Dec. 6, 1960 R. W. BEALL, JR 2,963,205

LIQUID DISPENSING DEVICE

Filed May 7, 1956

FIG. 1.

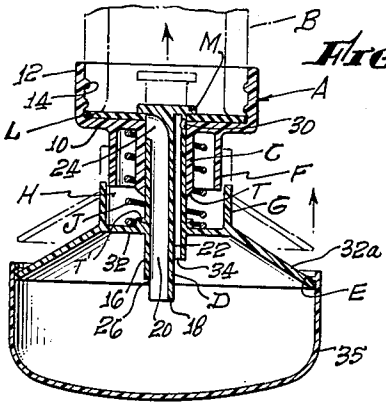


FIG. 2.

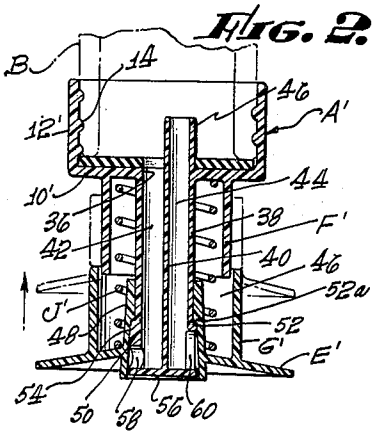


FIG. 3.

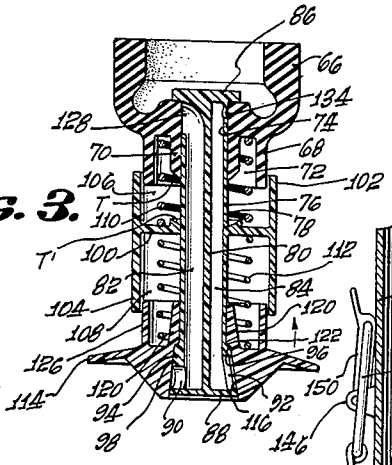


FIG. 4.

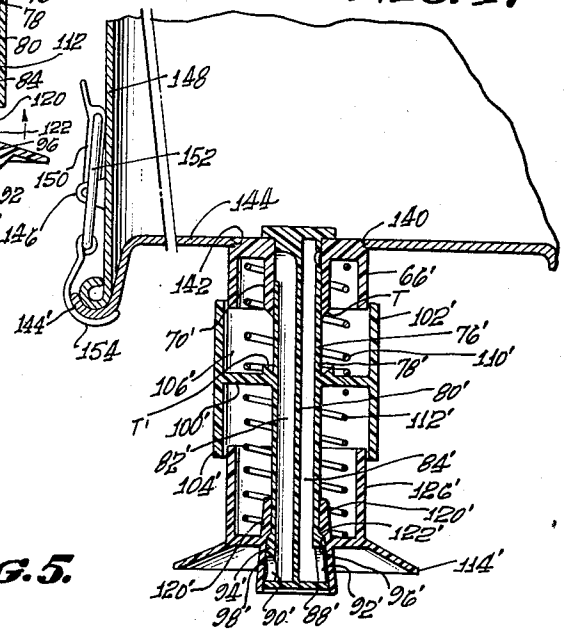
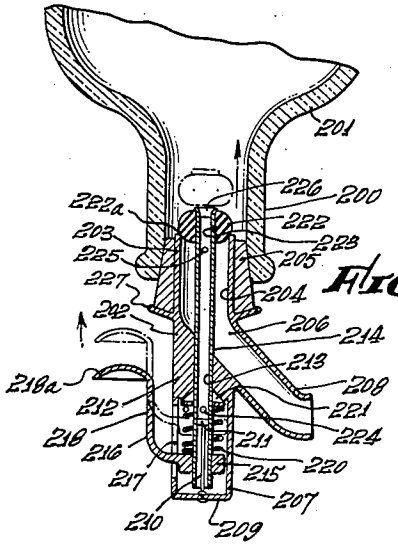


FIG. 5.



