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DROP DISPENSER

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FIG. 1

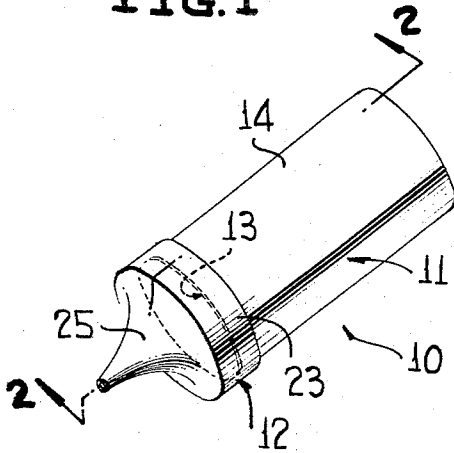


FIG. 3

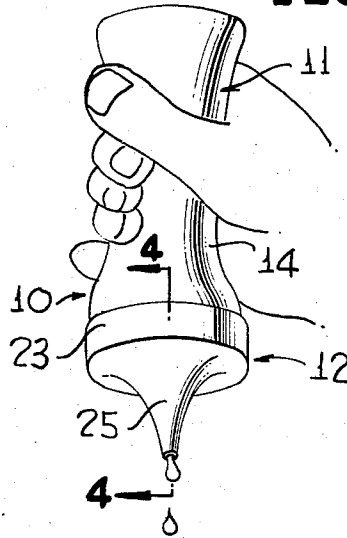


FIG. 2

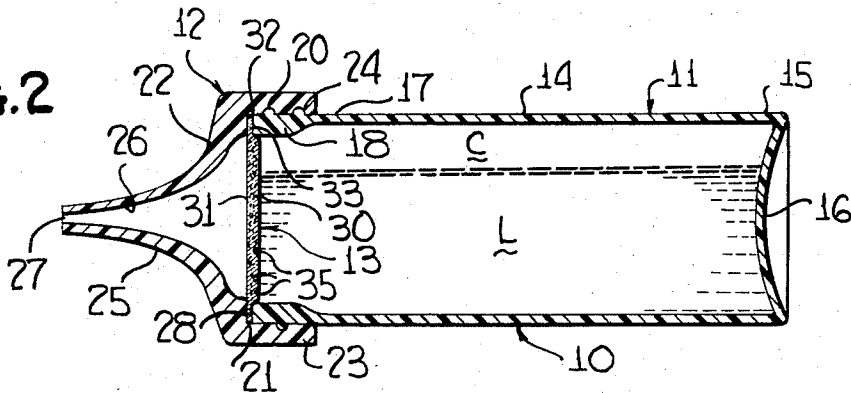
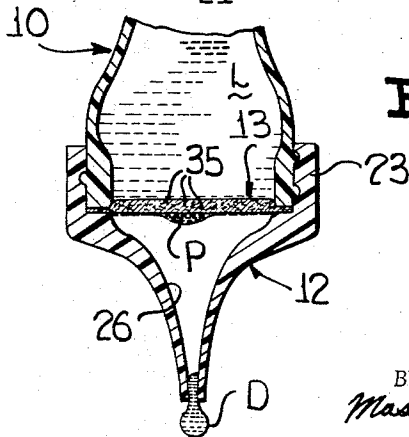


FIG. 4



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DROP DISPENSER

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16 Claims. (Cl. 222-189)

This invention relates to a novel dispenser for dispensing liquid from a container in drop-by-drop fashion when a body portion of the container is manually squeezed to force liquid packaged therein through a porous wall portion defining a plurality of capillary-like irregularly directed openings which are open at all times to liquid travel but which pass liquid only upon the application of pressure to the container.

At present there are numerous conventional devices for dispensing liquid drop-by-drop from a container in which the liquid is packaged. Generally either the container or a dispensing closure carried thereby is provided with intricate and costly means for obtaining such drop dispensing. For example, it is known to form closures and/or container bodies with a partition member for separating a liquid chamber of the containers from a chamber of the closures. Such partition members are provided with one or more valves for placing the chambers in liquid communication during a dispensing operation. Such valves generally include one or more moving parts, the partition members must be constructed to receive the valves, vents or other means are generally provided in either the closures or the containers, and intricate and exacting assembly of each of these elements is necessary for a successful drop-dispensing operation. The cost of raw materials, fabricating the various components from different material, assembling different parts of each component, and thereafter assembling each of the components to complete the formation of the dispenser is both time consuming and costly.

