to the annular surface **56**. The lower end of the cylindrical upper portion **60** merges in an interiorly extending annular shoulder **62** in perpendicular relation to said cylindrical upper portion **60** and seated against an annular flange **63**, equivalent to the annular flange **22**, extending inwardly from the lower end of the circular wall **55**. As shown, the annular flange **63** is provided by crimping metal of the can at the inner margin of the annular wall **54** and at the lower end of the circular wall **55** inwardly while the cylindrical upper portion **60** of the shell **59** is in contiguous relation with the internal cylindrical surface **58**. The annular surface **56** and the annular shoulder **62** are in parallel relation and in alined relation longitudinally of the hollow member or can **52**. The interior marginal portion of the annular shoulder **62** integrally supports a cylindrical lower part **64** of the cup shape member or shell **59** which is below and concentric with the cylindrical upper portion **60**. The lower end of the cylindrical part **64** is integral with a base **65** of the cup shape member or shell **59**, and a tube **66** connects a lower portion of the hollow member or can **52** with a lower portion of the cup shape member or shell **59** by way of an opening through a pipe flange **67** upon the base **65** and fitted into the tube **66**.

A valve member, equivalent to the valve member of Fig. 1, is constituted as a conical valve **68** and an elongated cylindrical stem **69**.

A valve-seat-providing and sealing-off member, equivalent to the valve-seat-providing and sealing-off member of Fig. 1, is constituted as a hollow body **70** and an annular diaphragm **71**.

An annular flange portion **72** upon an upper portion of the hollow body **70** is fixedly seated between the annular surface **56** and the upper end **61** of the shell **59**, with the periphery of said annular flange portion **72** engaged against an upper part of the internal cylindrical surface **58**. An external cylindrical surface of the hollow body **70** is snugly engaged against the internal surface of the cylindrical upper portion **60** of the cup shape member or shell **59**, and a lower, outer circular portion **73** of said hollow body **70** is seated against the annular shoulder **62**. An annular passageway **74** within the hollow body **70** is contiguous with the elongated cylindrical stem **69**, the conical valve **68** and the end of said hollow body **70** adjacent said conical valve **68**, but sealed closed at its opposite end by said stem **69** and the annular diaphragm **71**. The end of the annular passageway **74** opposite said annular diaphragm **71** is bounded by an inwardly facing annular valve seat **75**, equivalent to the annular valve seat **37**, disposed at the inner side of the conical valve **68**. Ports **76** and **77** in the valve stem **69**, equivalent to the ports **38** and **39**, lead from the annular passageway **74** to

an outlet nozzle 78, equivalent to the outlet nozzle 40. An upper portion 79 of the annular diaphragm 71 is snugly seated in a downwardly facing annular groove in the valve stem 69. Like the annular diaphragm 31, said annular diaphragm 71 also is constituted as a resilient member capable of normally retaining the conical valve 68 and the annular valve seat 75 in engagement.

A nut 80, upon an external thread 81 of the elongated cylindrical valve stem 69 and adapted to be engaged against the upper end of the circular wall 55, constitutes a locking element for retaining the conical valve 68 engaged against the annular valve seat 75. When said nut 80 and upper end of circular wall 55 are interengaged, as in Fig. 3 of the drawings, said conical valve 68 and annular valve seat 75 also will be in engagement. When the conical valve is seated, the exterior end of the port 76 is engaged against and closed by the annular valve seat 75. The elongated valve stem 69 can be released to be vertically movable in the can by turning the nut 80 to position where in spaced relation to the upper end of said circular wall 55, as in Fig. 4.

The lower surface of the conical valve 68 fixedly supports a valve element, equivalent to the valve element of Fig. 1, constituted as a body 82 and a guide stem 83 loosely slidable in the pipe flange 67. The body 82 includes a flat surface 84 at its lower side, surrounding the guide stem 83, to be engaged against and removed from an annular valve seat 85 upon the base 65 of the shell 59 in surrounding relation to the pipe flange 67.

The valve apparatus of Figs. 3 and 4 is operative, or functions, in the same manner as does the valve apparatus of Figs. 1 and 2.

In Figs. 5 to 7, a can 88 is constituted as a hollow member bounded at its sides by a cylindrical wall 89 which merges at its upper end in an annular wall 90 extending upwardly and inwardly. The upper end of the annular wall 90 is integral with a vertical circular wall 91, extending upwardly from said annular wall 90, and a ring member 92 integral with the upper end of the vertical circular wall 91 is circular in cross-section. The lower end of the hollow member or can 88 is covered by a closure wall 93.