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LIQUID DISPENSING DEVICE

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3 Claims. (Cl. 222—484)

The present invention relates generally to the field of liquid dispensing devices, and more particularly to an air-vented liquid dispenser that may be used on a container when in an inverted position. The present application is a continuation-in-part of my Patent No. 2,779,517 entitled Fluid Dispensing Device which issued January 29, 1957.

The primary purpose in devising the present invention is to provide means by which a continuous flow of liquid may be obtained as desired from an inverted container such as an acid carboy, wine bottle, milk can, or the like, yet with the liquid in such containers remaining completely sealed out of atmospheric contact when not being discharged therefrom.

Another object of the invention is to provide a liquid dispenser that is so vented that the pressure in the interior of the container to which it is affixed is equalized with the atmospheric pressure as liquid flows from the container occurs.

A further objective of the invention is to provide a liquid dispenser of the type described by means of which the liquid flows from an inverted container without gurgling, or the liquid stream moving laterally as it is discharged into a receptacle, which is of utmost importance from a safety standpoint in the case of a strong acid, alkali, organic solvent, or poisonous fluids which could cause injury upon personal contact therewith.

A still further object of the invention is to provide a liquid dispensing unit that can be quickly and easily affixed to commercial liquid containers such as acid carboys, milk cans, and the like, which may be readily removed therefrom after discharge of the liquid.

Yet another objective of the invention is to provide an air-vented liquid dispensing unit that has a relatively simple mechanical structure, can be fabricated from standard commercially available materials and retailed at a sufficiently low price as to encourage its widespread use.

A still further object of the invention is to provide a liquid dispensing unit that is substantially maintenance and trouble-free due to the simplicity of its structure and the relatively few movable parts embodied therein.

Yet another object of the invention is to supply a dispensing device that automatically ceases to discharge liquid into a container when the discharged liquid has raised to a predetermined level therein.

These and other objects and advantages of the invention will become apparent from the following description of a preferred and certain alternate forms thereof, when taken in conjunction with the accompanying drawings, in which:

Figure 1 is a vertical cross-sectional view of a preferred form of the invention showing the manner in which it is affixed to the neck portion of a container;

Figure 2 is a vertical cross-sectional view of an alternate form of the device shown in Figure 1;

Figure 3 is a vertical cross-sectional view of a second alternate form of the invention that is primarily adapted

for use in dispensing acid or alkali solutions from an inverted carboy;

Figure 4 is a vertical cross-sectional view of a third alternate form of the invention shown as applied to the lid of a commercial milk can; and,

Figure 5 is a vertical cross-sectional view of a fourth alternate form of the invention.

Referring now to Figure 1 for the general arrangement of the invention, it will be seen that a threaded cap-shaped member A is provided that may be threadedly and removably mounted on a threaded bottle neck B such as that shown in inverted position in Figure 1, of a wine or brandy bottle, or a carboy in which acid is contained. Member A has a tubular member C depending downwardly therefrom in which a combined fluid discharge and air-vented member D is slidably mounted. A combination shield and actuating member E for initiating liquid flow is affixed to member D.

A first cylindrical flange F extends downwardly from member A, and in cooperation with a second cylindrical flange G affixed to shield E, defines an annulus-shaped enclosed space H in which a compressed helical spring J is housed. A resilient washer L is disposed in the lower portion of member A and effects a fluid-tight seal with the lower extremity of neck B, as well as likewise effecting a fluid-tight seal when a valve member M affixed to the upper end of the combined liquid discharge and air-vent member D is brought into forceful contact therewith by action of the spring J.

