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3,122,285

FLUID DISPENSING DEVICE

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2 Sheets-Sheet 1

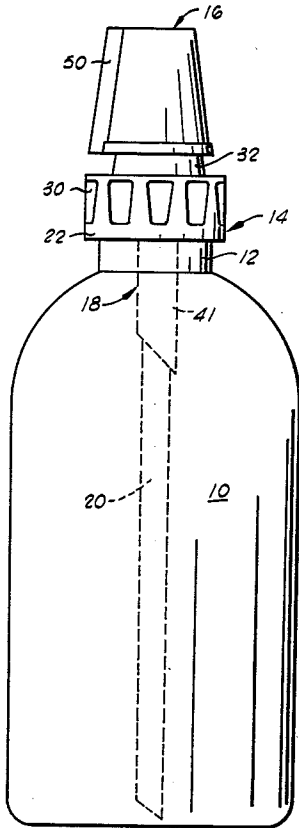


FIG. 1

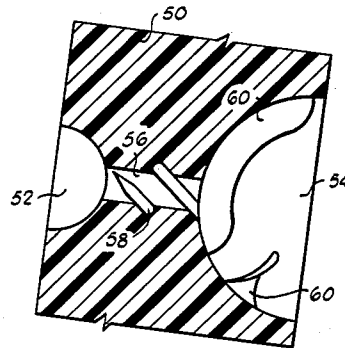


FIG. 5

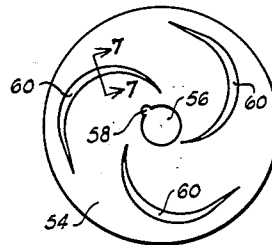


FIG. 6

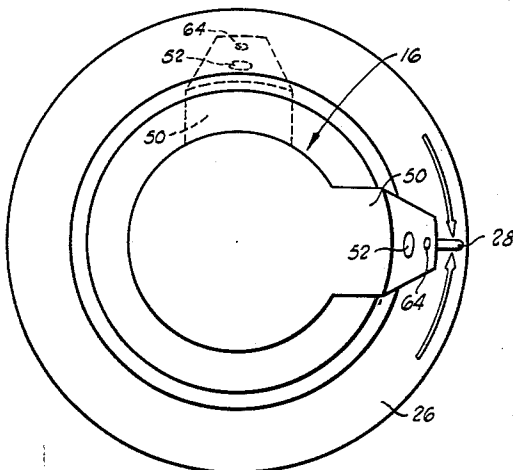


FIG. 3



FIG. 7

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FLUID DISPENSING DEVICE

2 Sheets-Sheet 2



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1

3,122,285

FLUID DISPENSING DEVICE

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10 Claims. (Cl. 222-464)

This invention relates to dispensing devices, and more particularly, but not by way of limitation, the present invention relates to dispensing devices of the type which are secured to a container in which a fluid is located and which are utilized to dispense the fluid from the container to a desired point of application.

In modern times, the successful marketing of numerous products is closely related to the attractiveness and utility of the package which contains the product when it is placed upon the market. In the case of liquid products particularly, the design of the package in which the liquid is to be marketed is undertaken with substantial consideration devoted to the use which is to be made of the liquid content of the package. Thus, for example, the numerous uses to which various liquids which are widely marketed may ultimately be put frequently dictate that the container in which the liquid is stored and transported shall be provided with nozzles, valves, nipples, etc., to permit the liquid to be dispensed from the bottle in the form of a plurality of drops, a spray, or in atomized form. In recent years, the development of new and versatile types of plastic materials has led to the fabrication of liquid containers which, by virtue of their resilient side walls, permit the liquid contents of the container to be ejected therefrom simply by manually squeezing the container. Various types of spouts and nozzles have been utilized in conjunction with "squeeze bottles" of this type to permit the fluid to be ejected therefrom in the desired physical form.

