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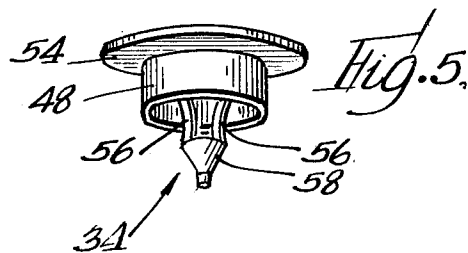
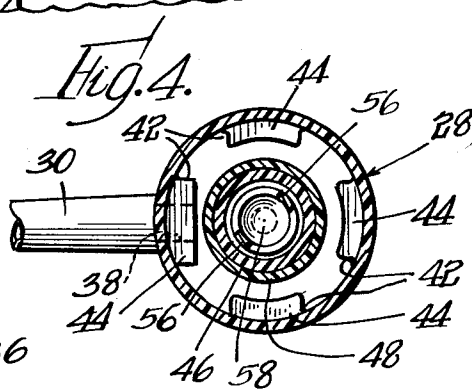
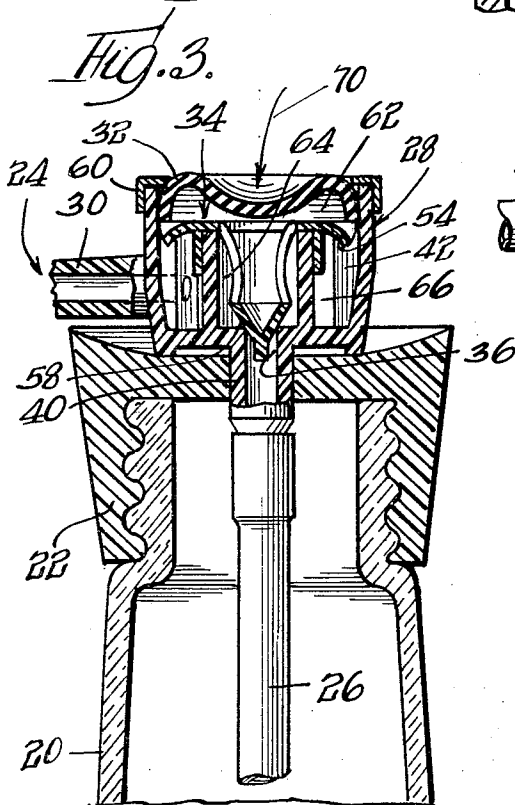
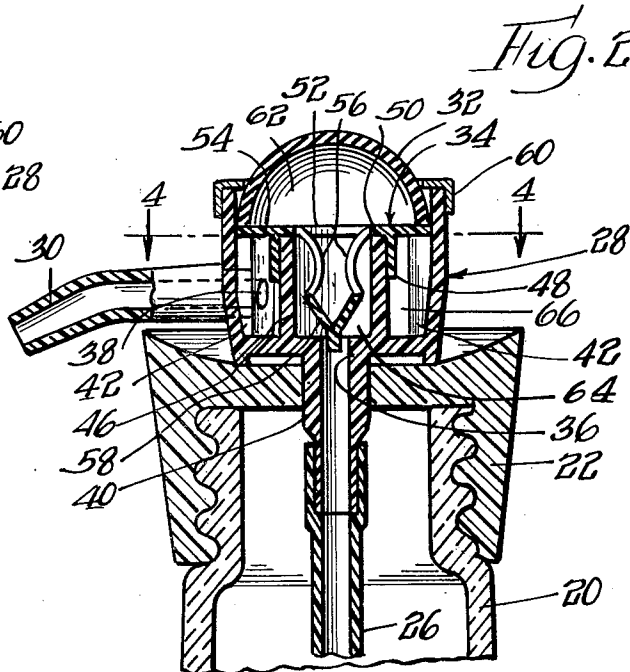
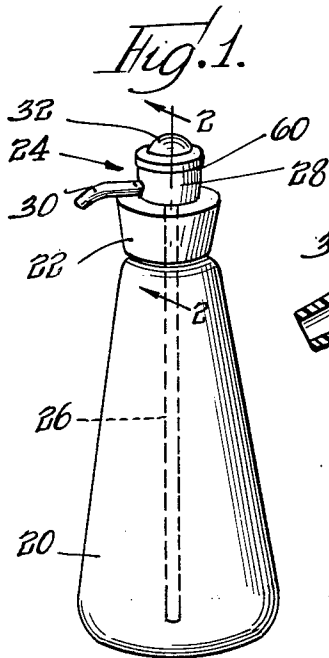
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3,130,877