In detailed structure, the cap-shaped member A includes a circular plate 10 that has a cylindrical side wall 12 projecting upwardly from the outer circumferential edge portion thereof. Threads 14 are provided on the interior of side wall 12 which engage threads that are normally formed as a part of the bottle neck B. Flange F is preferably formed as an integral part of the plate 10 and depends downwardly therefrom, as best seen in Figure 1. Likewise tubular member C is preferably formed as an integral part of plate 10 and also depends downwardly therefrom substantially the same distance as flange F. The combined liquid discharge and air-vented member D is circular in cross section and of such size as to be slidably movable within the confines of tubular member C, with a portion thereof extending downwardly below this tubular member.

Member D is formed with an elongate cylindrical side wall 16 which has a longitudinally extending partition 18 disposed therein that is an integral part thereof, which partition divides the space within side wall 16 into an elongate liquid discharge passage 20 and an air-vent passage 22. The upper portion of partition 18 develops into the circular valve member M of such dimensions that the under circumferential edge portion thereof seats on the inner upper surface of the resilient washer L. A port 24 is formed in the upper portion of side wall 16 directly under the valve seat M, which port communicates with the liquid discharge passage 20 but is only in communication with the liquid within the confines of neck B when the valve member M is not in the seated position on washer L, as shown in Figure 1. A portion 26 of the lower extremity of member D is cut away whereby the force of capillary attraction is diminished and liquid is not inclined to adhere to the lower portion of member D. In addition, a port 30 is formed in side wall 16 directly under valve member M and opposite port 24, with port 30 communicating with the air-vent passage 22.

The combined shield and actuating member E comprises a plate 32 preferably integrally formed as a part of the member D, which plate projects outwardly therefrom to support the second cylindrical flange G as well as a downwardly and outwardly tapering outer edge por-

tion 32*a*. The helical spring J (Figure 1) is compressed, with the upper end thereof abutting against the lower face of plate 10, and the lower end of the spring resting on the upper surface of plate 32.

When it is desired to utilize the preferred form of the invention, a glass or other receptacle (not shown) is brought into contact with the under side of the shield E and moved upwardly. This upward movement of the receptacle causes concurrent upward movement of the second flange G and the combined liquid discharge and air-vent member D whereby fluid can flow from the neck B through port 24 into the liquid discharge passage 20. Likewise air can flow upwardly through the air-vent passage 22 and port 30 into the confines of the bottle of which neck B forms a part, to equalize the air pressure in the bottle with that of the outside atmosphere during liquid discharge through member D.

After liquid has risen to a point in the receptacle into which it is being poured where it contacts the lower extremity 34 of the air-vent, air can no longer enter passage 22 and thereafter liquid flow from passage 20 ceases, thereby preventing the overfilling or overflowing of said receptacle. However, liquid flow from the bottle of which neck B forms a part can be immediately stopped at any time by simply moving the receptacle downwardly together with valve member M, which seats on the washer L to effect a fluid-tight seal therewith. Thus, it will be seen that by use of the above-described invention liquid can only be discharged into a receptacle to a certain elevation therein whereby inadvertent overfilling of the receptacle is avoided. This desirable feature is also common to the forms of my invention shown in Figures 2, 3 and 4. Also by use of this device, liquid can be discharged into a receptacle to the desired level therein and the further flow of liquid immediately terminated by downward movement of the receptacle. Should it be desired to seal the lower portion of the shield E for sanitary reasons, convex-concave member 35 (Figure 1) may be clipped to the outer circumferential portion of the shield. The use of such a convex-concave member is desirable when wine is being dispensed, as certain insects are attracted to the lower portion of member D due to the wine odor.

The first alternate form of the invention, as shown in Figure 2, includes a cap-shaped member A′ that is adapted to threadedly engage the neck B of a liquid container. Member A′ comprises a circular plate 10′ from which a cylindrical side wall 12′ projects upwardly and has threads 14′ formed on the interior thereof that engage the threads normally provided on the neck B of certain types of glass bottles and carboys. A centrally disposed opening 36 is provided in plate 10′, which opening communicates with a combined liquid discharge and air-vent member 38 that depends downwardly from the plate. Member 38 has a longitudinally extending partition 40 situated within the confines thereof that cooperates with the interior surface of the member to define a longitudinally extending liquid discharge passage 42 and an air-vent passage 44. The upper portion of partition 40, together with a portion of member 38, extend upwardly within the confines of member A′ to provide a tubular inlet 46 through which air flows into the confines of the bottle of which the neck B forms a part.