The disadvantages of such conventional drop dispensers are recognized and it is a primary object of this invention to provide a novel drop dispenser which is constructed from a maximum of three assembled components, requires no moving parts for a successful drop-dispensing operation, is relatively inexpensive from a standpoint of material, time and labor costs, and thus overcomes the above and many other disadvantages of conventional drop dispensers.

A further object of this invention is to provide a novel drop dispenser which includes a container, a closure and an insert, the container including a body being constructed of yieldable material, the closure including a dispensing opening, the insert defining a barrier between a liquid chamber of the body and the dispensing opening of the closure, and the insert being constructed from porous material defining a plurality of capillary-like openings providing an open path of liquid travel at all times from the liquid chamber to the opening but providing for liquid passage from the chamber to the opening only upon the pressurization of the liquid in the chamber by the application of manual pressure to the yieldable body whereby liquid is extruded through the capillary-like openings and dispensed in drop-by-drop fashion through the opening of the closure.

A further object of this invention is to provide a novel drop dispenser of the type immediately above described, and including cooperable means between the insert and the container body and/or the closure for maintaining the insert securely and accurately positioned in the dispenser.

Still another object of this invention is to provide a novel dispensing closure particularly adapted for use with a container packaged with a dispensible liquid for dispensing in a drop-by-drop manner, the closure including

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an end wall terminating at a peripheral skirt portion, the end wall including a dispensing nozzle defined by a wall converging toward a relatively small dispensing opening, the peripheral skirt portion terminating in a peripheral edge, and a porous insert member positioned between the opening of the nozzle and the peripheral edge of the skirt portion, the porous insert member defining a plurality of indiscriminately directed, constantly open capillary-like openings which provide an open path of travel at all times from a liquid chamber of a container to which the closure is attached to and through the dispensing opening of the closure.

A further object of this invention is to provide a novel container particularly adapted for use with a closure having a nozzle for dispensing liquid drop-by-drop including a container body terminating at a lower portion in a bottom wall and an upper portion in a porous wall, and the porous wall defining a plurality of minute, irregularly directed, continuously open, capillary-like openings providing an open path of travel for liquid from the interior of the container body to the exterior thereof and through the nozzle of a closure secured to the container to obtain drop-by-drop dispensing of the liquid.

Still another object of this invention is to provide a novel dispensing insert adapted for positioning between a container body packaged with dispensible liquid and a dispensing opening in a closure adapted for securement to the container body, the insert comprising a relatively flat member defined by opposite surface portions and a peripheral edge portion defining the general contour of the insert, and the member being constructed of porous material defining a plurality of capillary-like openings which at all times provide indiscriminately directed paths of liquid travel from a first of the surface portions to a second of the surface portions only upon the pressurization of liquid against the first surface portion at pressures above atmosphere.

With the above, and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing.

In the drawing:

FIGURE 1 is a side perspective view of a novel drop dispenser constructed in accordance with this invention, and illustrates the dispenser in a tilted position prior to manually squeezing a yieldable body of the container to dispense liquid therein drop-by-drop through a nozzle of a closure secured to the container body.

FIGURE 2 is an enlarged axial sectional view taken along line 2-2 of FIGURE 1, and illustrates a porous insert member forming a barrier preventing the passage of liquid from the container body through the nozzle prior to pressurizing the liquid by manually squeezing the body during a dispensing operation.

FIGURE 3 is a perspective view of the drop dispenser of FIGURES 1 and 2, and illustrates the container body being manually squeezed during a drop-dispensing operation.

FIGURE 4 is an enlarged fragmentary sectional view taken along line 4-4 of FIGURE 3, and illustrates the dispensible liquid being forced through the porous member during a drop-dispensing operation and the formation of a drop of the dispensible liquid at the closure nozzle.

A novel drop dispenser constructed in accordance with this invention is best illustrated in FIGURE 2 of the drawing and is generally referred to by the reference numeral 10. The drop dispenser 10 is of a three-part construction comprising a container 11, a closure 12, and an insert 13.

