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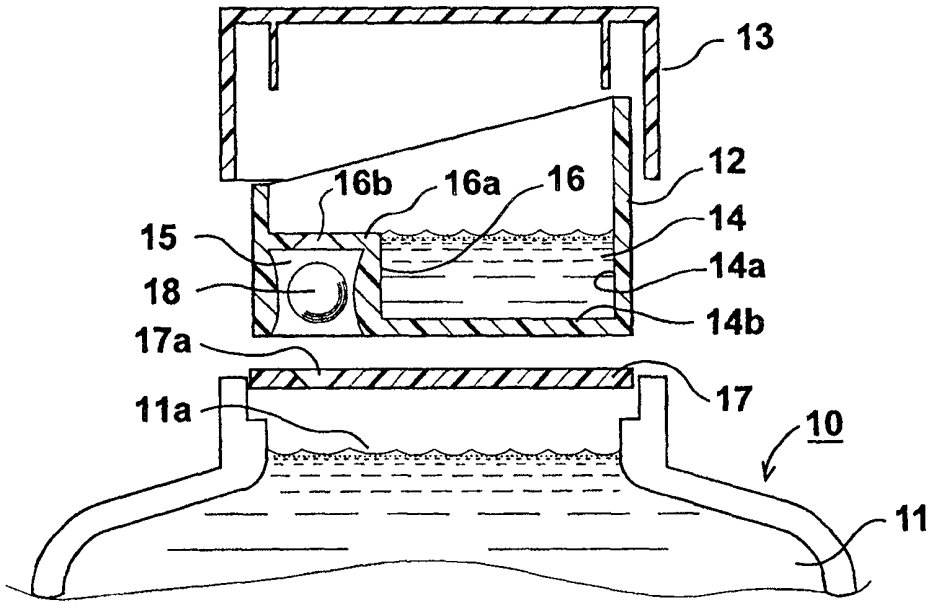

(57) Abstract

A device for dispensing flowable material in unit doses that requrires shaking before dispensing. There is a container (10), having an auxiliary compartment (14), above the container compartment (11) normally closed by a cap (13). A valve member (18) closes a passageway (16b) between the two compartments in an inverted position, but alternately opens and closes the passageway (16b) when the container is shaken parallel to its longitudinal axis.

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DEVICE AND METHOD FOR CONTAINING AND DISPENSING FLOWABLE MATERIAL, PARTICULARLY MEDICINES

FIELD AND BACKGROUND OF THE INVENTION

The present invention relates to a device, and also to a method, for containing and dispensing flowable material requiring shaking before dispensing. The invention is particularly useful for containing and dispensing medicines in the form of liquid mixtures which require shaking before being consumed, and is therefore described below with respect to this application.

Many medicines, particularly those in the form of liquid mixtures (but conceivably also in the form of granular particles) are to be shaken before being consumed. Their containers generally include clear instructions to the user to shake before using. However, the user may fail to read the instructions, or for some other reason may neglect to shake the container before using, thereby reducing, if not destroying, the effectiveness of the medicine to be taken.

While shaking before use is particularly important in medicines, there are many other materials which should also be shaken before use, including, for example, paints, mouthwashes, bathoils, eye make-up removers and other cosmetics, whitening correction fluids, salad dressings, and many other multiple-phase liquid products.

OBJECTS AND BRIEF SUMMARY OF THE INVENTION

An object of the present invention is to provide a device for containing and dispensing flowable material, particularly liquid-mixture medicines, which have to be shaken by the user before they are to be consumed. Another object of the invention is to provide a method of enforcing a shaking requirement before permitting the container contents to be dispensed.

According to one broad aspect of the present invention, there is provided a device for containing and dispensing flowable material requiring shaking before dispensing, comprising: a container having a substantially

vertical axis in the upright and inverted positions of the container, a main compartment for containing the flowable material to a predetermined maximum level, and a cap normally closing the upper end of the container and removable to dispense material therefrom; characterized in that the container further includes: an auxiliary compartment at the upper end of the container above the predetermined maximum level of the main compartment, and normally closed by the cap; an opening defining a passageway from the main compartment into the auxiliary compartment also above the predetermined maximum level of the main compartment; and a valve member closing the opening when the container is in an inverted position, but alternately opening and closing the opening, to permit filling the auxiliary compartment from the main compartment, when the container is shaken repeatedly substantially parallel to the axis of the container.