A first cylindrical flange F′ depends downwardly from the lower surface of plate 10′ in the same manner as the previously described flange F. Flange F′ cooperates with a second cylindrical flange G′ that projects upwardly from a circular, downwardly tapering combined shield and actuating member E′ to define an annulus-shaped space 46 in which a compressed helical spring J′ is enclosed in an encircling position about the combined liquid discharge and air-vent member 38. Member 38 is provided with a tubular valve member 48 at the center thereof, which valve member is preferably formed as an integral part of shield member E′.

In Figure 2 it will be noted that the lower end of the combined liquid discharge and air-vent member 38 developed into an enlarged tubular portion 50 that is defined by a circumferentially extending, downwardly tapering seat 52 that terminates in a downwardly depending cylindrical side wall 54. The lower end of member 38 is closed by a circular plate 56 that is affixed to the lower end of the partition 40. A port 58 is formed in the enlarged portion 50 of member 38 directly above plate 56, and is in communication with the liquid discharge passage 42. A second port 60 is formed in the enlarged portion 50 opposite port 58 which communicates with the air-vent passage 44.

The upper portion of valve member 48 is slidably mounted on the combined liquid discharge and air-vent member 38 and can move downwardly to the position shown in Figure 2, where further downward movement is prevented when the seat 52 encounters a shoulder 52*a* formed on the interior of valve member 48. When valve member 48 is in the position shown in Figure 2, it completely obstructs ports 58 and 60. The upper end of spring J′ abuts against the lower face of plate 10′ and the lower end of the spring is disposed against the upper surface of member A′. Inasmuch as spring J′ is under compression at all times, it tends to urge the combined shield and actuating member A′ downwardly to maintain valve member 48 in a port-closing position.

When it is desired to discharge liquid from the bottle of which neck B forms a part, a receptacle (not shown) is placed under member A′ and urged upwardly. As a result of this upward movement valve member 48 uncovers ports 58 and 60 whereby the liquid is discharged through passage 42 and port 58 and air enters port 60 to flow upwardly in passage 44 and equalize the pressure on the interior of the bottle with that of the outside atmosphere. To stop the liquid flow from the bottle on which this alternate form of the invention is mounted, the receptacle is simply moved downwardly, which permits the combined shield and actuating member E′, together with valve member 48, to move downwardly relative to member 38. This downward movement of the valve member effects immediate closure of port 58 and any drop of liquid adhering thereto is shut off by the valve member and drops into the receptacle. In this form of the invention there is no possibility that liquid will adhere to the lower portion of member 38 due to the above-mentioned valve action.

A second alternate form of the invention is shown in Figure 3 that is particularly adapted for use with an acid carboy when it is disposed in an inverted position. This form of the device includes a resilient cap-shaped member 66 preferably fabricated from rubber, or the like, and is mounted on the neck (not shown) of the carboy. Member 66 is provided with a cylindrical rib 68 that depends therefrom and is separated from a tubular member 70 that extends downwardly from the member, by an annulus-shaped space 72.

A combined liquid discharge and air-vent member 76 is provided that is slidably mounted in a centrally disposed bore 74 formed in member 66. Member 76 is tubular, having an exterior side wall 78 and a partition 80 that extends the interior length of the tube to divide it into a liquid discharge passage 82 and an air-vent passage 84. The upper end of partition 80 terminates in a valve plate 86 which is of such size that the lower circumferential edge portion thereof seats on the surface portion of member 66 surrounding bore 74. The lower end of partition 80 terminates in a second plate 88. A bore 90 is formed in the lower portion of member 76 directly above the second plate 88 and communicates with the liquid passage 82. A second bore 92 is formed in member 76 opposite bore 90 and is in communication with the air-vent passage 84.