The container 11 includes a tubular container body 14 which is preferably cylindrical, and which is constructed

from yieldable, flexible or deformable material such as polyethylene or similar plastic material. The container body 14 terminates at a lowermost end portion 15 in an outwardly concaved bottom wall 16. An upper end portion 17 of the container body 14 is circumferentially thickened at 18 and provided with means 20, such as a screw thread, for securing the closure 12 to the container 11. The thickened portion 18 of the container body 14 terminates in a relatively flat peripheral edge 21.

The closure 12 of the drop dispenser 10 comprises an end wall 22 terminating at a peripheral skirt portion 23. The peripheral skirt portion 23 is provided with means 24, such as a complementary groove cooperating in a conventional manner with the screw thread 20 for securing the closure 12 to the container body 14. The end wall 22 includes a wall portion 25 converging away from the insert 13. The wall portion 25 defines a nozzle of the closure 12 having a converging port or passageway 26 terminating at a relatively small, preferably circular, opening 27. The end wall 22 of the closure 12 is thickened adjacent the peripheral skirt portion 23, and at this portion includes a shoulder 28 opposing the edge 21 of the container body 14.

The insert 13 is a relatively flat porous member having opposite surface portions 30 and 31 and a peripheral surface 32 defining the general configuration or outline of the insert 13. In the illustrated embodiment of the invention, the insert 13 is preferably circular and is reduced in section at a peripheral edge portion 33 which is clamped between the edge 21 of the container body 14 and the seat 28 of the closure 12 in the manner clearly illustrated in FIGURE 2 of the drawing. The insert 13 thus defines a barrier to dispensible liquid L in a chamber C of the container 11.

The porous material of the insert 13, which is preferably constructed from porous plastic material, but may also be constructed from paper, cork, sintered metal, or other porous material, defines a plurality of capillary like extremely small irregularly directed continuously open openings 35 which at all times provide an open path of travel for the liquid L from the chamber C of the container 11 into the port 26 of the closure 12. However, while the capillary-like openings 35 provide such a liquid path, under low pressures (atmospheric) the liquid L is prevented from passing through the capillary openings 35 of the insert 13. However, upon pressurization of the dispensible liquid L a limited amount of the liquid L is forced through or extruded through these capillary openings 35 of the insert 13. The increase in pressure is accomplished during a drop dispensing operation by manually grasping and squeezing the container body 14 of the container 11 when the drop dispenser 10 is in the inverted position illustrated in FIGURE 3 of the drawing. As the liquid L is forced through the capillary openings 35 of the insert 13, a small pool P (FIGURE 4) of liquid forms on the surface 31 of the insert 13. The pool P increases in size until capillary break-down occurs between the surface 31 of the insert 13 and the pool P, at which time the pool P drops downwardly against and is guided by the converging passage 26 of the nozzle 25 to and through the dispensing opening 27 in the form of a drop D (FIGURE 4).

Additional drops of the liquid L are dispensed from the drop dispenser 10 by merely maintaining manual pressure against the body 14 of the container 11. When such manual pressure is terminated, the container body 14 rebounds from the generally deformed configuration illustrated in FIGURE 3 of the drawing to that shown in FIGURE 1. With the liquid L no longer under pressure the insert 13 prevents the liquid L in the container body 14 from passing into the nozzle 25 even though the capillary openings 35 remain open and the dispenser is positioned in a manner in which the liquid L contacts the surface 30 of the insert 13 (FIGURES 1 and 2).

The capillary openings 35 of the insert 13 vary in size, depending primarily upon the viscosity of the liquid L which is to be dispensed by the drop dispenser 10. The size of the opening 27 of the nozzle 25 similarly varies in size, depending not only upon the viscosity of the liquid L, but the size of the drop D which is desired or intended to be dispensed.

From the foregoing, it will be seen that novel and advantageous provisions have been made by carrying out the desired end. However, attention is again directed to the fact that additional variations may be made in this invention without departing from the spirit and scope thereof as defined in the appended claims.

I claim:

1. A drop dispenser comprising a container and a closure, said container having a container body adapted to house a dispensible liquid, said closure having a dispensing opening through which said dispensible liquid is adapted to pass during a dispensing operation of said dispenser, and means at all times providing an open path of liquid travel from said body outwardly thereof but which pass such liquid from said body outwardly thereof only upon the application of pressure against said container body whereby liquid is dispensed from said opening.