DISPENSER AND VALVES FOR SAME

Filed Oct. 7, 1960

2 Sheets-Sheet 1



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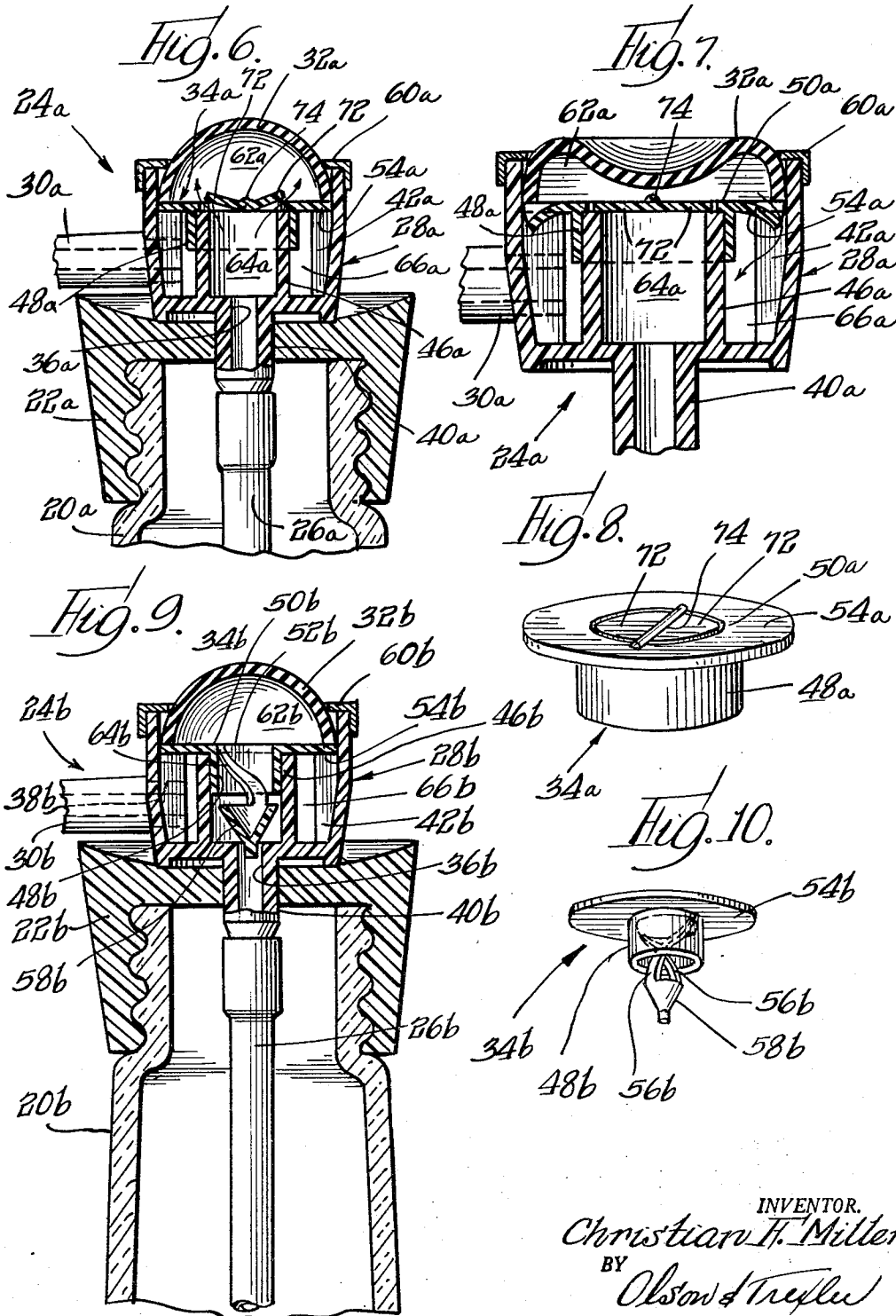
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DISPENSER AND VALVES FOR SAME

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2 Sheets-Sheet 2



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DISPENSER AND VALVES FOR SAME

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This invention relates generally to fluid dispensers and especially to the valves used in fluid dispensers.