An outer, lower shell 94 of the valve apparatus of Figs. 5 to 7 is constituted as a cup shape member having an upper end circular portion 95 which opens downwardly, as at 96, to be seated upon the ring member 92. As will be clear from Fig. 5, the upper end circular portion 95 is secured upon said ring member 92 to cause the outer, lower shell 94 to be fixedly supported within the can. Said upper end circular portion 95 supports a horizontal annular portion 97 which in turn supports a vertical cylindrical intermediate portion 98 of the cup shape member or outer, lower shell 94, below and concentric with the upper end circular portion 95, and said vertical cylindrical intermediate portion merges integrally at its lower end in an interiorly extending annular shoulder 99 in perpendicular relation to the cylindrical wall 89. The interior marginal portion of the annular shoulder 99 integrally supports a cylindrical portion 100 of said cup shape member or outer, lower shell 94 which is below and concentric with the cylindrical intermediate portion 98. In turn, the lower end of said cylindrical lower portion 100 is integral with a base 101 of the cup shape member or outer, lower shell 94, and a tube 102 communicates with a lower portion of said cup shape member or outer, lower shell by way of an opening 103 through the base 101 and a pipe flange 104 upon said base and in the adjacent end portion of the tube 102.

An inner, upper shell 105 is shaped to provide a downwardly facing, interiorly disposed, annular surface 106 contiguous at its interior margin with the lower end of a relatively small internal cylindrical surface 107 bounding an upper portion of the inner, upper shell 105 and at its exterior margin with the upper end of a comparatively large internal cylindrical surface 108 bounding a

lower portion of said inner upper shell 105. The annular surface 106 is in perpendicular relation to the cylindrical wall 89. An annular flange portion 109, upon and extending upwardly from the lower end of the inner, upper shell 105 in perpendicular relation thereto, has its external surface engaged against the internal surface of the vertical cylindrical intermediate wall 98 and its surface 110 situated in spaced, parallel relation to the upper, inner surface 111 of the annular shoulder 99. The upper end of the vertical cylindrical intermediate portion 98 is crimped inwardly to provide an annular shoulder 112 seated against a marginal circular portion of the upper surface of the annular flange portion 109. The annular surface 110 and the upper, inner surface 111 are in parallel relation and in alined relation longitudinally of the hollow member or can 88.

A valve member, equivalent to the valve members of Figs. 1, 3 and 4, is constituted as a conical valve 113 and an elongated cylindrical stem 114.

A valve-seat-providing and sealing-off member, equivalent to the valve-seat-providing and sealing-off members of Figs. 1, 3 and 4, is constituted as a hollow body 115 and an annular diaphragm 116.

An annular flange portion 117 upon a lower portion of the hollow body 115 is fixedly seated between the annular surfaces 110 and 111, with the periphery of said annular flange portion 117 engaged against a lower part of the internal surface of the vertical cylindrical intermediate wall 98. An external cylindrical surface of the hollow body 115 is snugly engaged against the internal surface 108 of the inner, upper shell 105, and an upper, outer circular portion 118 of said hollow body 115 is seated against the annular surface 106. An annular passageway 119 within the hollow body 115 is contiguous with the elongated cylindrical stem 114, the conical valve 113 and the end of the hollow body 115 adjacent said conical valve 113, but sealed closed at its opposite end by said stem 114 and the annular diaphragm 116. The end of the annular passageway 119 opposite said annular diaphragm 116 is bounded by an inwardly facing annular valve seat 120, equivalent to the annular valve seats 37 and 75, disposed at the inner side of the conical valve 113. Ports 121 and 122 in the valve stem 114 lead from the annular passageway 119 to an outlet nozzle 123 above the hollow member or can 88. An upper portion 124 of the annular diaphragm 116 is snugly seated in a downwardly facing annular groove in the valve stem 114. As set forth in connection with the annular diaphragms 31 and 71, the annular diaphragm 116 also is constituted as a resilient member capable of normally retaining the conical valve 113 in engaged relation with the annular valve seat 120.

A shroud for the valve apparatus of Figs. 5 to 7 is denoted 125. Said shroud is supported, as at 126, upon the annular wall 90 of the can 88 and the upper end circular portion 95 of the outer, lower shell 94 of the valve apparatus.

The conical valve 113 includes a flat surface 127 at its lower side to be engaged against and removed from an annular valve seat 128 upon the base 101 of the outer, lower shell 94 in surrounding relation to the pipe flange 104.