The lower portion of the combined air-vent and liquid discharge member 76 is generally designated by the nu-

meral 94 and is somewhat larger in diameter than the upper portion thereof. Portion 94 is defined by a circumferentially extending, downwardly tapering valve seat 96 from which a cylindrical side wall 98 extends. Bores 90 and 92 are formed in this enlarged portion 94 of member 76. A horizontally disposed circular element 100 extends outwardly from the exterior central portion of member 76, which element terminates on its outer circumferential edge in an upwardly extending cylindrical first wall 102 and a similar cylindrical downwardly extending second wall 104. Wall 102 and the upper exterior surface of member 76 cooperatively define an annulus-shaped space 106 that is in communication with the annulus-shaped space 72.

A compressed helical spring 110 is mounted within the confines of the annulus-shaped spaces 72 and 106, with the lower end of the spring abutting against the upper surface of plate 100 and the upper end of the spring resting on the lower face of the cap-shaped member 66. The second wall 104 and the exterior surface of the lower portion of member 76 cooperatively define an annulus-shaped space 108. A second compressed helical spring 112 is disposed within the confines of space 108. A circular combined actuating member and shield 114 is provided in which a centrally located tapered bore 116 is formed. A tubular valve member 120 extends upwardly from the center portion of member 114 and with bore 116 cooperatively forms a circular tapered body shoulder 122 at the junction thereof. Due to the action of the compressed spring 112, shoulder 122 is adapted to engage the seat 96 when the combined actuating member and shield 114 is in the position shown in Figure 3. Displacement of spring 112 from the upper surface of member 114 is prevented by a third cylindrical side wall 126 that extends upwardly therefrom and is slidable within the confines of the second wall 104. A port 128 that communicates with liquid discharge passage 82 is provided in the upper portion of member 76, and similarly, a vent 134 of considerably smaller size than vent 136 which communicates with the air vent passage 84 is formed in the upper portion of member 76.

The operation of the second alternate form of the invention is considerably different from that of the two inventions previously described. When it is desired to discharge a liquid from a carboy (not shown) it is first inverted and a receptacle is then placed in contact with the under side of the combined shield and actuating member 114 and brought upwardly. As spring 112 is weaker than spring 110, the valve member 120 first moves upwardly to uncover the ports 90 and 92. This upward movement of the valve member 120 continues until the upper exterior face of the combined shield and actuating member 114 contacts the lower circumferential edge of the second wall 104. When such contact is effected the element 100 is moved upwardly, and the combined liquid-discharge and air-vent member 76 moves upwardly to a point where the ports 128 and 134 are disposed above the exterior surface of the lower portion of the cap-shaped member 66. Liquid can then flow through port 128 into the passage 82 and discharge through port 90 into the receptacle. Concurrently air enters port 92 to flow upwardly in the air-vent passage 84, through the port 134 into the confines of the carboy (not shown) to equalize the air pressures within and without the carboy. As the result of such equalization the acid or other fluid contents of the carboy flows from port 90 in a continuous, uninterrupted stream without gurgling, or the danger of the discharging stream being diverted laterally.

When the desired amount of fluid has been discharged into the receptacle, the receptacle is moved downwardly which permits the stronger spring 110 to move the combined liquid discharge and air-vent member 76 downwardly to bring the valve plate 86 into liquid-sealing contact with the upper surface of the lower portion of the cap-shaped member 66. Liquid discharge from the interior of the carboy into passage 82 is, of course, immediately terminated. Further downward movement of the receptacle causes spring 112 to move the combined shield and actuating member 114, together with valve member 120 downwardly for the valve to seal ports 90 and 92 and concurrently wipe all liquid therefrom to return it to the receptacle. Thus it will be seen that both the opening and closing of the second form of the invention occurs in two stages whereby any inadvertent upward movement of the combined shield and actuating member, however slight, will not permit liquid to discharge from the carboy.