One of the most simple and least costly dispensing devices which has previously been devised for use in conjunction with collapsible containers of the type described is a simple tubular spout having a cap which is screwed or pressed over the end of the spout to prevent the egress of fluid from the container during shipment, handling and storing. In order to dispense the contents of the container, the screw-on or snap-on closure cap must be completely removed and thus becomes subject to loss or misplacement. After the cap is removed from the tubular spout, the fluid contents of the squeeze bottle are discharged through the spout by squeezing inwardly upon the sides of the bottle to displace an amount of the fluid through the orifice spout. The discharge of the fluid occurs substantially along the long, or vertical, axis of the spout and container. When it is desired to apply the fluid contents of the squeeze bottle to a surface other than a horizontal surface, the container must be tilted from the vertical at an angle which corresponds to the angle formed by the surface with a horizontal plane. This imposes a serious limitation upon the ease and practicality of use of the device, since the user's hand must assume an awkward and unsuitable position, particularly in those situations wherein he wishes to apply the liquid to a surface which is positioned above the middle of his thorax. In other words, the user's control of the direction of fluid discharge is generally impaired, and the unnatural position which must be assumed by the hand of the user lends itself to rapid tiring and physical exhaustion. Moreover, in the simple orificed spout type of dispenser under discussion, a serious limitation is imposed upon the conditions of use of such dispensers since the degree of tilt of the container can never be so great that the diminished volume of fluid within the container will fail to fill the spout portion thereof.

To overcome the cited deficiencies of the simple spout

2

type dispenser, a finger activated dispensing device which discharges the fluid in a direction which is normal to the vertical axis of the spout and container has been widely utilized. One of the most familiar adaptations of this type of dispensing device is that which is utilized to supply a liquid in spray form to the window panes of windows. This type of dispensing device is, in effect, a spring activated suction and pressure discharge pump which is provided with suitable check valves and which delivers a given and limited volume of liquid for each stroke as the pump is actuated by the finger. The dispensing device usually includes a tube which originates at the bottom of the container so that all of the liquid in the container may be discharged therefrom without concern for the angle of tilt of the container. The dispensing device also usually includes an internally threaded cap which is attached to the neck of the container.

Fluid dispensing devices of the finger actuated type, although they permit the fluid contents of the container to be discharged at a right angle to the vertical axis of the container, are characterized by many undesirable features and deficiencies which become apparent in actual use. In the first place, since the dispensing device must be actuated solely by the muscular power of the index finger alone, the user becomes tired rather quickly. The tiring is greatly accelerated by a frequently occurring partial mechanical failure in the form of a tendency of the piston or packing to stick in the barrel of the pump, thereby demanding the exertion of additional pressure by the finger. Frequently too, the spring which is utilized to return the piston to the top of its stroke will become weakened early in the life of the device to the extent that the pump becomes inoperative and the whole dispensing device fails in its assigned utility. Also, as there are numerous metallic components utilized, corrosion is an ever-present problem, particularly in the case of fluids of a highly corrosive nature. For easier operation, and to permit rapid access of atmospheric air to the interior of the container, the fit of the piston in relation to the pump barrel is made rather loose. This results in undesirable leakage to the outside of the container and such dispensing devices cannot be installed in the container during shipment unless they are provided with a leak-proof closure gap. Finally, as has been suggested by the foregoing description of the finger actuated type dispensing device, a number of operative parts are utilized which, of course, increases the probability of early malfunctioning, and also increases the cost of manufacture.

The present invention combines the desirable attributes of the simple spout and cap type dispenser with the attractive features of the finger actuated type dispenser while overcoming the deficiencies of both types. Thus, the dispensing device of the present invention is of extremely simple construction in that it requires only three, or at the most four, parts for the construction of the entire device. The fluid is discharged at a right angle to the vertical axis of the device so that tilting of the device is unnecessary in order to apply the liquid content to a vertical surface, such as a window pane. The dispensing device is characterized by an inexpensive rotatable cap which prevents spillage during shipment and handling, and also prevents evaporation during standing between usages. In addition, this cap serves as a manually operated valve to permit both the delivery of the fluid from the inside of the container, and the ingress of atmospheric air into the container. The novel design of the discharge and intake orifices through the spout and cap portions of the container provides for proper hydraulic distribution of the fluid at the ends of the orifices, and also enables a relatively large tolerance to be realized in placing the rotatable cap in both opened and closed positions. Suitable indicia are

provided upon the rotating cap and the discharge spout for the purpose of clearly indicating to the user when the cap is rotated to its open position, and when it is in closed position.