Containers constructed in accordance with the foregoing features of the present invention are to be distinguished from the many known types of containers designed to dispense predetermined dosages, such as described in US Patents 4,489,859, 3,146,923, 3,115,993, 3,091,374, 2,419,769, 2,149,989, 2,038,418, 1,710,517, 1,555,591, and 298,778.

Several embodiments of the invention are described below for purposes of example.

In one described preferred embodiment, the valve member is a ball freely movable within a ball compartment to open and close the passageway upon shaking the container.

In a second described preferred embodiment, the valve member comprises: a stem passing through the opening; a first valve element at the end of the stem located within the auxiliary compartment and effective to close the opening in the upright position of the container; and a second valve element at the end of the stem located within the main compartment and effective to close the opening in the inverted position of the container; the stem being sufficiently long to cause its valve element to alternately open and close the opening, to permit filling the auxiliary compartment from the main compartment,

when the container is shaken repeatedly substantially parallel to the axis of the container.

A third embodiment of the invention is described, wherein the valve member includes a spring normally urging the valve member to close the opening; the spring being deformable to cause the valve member to alternately open and close the opening when the container is shaken repeatedly substantially parallel to its longitudinal axis.

According to further features that are applicable to any one or all the foregoing embodiments, the auxiliary container may be of a predetermined volume to define a predetermined dosage of the flowable material to be dispensed. Preferably, the auxiliary compartment is provided with a drain opening permitting excess material therein, in excess of the predetermined volume, to drain back from the auxiliary compartment to the main compartment in the upright position of the container.

According to another aspect of the present invention, there is provided a method of dispensing a flowable material, comprising: containing the flowable material in a container having a main compartment for containing the flowable material, a removable cap, an auxiliary compartment at the upper end of the container and normally closed by the cap, and a passageway from the main compartment to the auxiliary compartment; and blocking the passage of the flowable material from the main compartment to the auxiliary compartment when the container is in an inverted position, but alternately opening and closing the passageway to permit the flowable material to flow from the main compartment into the auxiliary compartment when the container is shaken repeatedly substantially parallel to its longitudinal axis.

As will be described more particularly below, the invention is particularly useful for containing and dispensing liquid medicines which require shaking before being consumed since the invention automatically enforces the "shake before use" instruction normally provided on such a container. It will be appreciated, however, that the invention could be used in

other applications, e.g., for containing many other products, e.g., those mentioned earlier.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein:

Fig.1 is an exploded, sectional, fragmentary view illustrating one form of container constructed in accordance with the present invention;

Fig. 1a illustrates the external appearance of the container of Fig. 1 with the cap removed;

Fig. 1b more particularly illustrates the auxiliary compartment and the valve member included in the container of Fig. 1;

Fig. 2 is a fragmentary, partially-sectional view illustrating a second form of container constructed in accordance with the present invention, with the cap removed;

Fig. 2a is a fragmentary view illustrating the container of Fig. 1 and its cap in the inverted position of the container;

Fig. 2b illustrates a modification in the valve member of Figs. 2 and 2a;

Fig. 3 is a fragmentary view illustrating a third form of container constructed in accordance with the present invention;

and Fig. 3a is an exploded view more particularly illustrating the valve member in the comntainer of Fig. 3.

DESCRIPTION OF PREFERRED EMBODIMENTS

The embodiment illustrated in Fig. 1 includes a container, generally designated 10, having a vertical longitudinal axis LA in the normal upright position of the container, shown in Figs. 1 and 1a, as well as in its inverted position (not shown). Container 10 further includes a main compartment 11 for containing its contents (e.g., a liquid mixture or other flowable material) to a maximum level 11a; a neck 12 at the upper end of the main compartment 11, through which the liquid contents are dispensed; and a removable

non-apertured cap 13 normally closing the neck 12. The foregoing elements of the container 10 may be of the appropriate size and configuration for the particular application.

According to the present invention, container 10 is provided with an auxiliary compartment 14 at its upper end, namely, in its neck 12 above the maximum level 11a of the container contents, which auxiliary compartment 14 is closed by the cap 13. Container 10 is further provided with a passageway 15 from the main compartment 11 to the auxiliary compartment 14. As described below, passageway 15 is closed when the container is in its inverted position but is opened, to permit the liquid contents of the container to flow from the main compartment 11 into the auxiliary compartment 14, only when the container is shaken repeatedly substantially parallel to its longitudinal axis LA.