2. A drop dispenser comprising a container and a closure, said container having a container body adapted to house a dispensible liquid, said closure having a dispensing opening through which said dispensible liquid is adapted to pass during a dispensing operation of said dispenser, and means defining a plurality of capillary-like openings which are open at all times to liquid travel from said container body outwardly thereof but which pass such liquid only upon the application of pressure against said container body, whereby liquid is dispensed from said opening.

3. A drop dispenser comprising a container and a closure, said container having a container body adapted to house a dispensible liquid, said closure having a dispensing opening through which said dispensible liquid is adapted to pass during a dispensing operation of said dispenser, and relatively rigid means defining a plurality of capillary-like openings which are open at all times to liquid travel from said container body outwardly thereof but which pass such liquid only upon the application of pressure against said container body whereby liquid is dispensed from said opening.

4. A drop dispenser comprising a container and a closure, said container having a container body adapted to house a dispensible liquid, said closure having a dispensing opening through which said dispensible liquid is adapted to pass during a dispensing operation of said dispenser, said body being constructed of pressure-yieldable material, and means defining a plurality of capillary-like openings which are open at all times to liquid travel from said container body outwardly thereof but which pass such liquid only upon the application of pressure against said container body whereby liquid is dispensed from said opening.

5. The drop dispenser as defined in claim 2 wherein said means defining said capillary-like openings is a separate element, and cooperable means are provided between said insert and said container body for maintaining said insert positioned along said liquid flow path between said body and said opening.

6. The drop dispenser as defined in claim 2 wherein said means defining said capillary-like openings is a porous insert member.

7. The drop dispenser as defined in claim 2 wherein said closure includes a converging wall defining a port terminating at said dispensing opening for directing a drop of liquid pressure-forced through said last mentioned means to and through said dispensing opening.

8. A container particularly adapted for use with a closure having a nozzle for dispensing liquid drop-by-drop comprising a container body terminating at a lower por-

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tion in a bottom wall and at an upper portion in porous wall, and means defining a plurality of capillary-like openings which are open at all times to liquid travel from the interior of said body to the exterior thereof but which pass such liquid only upon the application of pressure against said container body.

9. The container as defined in claim 8 wherein said container body is constructed from pressure-yieldable and reboundable material.

10. A dispensing closure particularly adapted for use with a container packaged with dispensible liquid media for dispensing liquid drop-by-drop comprising an end wall terminating at a peripheral skirt portion, a dispensing opening in said end wall, said peripheral skirt portion terminating in a peripheral edge portion, and porous means between said opening and said peripheral edge portion defining a plurality of capillary-like openings which are open at all times to liquid travel from a container with which the dispensing closure is associated outwardly thereof but which pass such liquid only upon the application of pressure against the container.

11. The dispensing closure as defined in claim 10 wherein said last mentioned means is a porous relatively rigid member.

12. A drop dispenser comprising a container, said container including a container body adapted to receive a dispensible liquid, at least a portion of said container body being constructed for inward deflection upon the application of manually applied forces thereto, said container body terminating at a lower portion in a bottom wall, said body also including an uppermost end portion, means between a position contacting said uppermost end portion and said bottom wall, said means defining a portion of a liquid chamber, said means being a porous wall portion defining a plurality of capillary-like irregularly directed openings which are open at all times to liquid travel from said chamber outwardly thereof but which pass such liquid only upon the application of pressure against said deflectable container body portion, a closure, means securing said closure at said uppermost end portion, and said

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closure including means for directing liquid passed through said porous wall.

13. A drop dispenser comprising a container, said container including a body closed at a lower portion and open at an upper portion, said body being constructed from yieldable material, an insert closing said open upper portion, said insert being constructed of porous material defining a plurality of capillary-like irregularly directed openings which are open at all times to liquid travel from said chamber outwardly thereof but which pass such liquid only upon the application of pressure against said yieldable body, a closure, means securing said closure to said upper body portion, cooperating means between said closure and said body for maintaining said insert positioned in closing relationship to said upper end, and said closure having a dispensing nozzle for the passage of liquid outwardly of said closure during a dispensing operation.

14. The drop dispenser as defined in claim 13 wherein said nozzle converges away from said insert and terminates at a small dispensing opening.

15. The drop dispenser as defined in claim 14 wherein said insert is constructed from porous plastic material.

16. The drop dispenser as defined in claim 14 wherein said insert is constructed from sintered metal.

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