An important aspect of the present invention is the manner in which it is manipulated to discharge the fluid contents thereof. Thus, as opposed to the requirement in finger actuated devices of repeated utilization of the index finger, the entire hand of the user may be utilized for actuating the dispensing mechanism of the present invention, and its continued use is therefore much less tiresome than in finger actuated devices of the type described above. The user is not forced to assume unnatural or awkward positions in applying the contents to the desired area. Because of the extreme simplicity of construction and few moving parts, the device may be utilized over long periods of time with absolute reliability. Moreover, in the preferred embodiment illustrated and described in the present application, all components of the device are constructed of a high density thermoplastic material, thus reducing to negligible magnitude the problem of corrosion which has existed in such devices where metallic components have been utilized.

Another important feature of the present invention is the provision of a novel air access valve which effectively seals an orifice through the spout and rotatable cap of the dispensing device at the time when the fluid contents of the container are being discharged therefrom, but which permits the immediate ingress of atmospheric air to the interior of the container when the pressure of the hand is released to permit the resilient container to reassume its original shape. The nature of the air access valve is such that it may be conveniently molded integrally with the tube which projects downwardly into the bottom of the container for conducting the fluid content of the container from the bottom thereof into the discharge spout secured to the top thereof.

It is a major object of the present invention to provide an efficient dispensing device for utilization in directing fluid to a desired point of application from a container in which the fluid is located.

Another object of the present invention is to provide a dispensing device which is characterized by continued reliability and effective operation over long periods of use, and which is quite economical to manufacture.

An additional object of the present invention is to provide a fluid dispensing device in which the fluid dispensed is discharged through a novel orifice which is designed to afford desirable hydraulic equalization in the fluid at the instant of discharge. The discharge orifice is also characterized by a rifled bore which imparts a swirling motion to the fluid as it is discharged from the container, and thereby facilitates better control of the direction of discharge.

Another object of the present invention is to provide a fluid dispensing device which may be quickly and easily attached to a fluid container, and which is designed to provide a tight seal between the discharge device and the container at all times.

A further object of the present invention is to provide a fluid dispensing device by means of which fluid may be dispensed at a right angle to the vertical axis of an elongated upright container in which the fluid is located.

An additional object of the present invention is to provide a fluid dispensing device characterized by appropriately located indicia to aid the user in determining when the device is properly positioned for dispensation and when the device is in its closed position.

Yet a further object of the present invention is to provide a fluid dispensing device which may be actuated by simply compressing the resilient walls of a fluid container constructed of resilient material.

Another object of the present invention is to provide a fluid dispensing device which is characterized by a novel air access valve which permits atmospheric air to be

rapidly admitted to the interior of the fluid container after each dispensation of fluid therefrom.

These objects and advantages will be better understood, and other objects and advantages will become apparent from a reading of the following disclosure when considered in conjunction with the accompanying drawings which illustrate my invention.

In the drawings:

FIGURE 1 is a view in elevation of a liquid container having deformable, resilient walls and provided with the dispensing device of the present invention.

FIGURE 2 is a view in elevation of the dispensing device of the invention.

FIGURE 3 is a plan view of the dispensing device of the present invention. The closed position of the dispensing device is illustrated in dashed lines.

FIGURE 4 is a sectional view taken along line 4—4 of FIG. 2 showing the dispensing device as it appears in its open position.

FIGURE 5 is a detail view illustrating the construction of the orifice of the dispensing device through which the liquid to be dispensed is discharged.

FIGURE 6 is a detail view showing the hemispherical recess which communicates with the discharge orifice shown in FIG. 5 as it appears when viewed from inside the closure cap of the dispensing device.

FIGURE 7 is a sectional view taken along line 7—7 of FIG. 6.