In one specific aspect, the present invention relates to dispensers for use on bottles filled with a viscous fluid such as hand lotion.

In one modern type of fluid dispenser, check valves comprising steel balls are employed to control the passage of fluid to and from a pumping element. These steel ball valves have proved to be expensive; and any corrosive action of the dispensed fluid on the surface of the balls tends to make operation of the valve sticky in nature. Moreover, assembly of these steel ball valves in the dispensers has proved difficult.

Therefore, a general object of the present invention is to provide a new and improved dispenser which overcomes the limitations of the prior art by incorporating novel plastic valves.

Another object of the invention is to provide a dispenser incorporating a one-piece member which defines two check valves.

Yet another object of the invention is to provide check valves which are easy to assemble in a dispenser.

A further object of the invention is to provide a valve element which can be readily replaced in repair of the dispenser in which it is assembled.

A still further object of the invention is to provide a dispenser having a dripless spout.

And a still further object of the invention is to provide a dispenser in which the valves are arranged for partial evacuation of the spout on the suction portion of the pumping cycle.

Additional objects and features of the invention pertain to the particular structure, materials and arrangements whereby the above objects are attained.

A structure in accord with the invention includes a relatively rigid body member defining a first fluid passageway communicating with a primary fluid reservoir and defining a second fluid passageway separate from the first fluid passageway and communicating with an outlet for dispensing the fluid, the second passageway being of generally annular shape and surrounding the first passageway; a pumping member including a domed diaphragm defining a variable volume chamber selectively communicating with the first passageway and with the second passageway; and a unitary, resinous plastic check valve-defining member including a central collar adapted to be mounted to the body member, valve means in the collar for controlling fluid flow through the first passageway, and a deflectable, radially extending flange at one end of the collar defining a vane-type valve for controlling fluid flow through the second passageway.

In order that the principle of the invention may be readily understood, three embodiments thereof applied to the dispensing of a viscous liquid such as hand lotion but to which the application is not to be restricted, are shown in the accompanying drawings wherein:

FIG. 1 is a perspective view of a hand lotion bottle with a dispenser attached thereto, the dispenser being constructed in accordance with the present invention;

FIG. 2 is an enlarged view taken through the section 2-2 of FIG. 1;

FIG. 3 is a view similar to the showing of FIG. 2 illustrating the cooperation of the parts when the domed diaphragm pumping member is depressed;

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FIG. 4 is a view taken through the section 4-4 of FIG. 2;

FIG. 5 is an enlarged perspective view of the unitary, check valve-defining member incorporated in the dispenser of FIG. 1;

FIG. 6 is a view similar to FIG. 2 showing a dispenser incorporating a modified check valve-defining member;

FIG. 7 is a further enlarged view of the showing of FIG. 6 illustrating the cooperation of the parts when the domed diaphragm pumping member is depressed;

FIG. 8 is an enlarged perspective view of the check valve-defining member incorporated in the dispenser of FIG. 6;

FIG. 9 is another view similar to FIG. 2 showing a further modified embodiment of the check valve-defining member; and

FIG. 10 is an enlarged perspective view of the check valve-defining member incorporated in the dispenser of FIG. 9.

Referring now in detail to the drawings, specifically to FIGS. 1-5, a glass bottle 20 will be seen defining a primary reservoir for hand lotion or a similar fluid. The mouth of bottle 20 is advantageously threaded in order that a cooperatively threaded cap 22 may be employed to closure the bottle. A dispenser indicated generally by the numeral 24 is mounted on the cap 22 in a suitable manner to extend a pump tube 26 into the lower regions of bottle 20 where it will remain in withdrawing relationship with the fluid contained within the bottle until the bottle is nearly drained of its contents.

Turning to FIG. 2, the dispenser 24 will be seen to include a relatively rigid body member 28, a spout 30, a pumping member taking the form of a resilient, domed diaphragm 32 and a check valve-defining member 34. The body member 28 comprises a cup-shape element having a bottom inlet 36 and a side outlet 38. The outlet 38 fittingly receives one end of the spout 30; and the inlet 36 continues into the central bore of a depending stem portion 40. Stem portion 40 freely passes through a bore in cap 22 and receives the tube 26 over its free end. The stem portion 40 is advantageously arranged to fit loosely in the bore in cap 22 so that air may be drawn into the bottle 20 around the stem 40 to replace the volume of fluid removed from the bottle 20 at any one time by the dispenser 24.