In the Fig. 1 embodiment, the auxiliary compartment 14 is defined by a cylindrical wall 14a open at the top and to be closed by cap 13. The bottom wall 14b of the auxiliary compartment 14 is of circular configuration except a lateral segment thereof is open and bounded by an upstanding wall 16 closed at its upper end by an upper wall 16a formed with an opening 16b. A disk 17 underlies wall 14b of the auxiliary compartment 14 and is formed with an opening 17a in alignment with opening 16b, to establish communication between the main compartment 11 and passageway 15.

Upstanding wall 16 defines passageway 15 and includes a valve member in the form of a ball 18 freely movable within passageway 15. Wall 16, together with its upper end wall 16a formed with opening 16b and its lower end disk 17 formed with opening 17a, defines a ball compartment for ball 18 such that when the container 10 is in its upright position, ball 18 seats on opening 17a in disk 17, and when container 10 is in its inverted position (not shown), ball 18 seats on opening 16b in the upper wall 16a leading to compartment 14. In the latter position, ball 18 blocks communication between passageway 15 and the auxiliary compartment 14.

As shown particularly in Fig. 1, side wall 16 of the ball compartment containing passageway 15 is of cylindrical

configuration, but its inner diameter gradually increases from its mid portion to its upper end wall 16a and its lower end wall defined by disk 17. With such an arrangement, ball 18 closes by gravity one of the openings 16b or 17a when the container is in a horizontal position.

Disk 17 is preferably formed with further openings 17b (Fig. 1b) laterally on both sides of opening 17a, so as to provide communication between the main compartment 11 and passageway 15 in the upright position of the container. The purpose of these further openings 17b is to permit drainage of liquid from the auxiliary compartment 14 back to the main compartment 11 when the container 10 is in its upright position and the level of the liquid within the auxiliary compartment 14 is above the level of wall 16a. These further openings 17b also speed-up the filling of the auxiliary compartment 14 during the shaking of the container, as will be described more particularly below.

The container illustrated in Figs. 1, 1a and 1b is used in the following manner:

When the container is in its upright position, as shown in Figs. 1 and 1a, ball 18 seats on opening 17a, but there is nevertheless communication between the main compartment 11 and passageway 15 via the lateral openings 17b in disk 17. However, since these openings leading into the auxiliary compartment 14 via passageway 15 are above the normal level 11a of the flowable material (e.g., a liquid mixture) within container 10, placing the container 10 in its normal upright position will not cause any flow of the container contents into the auxiliary compartment 14. When container 10 is in its inverted position (not shown), ball 18 seats on opening 16b, and thereby blocks communication via passageway 15 between the main compartment 11 and the auxiliary compartment 14.

Liquid can be passed from compartment 11 via passageway 15 into compartment 14 only by grasping the container 10, with cap 13 closing the container neck 12, and repeatedly shaking the container substantially parallel to its longitudinal axis LA. With each stroke of the container towards the container bottom, ball 18 will move away from opening 17a, permitting the

liquid to flow, by its own momentum, from the main compartment 11 into passageway 15 via that opening, as well as via the lateral openings 17b; and with each stroke of the container in the opposite direction, i.e., towards cap 13, ball 18 will move away from opening 16b, to permit the liquid within passageway 15 to pass through opening 16b into the auxiliary compartment 14.

It will thus be seen that by shaking container 10 parallel to its longitudinal axis, whether the container be upright, inverted, or horizontal, ball 18 will alternately open and close opening 16b to cause the liquid to flow, by its own momentum during the shaking movements, from the main compartment 11, through passageway 15, and to the auxiliary compartment 14. Thus, the auxiliary compartment 14 will be filled with the liquid contents only after the container has been well shaken.

If, after this repeated shaking of the container, the liquid within the auxiliary compartment 14 is above the level of wall 16a, this excess liquid will drain via opening 16b into passageway 15, and through the lateral openings 17b, back into the main compartment 11, so that the liquid within the auxiliary compartment 14 will be a pre-measured volume, according to the volume of the auxiliary compartment up to wall 16a. Thus, the liquid within the auxiliary compartment 14 to be dispensed upon removing cap 13 will not only be well-mixed, but will also be of a predetermined dosage, e.g., 5cc.