The third alternate form of the invention is identical to the second form, with the exception that a plug 66' having threads 140 formed on the upper exterior surface thereof is substituted for the cup-shaped member 66. Threads 140 on this third form of the device are adapted to engage a capped bore 142 formed in a conventional cover 144 used on metal milk cans. Bracket 146 is affixed to the exterior surface 148 of the can and pivotally supports a lever 150. This lever in turn pivotally supports a leg 152 on the lower end of which a hook 154 is mounted that engages the lip 144' forming a part of the conventional milk can cover 144. When the lever 150 is pivoted to the position shown in Figure 4, the hook 154 is held in locking position to maintain the cover 144 in the position shown in Figure 4. Thus, when a can of milk on the cover of which the third alternate form of the invention is mounted is inverted, the device permits milk to be discharged through the cover. The same numerals employed to identify the components of the second alternate form of the invention are used on the third form but have a prime added thereto.

A fourth alternate form of the invention is shown in Figure 5 mounted in the mouth portion 200 of an inverted bottle 201. This form of the dispenser includes a tubular body 202 having a primary tubular pouring spout 203 extending upwardly through a centrally located bore 204 formed in a frusto-conical stopper 205. Stopper 205 may be fabricated from cork, rubber, or other resilient materials not adversely affected by fluid contained in the bottle with which it is associated. At an intermediate junction 206, the primary pouring spout 203 branches into a downwardly extending tubular member 207 and an angularly disposed secondary pouring spout 208. The lower end of tubular member 207 is closed by a plate 209 that supports a centrally disposed, upwardly extending stem 210, which stem supports an annular packer 211 on the upper end thereof.

The portion of tubular member 207 directly below junction 206 is sealed by a plug 212 in which a longitudinally extending bore 213 is formed. An elongate air tube 214 is mounted in bore 213 and is vertically slidable therein. Stem 210 projects upwardly into tube 214 and maintains packer 211 in slidable sealing contact with the interior surface thereof. A collar 215 is mounted on the lower portion of tube 214, which collar is disposed within the confines of tubular member 207 in slidable contact with the interior wall surface thereof. A handle 216 projects from collar 215 and passes through a vertical slot 217 formed in tubular member 207. Handle 216 may take a variety of shapes, but that of a generally L-shape is shown in Figure 5 which includes a stem 218 that supports a convex pressure plate 218*a* at its upper end, which plate may be of any desired shape.

A helical spring 220 that is constantly under compression is disposed within tubular member 207. The lower end of spring 220 contacts the upper face of collar 215, and the upper end of the spring bears against a packing washer 221 positioned on the lower surface of plug 212.

In Figure 5 it will be seen that an annular valve member 222 is provided through which a bore 123 extends to permit mounting thereof on the upper extremity of tube 214. Valve member 222 is at all times urged down-

wardly due to the compression of spring **220**, and seats in fluid-sealing contact with the upper edge **222***a* of tube **214**, as shown in solid line. A first air vent **224** is formed in tube **214** below packer **221**, and a second air-vent **225** is formed in the upper portion of tube **214** situated below valve member **222**. A plug **226**, or other conventional sealing means, closes the upper end of tube **214**. A flange **227** projects from primary spout **203** which limits the distance the spout may move upwardly relative to stopper **205**. Flange **227** is also of assistance in forcing stopper **205** into the mouth **200** of the bottle or container with which the invention is associated.

The operation of the fourth alternate form of the device is extremely simple. When it is desired to dispense fluid from an inverted container on which the invention is mounted, the handle **216** is moved upwardly. Upward movement of the handle causes tube **214** to move relative to packer **211** whereby the air-vent **224** is moved from the position shown in solid line to that indicated in phantom line. Upward movement of tube **214** also breaks the fluid-sealing contact between member **222** and seat **222***a* by causing member **222** to assume the position shown in phantom line (Figure 5).