The valve apparatus of Figs. 5 to 7 is operative, or functions, in the general manner as hereinbefore set forth in connection with the disclosure of Fig. 1. The elongated cylindrical valve stem 114 will be depressed when fluid under pressure is to be dispensed from the can 88, thus to cause the conical valve 113 to be removed from the annular valve seat 120 against resilient action of the annular diaphragm 116. Said annular diaphragm 116 will immediately react to reseat said conical valve upon release of said valve stem 114. When the conical valve 113 is seated, the exterior end of the port 121 is engaged against and closed by said conical valve. Flow from the can 88 will be by way of the tube 102, the outer,

lower shell **94**, the annular passageway **119** and the ports **121** and **122** to the outlet nozzle **123** when the conical valve **113** is removed from the annular valve seat **120**. The flat surface **127** will be removed from the annular valve seat **128** when the conical valve **113** and the annular valve seat **120** are in engagement. In response to inward or downward manual movement of the valve stem **114**, said flat surface **127** can be made to engage said annular valve seat **128**, thus to shut off flow of fluid under pressure from the tube **102** into the outer, lower shell **94**. The valve stem **114** can be manually actuated in any interval of time which may be predetermined from its position where the conical valve **113** is against the annular valve seat **120** to its position where the flat surface **127** is engaged against the annular valve seat **128**, thus to cause flow of a corresponding amount of fluid under pressure from the can **88**. The annular diaphragm **116** will act, aided by pressure of fluid in the can, to return the conical valve **113** to seated position against the annular valve seat **120** upon release of said valve stem **114**.

The only parts of the valve apparatus of Figs. 5 to 7 with which fluid under pressure being dispensed can come into contact are the tube **102**, the outer, lower shell **94**, the hollow body **115** and the annular diaphragm **116** of the valve-seat-providing and sealing-off member, and the valve member including the conical valve **113** and the elongated valve stem **114**. The hollow body **115** and the annular diaphragm **116** are of molded rubber, and the tube **102**, the outer, lower shell **94** and the member providing the conical valve **113** and the elongated valve stem **114** are of plastic material.

What is claimed is:

1. A valve apparatus for controlling flow of fluid from a container, comprising a body having a passageway therethrough and providing a valve seat surrounding an inlet side of said passageway to which the interior of said container is open, means supporting said body in said container and precluding flow of fluid past the body save by way of said valve seat constituted as a member providing an annular surface rigid with the container, an internal cylindrical surface contiguous with an exterior margin of said annular surface and a shell including a cylindrical portion engaged against said internal cylindrical surface and an annular shoulder extending interiorly of said cylindrical portion of said shell, said body being secured between said annular surface and annular shoulder, an external surface of said body being engaged against an internal surface of said cylindrical portion and an annular flange upon said body being secured between said annular surface and an end of said cylindrical portion of said shell and engaged with said internal cylindrical surface, a valve member including a valve disposed interiorly of and adjacent said valve seat and a valve stem rigid with said valve extending through said passageway, and a diaphragm having an outer portion thereof surrounding a part of said valve stem spaced from said valve, said diaphragm and valve stem sealing closed a side of said body opposite the valve seat and contiguous with the passageway, said diaphragm being resiliently urged to actuate said valve to cause it normally to be engaged against said valve seat, and there being an outlet through the valve stem past the diaphragm leading from said passageway to a location exterior of said apparatus and said continer.

2. A valve apparatus for controlling flow of fluid from a container, comprising a body having a passageway therethrough and providing a valve seat surrounding an inlet side of said passageway to which the interior of said container is open, means supporting said body in said container and precluding flow of fluid past the body save by way of said valve seat constituted as a member providing an annular surface rigid with the container, an internal cylindrical surface contiguous with an exterior margin of said annular surface and a shell including a cylindrical portion engaged against a surface of said member and an annular shoulder extending interiorly of said cylindrical portion of said shell, said body being secured between said annular surface and annular shoulder, an external surface of said body being engaged against said internal cylindrical surface and an annular flange upon said body being secured between said annular shoulder and an end of said member and engaged with said cylindrical portion of said shell, a valve member including a valve disposed interiorly of said valve seat and a valve stem rigid with said valve extending through said passageway, and a diaphragm having an outer portion thereof surrounding a part of said valve stem spaced from said valve, said diaphragm and valve stem sealing closed a side of said body opposite the valve seat and contiguous with the passageway, said diaphragm being resiliently urged to actuate said valve to cause it normally to be engaged against said valve seat, and there being an outlet through the valve stem past the diaphragm leading from said passageway to a location exterior of said apparatus and said container.

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