Figs. 2 and 2a illustrate another construction of container, generally designated 20, also including a main compartment 21 for the container contents, a neck 22 closed by a cap 23, and an auxiliary compartment 24 at the upper end of the main compartment 21. Container 20 further includes a passageway 25 defined by an upright wall 26 closed by an upper end wall 26a formed with an opening 26b for the flow of the container contents into the auxiliary compartment 24. The flow of the container contents into the auxiliary compartment 24 is controlled by a valve member 28 including a stem 28a having a conical valve element 28b at one end on the auxiliary compartment 24 side of wall 26a; and a second conical valve element 28c, at its opposite end, on the main compartment 21 side of wall 26a.

Conical valve element 28b normally closes opening 26b in wall 26a in the upright position of container 20, as shown in Fig. 2; and conical valve element 28c normally closes opening 26b in the inverted position of the container. However, when container 20 is shaken repeatedly substantially parallel to its longitudinal axis, concical valve elements 28b and 28c alternately open and close opening 26b to permit the material within the main compartment 21 to flow, under its own momentum, through opening 26b into the auxiliary compartment 24. Thus, the container 20 illustrated in Fig. 2 and 2a also requires shaking before the container contents may be transferred from the main compartment 21 into the auxiliary compartment 24 for dispensing by removing the cap 23.

Fig. 2b illustrates a variation in the construction of the container illustrated in Figs. 2 and 2a, in that the valve elements at the opposite ends of the valve stem 28a are in the form of spheres, as shown at 28b' and 28c', respectively, rather than in the form of cones.

The construction of Figs. 2, 2a and 2b may also be provided with a drain opening to drain excess material from the auxiliary compartment 24 back to the main compartment 21 when the container is in its upright position, to better assure that a predetermined measure of the material will be dispensed according to the level of wall 26a formed with opening 26b. For this purpose, the valve element, e.g., conical element 28b in Figs. 2 and 2a (or spherical element 28b' in Fig. 2b) located on the side of wall 26a facing the auxiliary compartment 24, may be provided with a recess or groove, as shown at 29 in Fig. 2a, so that when that valve element is seated in opening 26b of wall 26a in the upright position of the container, any excess liquid above wall 26a will drain back via opening 26b into the main compartment 21 in the upright position of the container.

In all other respects, the construction illustrated in Figs. 2, 2a and 2b, is substantially the same, and operates in substantially the same manner, as described above with respect to Figs. 1, 1a and 1b.

Figs. 3 and 3a illustrate another container, generally designated 30, constructed in accordance with the present

invention. Container 30 is also provided with a main compartment 31 for the material to be dispensed, a neck 32 at the upper end of the main compartment 31 and closed by a cap 33, and an auxiliary compartment 34 defined by a wall 35 formed with an opening 36 which is controlled by a valve member 38 to permit the flow of material from the main compartment 31 into the auxiliary compartment 34 only when the container 30 is shaken parallel to its longitudinal axis, as in the above-described embodiments. In this case, however, valve member 38 is in the form of a semi-sphere spring-urged to close opening 36 by a leaf spring 39. One end of leaf spring 39 is secured to a ring 39a received within neck 32 of the container, and the opposite end carries the valve member 38.

As in the above-described embodiments, valve member 38 normally closes valve opening 36 in the inverted position of the container (as well as in the upright position of the container), but alternately opens and closes opening 36 upon shaking the container substantially parallel to its longitudinal axis to transfer material from the main compartment 31 into the auxiliary compartment 34 via opening 36. The container illustrated in Figs. 3 and 3a, therefore, also requires vigorous shaking of the container before the cap 33 is removed, to transfer the material from the main compartment 31 to the auxiliary compartment 34, so that the material is received within the auxiliary compartment only after it has been well mixed by vigorous shaking, which material may be dispensed when the cap 33 is removed.

As in the previously-described embodiments, wall 35 may also be provided with one or more drain opening 35a, to permit drainage of the excess material within the auxiliary compartment 34, i.e., above the level of wall 35, when the container is in its upright position, to thereby better assure dispensing of a predetermined dosage of the material.

While the invention has been described with respect to several preferred embodiments, it will be appreciated that these are set forth merely for purposes of example, and that the invention could include many modifications or could be applied in many other applications.

For example, the invention could be used in applications requiring only "shake-before-use", and not requiring measuring predetermined dosages. Also, the predetermined-dosage chamber could be of annular configuration, with the inlet opening located centrally of the chamber. In addition, while the invention is particularly useful in containing and dispensing medicines, it may be used in many other applications, such as those requiring mixing of multiple-phase liquids as briefly mentioned above.