Referring now to the drawings in detail, and particularly to FIG. 1, reference character 10 designates a fluid container which is constructed of a resilient material which may be easily deformed by the hand of a user. A popular material of construction which is currently in widespread use for so-called "squeeze bottles" of this type is polyethylene. At the top of the liquid container 10, an externally threaded neck portion 12 is provided through which the fluid is discharged from the container. In the preferred embodiment of the present invention which is illustrated in the accompanying drawings, the novel dispensing device of the invention comprises three elements which may be appropriately characterized as a combination screw cap-orificed spout 14, an orificed closure cap 16 and a combination transition tube-air access valve 18. A tubular extension 20 may be telescoped into the combination transition supply tube-air access valve when such procedure is desirable in order to extend the transition supply tube into the lower portion of an especially large container 10.

The combination screw cap-orificed spout 14 comprises a cap 22 provided with internal threads 24 of a size and shape to engage the external threads of the container neck 12. As shown in FIG. 4, the upper end of the cap 22 is partially closed by a transverse member 26 which is slightly dished to assure that the cap 22 will tightly seal against the neck portion 12 of the container 10. The transverse portion 26 carries an embossed ridge 28 on its upper surface to facilitate the opening and closing of the dispensing device in a manner subsequently to be described. Suitable indentations 30 may be formed around the outer periphery of the cap 22 to serve as finger grips facilitating the rotation of the cap to engage its internal threads 24 with the threads of the container neck portion 12. A frusto-conical spout 32 is secured to the transverse portion 26 of the cap 22 with its hollow interior in communication with the hollow interior of the cap. Although the spout 32 may be secured to the cap 22 in any suitable manner, I prefer to mold the two elements as an integral continuity. The top of the spout 32 is closed by a thin concave member 34. An annular groove 36 is disposed coaxially around the inner wall of the spout and a pair of spaced orifices 37 and 38 are located on opposite sides of the groove 36 in a line which occupies a common plane with the axis of the spout. On the outer periphery of the spout 32, an annular ridge 39 extends coaxially around the spout, and appropriate in-

5

dicia 40, such as the letter "N," are embossed on the lower portion of the spout in alignment with the ridge 28 to aid the user in properly opening and closing the dispensing device in a manner subsequently to be described.

The combination transition supply tube-air access valve 18 comprises a tubular member 41 which is disposed coaxially in the fluid container 10 and extends upwardly into the spout 32. At its upper end, the tubular member 41 is provided with a turned-over collar 42 of generally frusto-conical configuration which bears against the internal walls of the spout 32 in the manner illustrated in FIG. 4. The collar 42 is provided with an annular ridge 44 extending coaxially around its outer periphery and being of a size and location to mate with the annular groove 36 formed in the inner wall of the spout 32. The collar 42 is of diminishing cross section from its upper end to its lower end and terminates in a relatively thin lower edge portion 46. The location of the annular groove 36 and the size of the collar 42 are such that the collar extends over and closes the lowermost orifice 37 extending through the spout 32.

The closure cap 16 is generally frusto-conical in configuration and is pressed over the spout 32 in the manner illustrated in FIG. 4. The closure cap 16 has an annular groove 48 extending coaxially around its inner wall adjacent its lower end in a position to mate with the annular ridge 39 on the outer surface of the spout 32. The closure cap 16 may thus be rotated relatively to the spout 32 for the purpose of opening and closing the dispensing device. Extending from the top of the closure cap 16 to the bottom thereof is a thickened portion 50. The thickened portion 50 is in the shape of an isosceles trapezoid and is generally aligned in a common plane with the axis of the closure cap 16. Near the upper end of the closure cap 16, the thickened portion 50 has a pair of opposed hemispherical recesses 52 and 54 located at the outer and inner surfaces of the thickened portion respectively. The hemispherical recesses 52 and 54 communicate with each other through a small orifice 56 which is provided with a spiral groove 58 or is rifled in the manner most clearly illustrated in FIG. 5. As shown in FIGS. 5, 6 and 7, the hemispherical recess 54 in the inner surface of the thickened portion 50 is provided with three vorticose vanes 60 which project substantially normal to the surface of the hemispherical recess and are shaped in the manner illustrated in FIGS. 6 and 7.