Referring for the moment to FIG. 4, the body member 28 will be seen fashioned with a number of internal bosses 42 which terminate to define arcuately spaced lands 44. Spaced radially inwardly from the bosses 42 is a central, tubular column 46 which surrounds and opens into the inlet 36. In assembly of the dispenser 24, the check valve-defining member 34 is mounted in body member 28 in cooperation with the lands 44 and column 46; and considering FIGS. 2 and 5, the valve-defining member 34 will be seen to include a central collar 48 which is arranged to be disposed about column 46 in gripping relationship. The upper ends of collar 48 terminate in a radially inwardly extending, annular shoulder portion 50 which is adapted to engage the end surface of the wall of column 46. Radially inwardly of shoulder 50, there is an aperture 52; and radially outwardly of shoulder 50, there is a deflectable flange 54 which is disposed substantially coplanarly with the shoulder 50. The flange 54 defines a vane-type valve for purposes which will become more apparent hereinafter.

From the margins of shoulder 50, there depend two diametrically arranged, generally straight, spring elements 56 formed in the shape of flat straps; and the otherwise free ends of spring elements 56 are joined to a conical-shaped plug valve 58, plug valve 58 being arranged to close off inlet 36 selectively.

In accordance with a feature of the invention, the check valve-defining member 34 is fashioned as a unitary structure. Accordingly, the component parts of member 34 are integrally united by molding the member 34 from a suitable, resinous plastic material. Polyolefins have proved eminently useful as a material of construction for the member 34, these resinous plastics exhibiting good spring characteristics for the elements 56, additionally possessing the property of chemical resistance while displaying a surface to which hand lotion and other fluids adhere poorly.

The open end of body member 28 is closed off by the domed diaphragm pumping member 32, pumping member 32 being desirably held in place by means of a metal bezel 60. The bezel 60 is slipped over the edge of body member 28 to be held in place frictionally. The diaphragm 32 is fabricated from a suitable elastomer and defines a generally hemispherical chamber or secondary reservoir 62. The chamber 62 opens into a passageway 64 communicating with the primary fluid reservoir, passageway 64 being defined by tubular column 46, inlet 36 and the interconnected bores of stem 40 and tube 26. The chamber 62 also opens into a passageway 66 which communicates to the exterior, passageway 66 being defined by the annular space between the walls of column 46 and the sidewalls of body member 28 as modified by bosses 42, the outlet 38 and the bore in spout 30.

In the normal, outwardly domed condition of diaphragm 32, shown in FIG. 2, the marginal edges of flange 54 will be seen drawn up against the marginal edges of the diaphragm 32. Moreover, the plug valve 58 is raised out of contact with the edges of inlet 36 thus opening passageway 64 to the flow of fluid through column 46 and aperture 52 into the chamber 62.

With reference to FIG. 3, the diaphragm 32 will be seen deformed inwardly, as by finger pressure, to displace fluid from chamber 62; and as will be noted, the pressure exerted on the fluid within chamber 62 by depression of the diaphragm 32 causes the marginal edges of flange 54 to deform dependingly out of contact with the marginal edges of diaphragm 32 between the bosses 42 establishing a fluid-passing relationship that allows fluid to be driven from the chamber 62 through the passageway 66 and out of the spout 30. It will be observed that when fluid is being thus dispensed through the passageway 66, plug valve 58 seats in the inlet 36 closing off passageway 64 to the flow of fluid from chamber 62.

Upon initial attachment of dispenser 24 to cap 22, the first depression of diaphragm 32 as indicated at the arrow 70 in FIG. 3 will compress the air in chamber 62 whereby to urge plug valve 58 into closing relationship relative to the inlet 36 and to urge the marginal edges of flange 54 to depend between bosses 42 opening the passageway 66 and allowing the air to be forced from the dispenser. When the diaphragm 32 is released, its inherent resiliency will cause it to return to its normal, domed condition; and as it returns to this condition, a vacuum will be drawn in chamber 62. In response to the creation of this vacuum, the marginal edges of flange 54 will be drawn tightly up against the marginal edges of the diaphragm to seal off passageway 66. Also in response to the creation of this vacuum, plug valve 58 will be drawn out of obstructing relationship with the inlet 36; and fluid will be drawn from bottle 20 up through tube 26, through passageway 64 and into the chamber 62. The final condition of dispenser 24 is shown in FIG. 2.