Fluid may then flow into the primary spout **203** from where it is directed into the secondary spout **208**. A constant air pressure is maintained within bottle **201** due to the fact that air is immediately substituted for fluid as discharged. When fluid is discharged from the bottle **201**, air enters tube **214** through air-vent **224**, and flows through tube **214** to enter the bottle through air-vent **225**. After the desired amount of fluid has been discharged from bottle **201**, pressure is released from handle plate **218***a*, and compressed spring **220** returns tube **214** to the position shown where valve member **222** is in fluid-sealing engagement with seat **222***a* and vents **224** and **225** do not communicate. In practice it has been found desirable that the internal diameter of secondary spout **208** be somewhat smaller than the internal diameter of the primary spout **203** as this provides positive assurance that the secondary spout will be filled with fluid and there is no tendency for air to pass upwardly therethrough. To prevent venting of air and flow of liquids from the inventions when the receptacles into which liquid has been discharged are full, the lower ends of tubular members C, **70** and **70'** are preferably formed with downwardly and inwardly tapering faces T. Faces T are adapted to sealingly engage upwardly and outwardly tapered faces T' formed on member D and members **76**, as shown in Figures 1, 3 and 4.

Although the forms of the invention herein shown and described are fully capable of achieving the objects and providing the advantages hereinbefore mentioned, it is to be understood that they are merely illustrative of the presently preferred embodiments thereof and that I do not mean to be limited to the details of construction herein shown and described other than as defined in the appended claims.

I claim:

1. A dispenser capable of being removably mounted on the neck portion of a container to seal the same, but which permits concurrent discharge of liquid from, and venting of air into, the interior of said container only when said container is disposed in an inverted position, comprising: an elongate hollow rigid member having a longitudinally extending partition therein that divides the interior of said member into an unrestricted liquid discharge passage and an air vent passage; a cup-shaped member defined by a plate formed with an opening therein and a cylindrical side wall extending from the periphery of said plate; means on said side wall for removably supporting said cup-shaped member from the exterior surface of said neck portion; a tubular member in communication with said opening that extends outwardly from said plate oppositely from said side wall, said tube slidably supporting said hollow rigid member; a ring-shaped resilient washer disposed in said cup-shaped member and resting on said plate, which washer sealingly contacts the outer extremity of said neck portion when said cup-shaped member is mounted on said neck portion; a valve member mounted on the end of said hollow rigid member and disposed within the confines of said cup-shaped member, said valve member capable of sealingly engaging said washer, with said valve member being disposed adjacent first and second ports formed in said elongate member that are in communication with said liquid discharge passage and air vent passage respectively; a rigid shield that extends outwardly and downwardly from said elongate rigid member, which shield when pressure-contacted by an open-topped receptacle moves said hollow member and valve member upwardly relative to said cup-shaped member to a first position to permit vented liquid discharge from said container into said receptacle until the liquid in said receptacle rises to the extent that it obstructs the lower end of said air vent passage whereupon said liquid discharge ceases; spring means disposed exteriorly of said hollow rigid member that at all times tends to move said hollow member and valve member to a second position where said valve member is in sealing contact with said washer; and a dish-shaped resilient shell that is adapted to removably snap cnto the lower extremity of said shield to completely enclose the lower end of said elongate member to prevent contamination thereof when said dispenser is not in use.

2. A dispenser as defined in claim 1 wherein a first cylindrical flange is provided that projects from said circular plate toward said shield and a second cylindrical flange is provided that extends from said shield toward said circular plate, said first and second flanges being at all times in slidable engagement, with said first and second flanges, said circular plate and said shield cooperatively defining an enclosed space in which said spring means is disposed.

3. A dispenser as defined in claim 2 wherein said tubular member and a portion of said elongate member extend longitudinally through said confined space, and said spring means is a compressed helical spring that encircles said tubular member and portion of said elongate member, with one end of said spring abutting against said circular plate and the other end of said spring being in pressure contact with said shield.

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