At the lower end of the thickened portion 50, another hemispherical recess 62 is formed in the internal periphery of the closure cap 62 and is in registry with an orifice 64 which extends inwardly from the outer surface of the thickened portion 50. It will be noted, in referring to FIG. 4, that the hemispherical recesses 62 and 54 formed in the inner periphery of the closure cap 16 are spaced from each other for registry with the orifices 37 and 38, respectively, in the spout 32 when the closure cap 16 is rotated to its open position. Appropriate indicia 66, such as the letters "O," "P" and "E," are embossed on the outer surface of the thickened portion 50 to facilitate the alignment of the orifices 37 and 38 with the hemispherical recesses 62 and 54, respectively, when the dispensing device is opened for fluid discharge.

Operation

The fluid dispensing device of the present invention may be utilized upon nearly every type of fluid container having a cylindrical neck portion and walls of resilient material. The tubular member 41 may be used alone or it may have an extension tube 20 telescoped therein as shown in FIGS. 1 and 4 in order to accommodate the dispensing device to containers of different sizes. It is to be noted that the ends of the tubular member 41 and its extension tube 20, if the latter is utilized, are bias cut in order to prevent accidental blockage of the tube by any

6

sediment or solid matter that may be contained within the fluid to be dispensed.

In order to prepare the container 10 and dispensing device for the discharge of liquid therefrom, the cap 22 of the combination screw cap-orificed spout 14 is screwed tightly down upon the externally threaded neck 12 of the container 10. Initially, however, the combination transition supply tube-air access valve 18 has been secured to the spout 22 by pressing the turned-over collar 42 upward into the spout 32 until the ridge 44 becomes interlocked with the groove 36 in the spout. The annular ridge near the top of the collar 42 not only serves as a locking device, but also functions to limit the movement of the combination supply tube-air access valve 18 into the spout 32 so that the collar 42 will be properly positioned with respect to the discharge orifice 37. When the cap 22 has been screwed down upon the neck 12 of the container 10, the closure cap 16 is pressed down over the spout 32 until the groove 38 interlocks with the ridge 39 carrier by the spout 32. In the preferred embodiment illustrated in the accompanying drawings, the closure cap 16 and the spout 32 are constructed of resilient plastic materials and the cap 16 will easily snap into place upon the spout 32 with groove 48 and ridge 39 firmly interlocking, yet will permit the closure cap 16 to be easily rotated between the open and closed positions.

Prior to the discharge of fluid from the container 10, the fluid dispensing device will be closed to prevent accidental leakage of fluid from the container. The position of closure is illustrated in dashed lines in FIG. 3 and is attained by rotating the closure cap 16 upon the spout 32 until the hemispherical recesses 54 and 62 in the thickened portion 50 of the closure cap are no longer aligned with the discharge orifices 37 and 38 in the spout 32. To assure that not even the slightest alignment occurs between the orifices 37 and 38 and the recesses 54 and 62, I prefer to form a reference mark (not shown) of some type upon the dished end member 26 of the screw cap 22 at a position which is substantially 90 degrees around the periphery of the spout 32 from the position of alignment, or open position shown in FIG. 4.

In preparing to discharge fluid from the container 10, the user will rotate the closure cap 16 from its closed position to its open position, in which the hemispherical recesses 54 and 62 are aligned with the orifices 37 and 38 in the wall of the spout 32. Several features of the invention facilitate the proper alignment of the rotatable cap 16 in the open position without guesswork or doubt on the part of the user. First, appropriate indicia 66, such as the letters "O," "P" and "E," are provided upon the thickened portion 50 of the rotatable cap 16 in alignment with the orifices 56 and 64, and additional indicia 40, such as the letter "N," are provided upon the discharge spout 32 in a position directly beneath and in line with the orifices 37 and 38 in the spout 32. Thus, when the indicia upon the rotatable cap 16 are brought into alignment with the indicia upon the spout 32, the user is assured that the proper orifices and recesses are aligned to permit the discharge of the fluid from the container 10. An additional safeguard against misalignment of the orifice 38 and orifice 56 when the rotatable cap 16 is in the open position is the provision of the relatively large hemispherical recess 54 which permits some latitude or tolerance in the degree of alignment.