When the chamber 62 is filled with fluid, a subsequent depression of diaphragm 32 in the direction indicated by the arrow 70 will again urge plug valve 58 to close off passageway 64 as permitted by spring elements 56. Simultaneously, the vane-type valve defined by flange 54 will open communication between chamber 62 and passageway 66 for dispensing of the fluid through spout 30. Upon release of diaphragm 32, after dispensing of fluid, the suction or vacuum created by diaphragm 32 return-

ing to its domed condition will not only draw fluid up through tube 26 and through passageway 64 but will also draw a certain amount of fluid from the passageway 66 before the marginal edges of flange 54 seat against the marginal edges of the diaphragm. This slight suction in the passageway 66 withdraws a certain amount of fluid from the nozzle 30 thereby rendering it dripless; and it is to be recognized that this dripless feature of the dispenser 24 enhances its utility and desirability.

Although a specific embodiment of the invention has been shown and described with reference to FIGS. 1-5, it should be understood, of course, that the invention is not limited thereto since many modifications may be made. For example, turning to FIGS. 6-8, there is shown a modified form of the invention. Like numerals have been used to designate like parts in the embodiments of FIGS. 1-5 and FIGS. 6-8, the suffix letter "a" being used to distinguish those parts associated with the embodiment of FIGS. 6-8.

The dispenser 24a is specifically arranged with a modified check valve-defining member 34a shown in FIG. 8. There, the means for controlling fluid flow through passageway 64a will be seen to include a resiliently deformable, vane-type valve specifically comprising a pair of vanes or wings 72 fastened to a cross-rib 74 to be normally coplanar with flange 54a and to be radially spaced apart from shoulder 50a. The wings 72 are fashioned to be generally semi-circular, rib 74 thereby being situated as a diametral hinge axis. Considering particularly FIG. 7, the vanes 72 will be seen to seat on the end surface of tubular column 46a when diaphragm 32a is depressed, thus sealing off passageway 64a. On the other hand, upon the resilient return of diaphragm 32a from a depressed condition, the wings 72 will be raised up or drawn generally into the chamber 62a as shown in FIG. 6. This unseating of wings 72 from the end surfaces of column 46a opens passageway 64a to the flow of fluid into chamber 62a.

In other respects, the arrangement of FIGS. 6-8 operates similarly to the arrangement of FIGS. 1-5.

A further modified embodiment of the invention is shown in FIGS. 9 and 10, like numerals being used to designate like parts in the embodiment of FIGS. 9 and 10, the parts specifically associated with that embodiment being identified by the suffix letter "b."

In the embodiment of FIGS. 9 and 10, the check valve-defining member 34b is specifically modified to incorporate a plug valve 58b which is supportably mounted on spirally disposed spring elements 56b. It has been found that the spring elements of this configuration are somewhat softer in action requiring less pressure to move valve 58b into an opened condition than corresponding springs of straight configuration.

In the arrangement of FIGS. 9 and 10, the collar 48b is arranged to depend from the margins of shoulder 50b for gripping engagement with the interior of column 46b.

In other important respects, the arrangement of FIGS. 9 and 10 functions similarly to the arrangement of FIGS. 1-5.

It is contemplated to cover by the appended claims the described embodiments and any modifications such as fall within the true spirit and scope of the invention.