The dispensing operation is commenced by gripping the container in the palm of the hand and compressing its resilient sides inwardly. Such compressive force will, of course, reduce the volume inside the container 10 and liquid will be forced upwardly through the tubular member 18 to the top of the spout 32. The increase in the pressure inside the container will bias the turned-down collar 42 against the sides of the spout 32 and improve the seal which the thin end portion 46 of the collar 42 forms over the orifice 37 in the spout. The pressure in the container 10 will also act upon the concave member

34 at the upper end of the spout 32, causing the member 34 to be distended outwardly, thereby biasing the side walls of the spout into tight engagement with the closure cap 16 to prevent any leakage of atmospheric air into the container by seepage between the closure cap 16 and the spout 32.

When the sides of the container 10 are collapsed by the force exerted by the hand, the fluid is forced upwardly through the tubular member 41 into the upper portion of the discharge spout 32 and from thence through the uppermost orifice 38 formed in the side of the spout. The fluid then fills the hemispherical recess 54 and is channeled by the recess into the orifice 56. This inward channeling of the fluid assures an even distribution of the hydraulic forces acting at the instant of ejection so that the stream of fluid which is ejected from the dispensing device is directionally stabilized and its application more easily controlled. Additional directional stability is imparted to the fluid as it leaves the dispensing device by virtue of the vorticoe vanes 60 disposed in the hemispherical recess 54 and also the spiral groove 53 or rifling in the orifice 56. Finally, the hemispherical recess 52 formed at the outer end of the recess 56 presents the advantage of eliminating any interference with the fluid stream by sharp or abrupt edges of the rotatable cap 16 and also shields the stream at the instant of its formation from deflecting air currents which might be moving along the surface of the thickened portion 50 of the rotatable cap 16. The recess 52 also protects the mouth of the rifled orifice 56 from becoming fouled or distorted by bumping the side of the closure cap 32 against an object, or bringing it in contact with any substance which might clog or block the orifice.

When a jet of fluid in the desired amount has been dispensed from the container by collapsing the sides thereof, the force exerted by the hand is relieved and the resilient walls of the container 10 recover their original shape. This, of course, tends to create a partial vacuum inside the container 10 and atmospheric air must enter the container in order to replace the fluid which has been discharged therefrom before a second discharge cycle can be commenced. Some air will obviously enter the container by way of the hemispherical recess 52, orifice 56, recess 54 and discharge orifice 38. However, an additional air access route is highly desirable and is especially important when the discharge orifice is of a small diameter, such as the rifled orifice 56 of the present invention. For the purpose of allowing the more rapid ingress of a large volume of atmospheric air into the container 10, the intake orifice 64 and its registering hemispherical recess 62 have been provided in the rotatable cap 16 and they are placed in registry with the orifice 37 when the rotatable cap 16 is in the open position. The generally wedge-shaped collar 42 is positioned with respect to the orifice 37 so that the thin edge portion 46 of the collar 42 acts as a flap valve covering the orifice 37 during the discharge cycle of the dispensing device and opening to permit atmospheric air to rush into the container 10 during the recovery of its original shape. By this arrangement, the restoration of the container 10 to its original shape is greatly expedited, and the time delay between the end of the discharge cycle and the recovery of the original shape of the container in readiness for the repetition of the discharge cycle is reduced to a minimum.

From the foregoing description, it will be apparent that the present invention provides a dispensing device for use in conjunction with "squeeze bottle" type fluid containers, which device is extremely simple in construction and economical from the standpoint of manufacturing cost, and yet is characterized by a long and trouble-free operating life. In practically every instance, the discharge device will be entirely free from malfunctioning during the entire period of time required for dispensing the fluid content of the container in conjunction with which it is

utilized. Moreover, since the user's whole hand is employed in operating the device, its use for applying fluids to a vertical surface is much less tiring than the finger actuated devices of the prior art. Finally, it is much more efficient in use than most fluid dispensing devices of similar application which have heretofore been constructed in that the time lag between the end of the fluid discharge cycle and the instant when the container is restored to its original shape in preparation for the commencement of a second discharge cycle is greatly reduced, allowing a considerably greater volume of fluid to be dispensed in a given time than has been possible with such devices as previously constructed.

Although a preferred embodiment of the invention has been illustrated in the accompanying drawings, it will be appreciated that numerous modifications and alterations in the arrangement of parts and elements can be made in the structure of the dispensing device without departing from the spirit and scope of the invention as defined in the following claims.

I claim:

1. A device for dispensing fluids from a container constructed of a resilient material comprising a hollow cap for attachment to said container; a slightly dished cover member at one end of said cap and having a circular opening therethrough; a frusto-conical hollow spout secured at its end of larger diameter to said cover member with its hollow interior in communication with the hollow interior of said cap, said spout having an annular groove extending coaxially around the inner periphery thereof, and further having a pair of orifices in one side thereof spaced from each other on opposite sides of said annular groove; an annular ridge extending coaxially around said spout on the outer periphery thereof; a frusto-conical closure cap rotatably secured over said spout and having an annular groove around the inner periphery thereof of a size and location to mate with said annular ridge, said closure cap further having a pair of spaced orifices disposed in one side thereof and registering with said first-mentioned pair of orifices when said cap is rotated to a predetermined position with respect to said spout; and fluid flow control means disposed in said spout and directing said fluid to one of said first-mentioned pair of orifices while preventing said fluid from entering the other of said first-mentioned pair of orifices, said flow control means comprising tubular means extending from the interior of said spout into the bottom of said container for conveying fluid from said container into said spout when said container is collapsed inwardly, a hollow frusto-conical collar of resilient material secured at its end of smaller diameter to the upper end of said tubular member and turned back along said tubular member to concentrically surround the upper end portion of said tubular member, said collar bearing against the internal walls of said spout and tapering to a thin edge at its end of larger diameter to provide a flap valve covering said other first-mentioned orifice, and an annular ridge extending coaxially around said frusto-conical collar and positioned on said collar to mate with said annular groove in said spout.

2. A device for dispensing fluids as claimed in claim 1 wherein said closure cap further comprises a thickened wall portion generally occupying a common plane with the axis of said closure cap and having said second-mentioned pair of orifices extending therethrough, one of said second-mentioned pair of orifices having its origin and terminus in registry with hemispherical recesses defined by said thickened wall portion in opposite sides thereof and communicating with the orifice of said first-mentioned pair of orifices through which said fluid is ejected from said container.

3. A device for dispensing fluids as claimed in claim 2 wherein the one of said second-mentioned pair of orifices which registers with said hemispherical recesses is rifled to impart a rotary movement to said fluid as it passes therethrough, and wherein said dispensing device is further

characterized to include a plurality of vorticosse vanes disposed in said hemispherical recess in the inner surface of said closure cap, said vanes cooperating to impart a vortical movement to said fluid as it is discharged from said container.

4. A fluid applicator comprising a cap adapted to be attached to a container containing a fluid to be dispensed; a hollow spout projecting from said cap and defining a pair of spaced orifices, said spout being open at its end connected to said cap with its hollow interior in communication with the interior of said container, and being closed at its end opposite said cap by a resilient, concave membrane; closure means movably mounted on the outer surface of said spout and movable between a position of closure over said orifices and a second position in which said orifices are opened; and valve means in said spout for preventing the access of fluid in said container to one of said orifices while permitting the ingress of atmospheric air to the interior of said container through said one orifice, said valve means comprising a tubular member projecting downwardly into said container, and a resilient collar secured to the upper end of said tubular member and bearing against the internal walls of said spout in superimposed relation to said one orifice, said collar being wedge-shaped in cross section with its thinnest portion covering said one orifice whereby said collar may be biased away from the wall of said spout adjacent to said one orifice when said closure means is positioned to open said orifices and when a lower pressure than atmospheric pressure exists inside said container.