The invention is claimed as follows:

1. A dispenser adapted to be attached to a primary reservoir, said dispenser comprising: a body member including a cup element having an outlet, arcuately spaced lands adjacent the internal periphery of said cup element and a central, tubular column radially spaced from said lands, said body member defining a first fluid passageway communicating with said reservoir and defining a second fluid passageway separate from said first passageway and communicating with said outlet for dispensing a fluid; a pumping member closing off one end of said cup element including a domed diaphragm defining a variable volume chamber selectively communicable with said first passageway and with said second passageway, said dia-

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phragm being deformable inwardly to displace fluid inwardly from said chamber through said second passageway for dispensing said fluid and being resiliently returnable to a normal, outwardly domed condition to draw fluid from said reservoir through said first passageway into said chamber for replacing said dispensed fluid; first check valve means for controlling fluid flow through said first passageway; and second check valve means for controlling fluid flow through said second passageway including an annular, vane-type valve having free marginal edges seating against the edge of said diaphragm upon resiliently returnable movement thereof and deformably depending from said diaphragm into fluid-passing relationship between said lands upon inward deformation of said diaphragm.

2. A dispenser adapted to be attached to a primary reservoir, said dispenser comprising: a body member defining a first fluid passageway of substantially fixed volume communicating with said reservoir, said body member further defining a second fluid passageway of substantially fixed volume communicating with an outlet for dispensing a fluid, said body member including a tubular wall separating said first fluid passageway from said second fluid passageway, said second passageway being of generally annular shape and surrounding the first fluid passageway; a pumping member defining a variable volume chamber selectively communicable with said first passageway and with said second passageway; and a check valve assembly supported by said tubular wall and including valve means for controlling fluid flow through the first passageway and further including an annular deflectable flange extending radially from said tubular member to normally separate the variable volume chamber from said second passageway, means providing arcuately spaced lands around said second passageway exteriorly and spaced radially of said tubular wall and maintaining the corresponding areas of the outer edge of the deflectable flange fixed while permitting the outer edge of the deflectable flange between the said lands to flex upon dispensing movement of the pumping member for charging fluid into the second passageway at plural areas around the periphery thereof.

3. A dispenser according to claim 1 wherein said first and second check valve means are of one-piece construction.

4. A dispenser adapted to be attached to a primary reservoir, said dispenser comprising: a body member including a cup element having an outlet, arcuately spaced lands adjacent the internal periphery of said cup element and spaced from said outlet, and a central tubular column spaced radially inwardly from the lands, said body member defining a first fluid passageway communicating with said reservoir and further defining a second fluid passageway separate from said first passageway and communicating with said outlet for dispensing a fluid; a pumping member closing off one end of said cup element and defining a variable volume chamber selectively communicable with said first passageway and with said second passageway; first check valve means for controlling fluid flow through said first passageway; and second check valve

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means controlling fluid flow through said second passageway, including a deflectable edge portion extending radially outwardly from said tubular column and disposed in contact with said spaced lands and supported inwardly from said lands by said tubular column, the parts of said edge portion between said lands deflecting under fluid pressure to pass fluid from said variable volume chamber to said second passageway.

5. A dispenser according to claim 4 wherein said pumping member includes an annular shoulder portion aligned with said lands to sandwich corresponding portions of said deflectable edge portion therebetween and to restrain movement of the entire edge of said deflectable edge portion in one direction.

6. A dispenser adapted to be attached to a primary reservoir, said dispenser comprising: a body member including a cup element having an outlet aperture, an inlet aperture, and a central tubular column surrounding said inlet aperture to divide the interior of said cup element into a first fluid passageway communicating with said reservoir through said inlet aperture and a second fluid passageway communicating with said outlet aperture for dispensing a fluid; a pumping member closing off one end of said cup element and defining a variable volume chamber selectively communicable with said first passageway and with said second passageway; first check valve means for controlling fluid flow through said first passageway, including means supported by said tubular column, a tapering plug valve element adapted to be selectively seated in said inlet aperture with its base confronting said pumping member to be acted on by the changes in fluid pressure effectuated by said member and with its apex facing into said inlet aperture for closing off the same, and laterally disposed spaced resilient members connecting said plug valve element to said supported means whereby to mount said plug valve element for response to changes in fluid pressure incurred by said pumping member; and second check valve means including a laterally extending deflectable flange selectively closing off fluid flow between said variable volume chamber and said second passageway and deflectable at least at spaced intervals therearound to pass fluid from said variable volume chamber to said second passageway.

7. A dispenser according to claim 6 wherein said resilient members are spiral springs.

8. A dispenser according to claim 2 wherein spirally disposed spring elements control movement of said valve means.

9. A dispenser according to claim 4 wherein spirally disposed spring elements control movement of said first check valve means.

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