5. A fluid applicator comprising a cap adapted to be attached to a container containing a fluid to be dispensed; a hollow spout projecting from said cap and defining a pair of spaced orifices, said spout being opened at its end connected to said cap with its hollow interior in communication with the interior of said container and being closed at its end opposite said cap; closure means movably mounted on the outer surface of said spout and having a pair of orifices therein spaced to register with said first-mentioned pair of orifices when said closure means is rotated, said closure means further having a pair of spaced hemispherical recesses on the inner surfaces thereof communicating with the orifices in said closure means and positioned for registry with said first-mentioned orifices when said closure means is rotated; and valve means in said spout for preventing access of fluid in said container to one of the orifices in said spout while permitting the ingress of atmospheric air to the interior of said container through said one orifice in said spout, said valve means comprising a tubular member projecting downwardly into said container and a resilient collar secured to the upper end of said tubular member and bearing against the internal walls of said spout in superimposed relation to said one orifice in said spout, said collar being wedge-shaped in cross section with its thinnest portion covering said one orifice in said spout whereby said collar may be biased away from the wall of said spout adjacent said one orifice when said closure means is positioned to open said orifices and when a lower pressure than atmospheric pressure exists inside said container.

6. A fluid applicator as claimed in claim 5 and characterized further to include a plurality of vorticosse vanes disposed in said hemispherical recess through which said fluid passes and arranged to impart a vortical movement to the fluid passing therethrough.

7. A fluid applicator as claimed in claim 5 wherein said closure cap defines a third hemispherical recess in the outer surface of said closure cap in coaxial registry with said rifled orifice.

8. A fluid dispensing device for use in a container having collapsible, resilient walls comprising a cap for the container having a tubular spout thereon communicating with the interior of the container, said spout having a fluid discharge orifice and an air inlet orifice extending therethrough; discharge tube means extending from said spout to the bottom of said container; valve means secured to the upper end of said spout for preventing air from entering said container via said air inlet orifice when the pressure in said container is at least as great as the atmospheric pressure outside said container, said valve means comprising a resilient, generally wedge-shaped, lip portion responsive to a pressure differential to close said container from the atmosphere outside said container; closure means rotatably secured over said spout and having an orifice extending therethrough for registry with the fluid discharge opening in said spout, said closure means orifice being in the form of a pair of hemispherical recesses on opposite sides of said closure means interconnected by a generally cylindrical passageway, and said closure means further having a second orifice extending therethrough for registry with the air inlet orifice of said spout.

9. A fluid dispensing device as claimed in claim 8 wherein said tubular spout is closed at its end opposite said container by a resilient, concave membrane.

10. A fluid dispensing device for use in a fluid container having collapsible, resilient walls comprising a cap for the container having a tubular spout thereon communicating with the interior of the container, said spout having a pair of spaced orifices extending therethrough; closure means rotatably secured over said spout and having a pair of orifices therethrough spaced to register with said first mentioned pair of orifices when said closure means is rotated to align said orifices, the orifice in said closure means which registers with the uppermost orifice in said spout being in the form of a pair of hemispherical recesses on opposite sides of said closure means interconnected by a generally cylindrical, rifled passageway, and wherein said closure means is further characterized to include a plurality of vorticosse vanes disposed in said hemispherical recess located on the inner side of said closure means adjacent said spout; a tube extending from the lower portion of the container into the central portion of said spout and terminating at a point between the orifices in said spout; and air access valve means secured to the upper end of said tube and bearing against the walls of said spout to partition said spout into a discharge chamber in the upper end of said spout and an air intake chamber in the lower end of said spout with one of said spout orifices in each of said chambers, said valve means having a resilient lip portion superimposed over the lowermost spout orifice and acting as a flap valve to control the ingress of atmospheric air to said container following the discharge of fluid therefrom.

References Cited in the file of this patent

UNITED STATES PATENTS

2,717,727	Robb	Sept. 13, 1955
2,808,966	Hall et al.	Oct. 8, 1957
2,815,890	Coopridge et al.	Dec. 10, 1957
2,964,302	Tombu	Dec. 13, 1960