Many other variations, modifications and applications of the invention will be apparent.

WHAT IS CLAIMED IS:

1. A device for containing and dispensing flowable material requiring shaking before dispensing, comprising:

a container having a substantially vertical axis in the upright and inverted positions of the container, a main compartment for containing the flowable material to a predetermined maximum level, and a cap normally closing the upper end of the container and removable to dispense material therefrom;

characterized in that said container further includes:

an auxiliary compartment at the upper end of the container above said predetermined maximum level of the main compartment, and normally closed by said cap;

an opening defining a passageway from said main compartment into said auxiliary compartment also above said predetermined maximum level of the main compartment;

and a valve member closing said opening when the container is in an inverted position, but alternately opening and closing said opening, to permit filling the auxiliary compartment from the main compartment, when the container is shaken repeatedly substantially parallel to said axis of the container.

2. The device according to Claim 1, wherein said valve member is a ball freely movable within a ball compartment to open and close said passageway upon shaking the container.

3. The device according to Claim 2, wherein said ball compartment is closed at its upper end by an upper wall formed with said opening, and by a lower wall at its lower end formed with a further opening which further opening is also above said predetermined maximum level of the main compartment for passing flowable material from the main compartment into the ball compartment upon shaking the container.

4. The device according to Claim 3, wherein said valve member is movable to close said lower wall opening in the upright position, and said upper wall opening in the inverted position, of the container, but to open said openings when the

container is shaken repeatedly substantially parallel to its longitudinal axis.

5. The device according to Claim 3, wherein said ball compartment has a cylindrical side wall which gradually increases in diameter from its mid-portion towards its upper and lower end walls, such that said ball closes by gravity one of said openings when the container is in a horizontal position.

6. The device according to Claim 3, wherein said lower wall is formed with a still further opening permitting excess material in the auxiliary compartment above said upper wall to drain back into the main compartment in the upright position of the container.

7. The device according to Claim 1, wherein said valve member comprises:

a stem passing through said opening;

a first valve element at the end of the stem located within said auxiliary compartment and effective to close said opening in the upright position of the container;

and a second valve element at the end of the stem located within said main compartment and effective to close said opening in the inverted position of the container;

said stem being sufficiently long to cause its valve elements to alternately open and close said opening, to permit filling the auxiliary compartment from the main compartment, when the container is shaken repeatedly substantially parallel to said axis of the container.

8. The device according to Claim 7, wherein said valve elements are of conical configuration.

9. The device according to Claim 7, wherein said valve elements are of spherical configuration.

10. The device according to Claim 1, wherein said valve member includes a spring normally urging the valve member to close said opening; said spring being deformable to cause said valve member to alternately open and close said opening when the container is shaken repeatedly substantially parallel to its longitudinal axis.

11. The device according to Claim 10, wherein said spring is a leaf spring secured at one end with respect to the container, and carrying said valve member on its opposite end.

12. The device according to Claim 11, wherein said one end of the leaf spring is secured to a ring received within the neck of the container.

13. The device according to Claim 1, wherein said auxiliary compartment is of a predetermined volume to define a predetermined dosage of the flowable material to be dispensed.

14. The device according to Claim 13, wherein said auxiliary compartment is provided with a drain opening permitting excess material therein, in excess of said predetermined volume, to drain back from said auxiliary compartment to said main compartment in the upright position of said container.

15. The device according to Claim 1, further including a liquid mixture filling said main compartment of the container.

16. A method of dispensing a flowable material, comprising:

containing the flowable material in a container having a main compartment for containing the flowable material, a removable cap, an auxiliary compartment at the upper end of the container and normally closed by said cap, and a passageway from the main compartment to said auxiliary compartment;

and blocking the passage of the flowable material from said main compartment to said auxiliary compartment when the container is in an inverted position, but alternately opening and closing said passageway to permit the flowable material to flow from the main compartment into the auxiliary compartment when the container is shaken repeatedly substantially parallel to its longitudinal axis.

17. The method according to Claim 16, wherein said auxiliary compartment is of a predetermined volume to define a predetermined dosage of the flowable material to be dispensed.

18. The method according to Claim 17, wherein said auxiliary compartment is provided with a drain opening permitting excess material therein, in excess of said

predetermined volume, to drain back from said auxiliary compartment to said main compartment in the upright position of said container.

19. The method according to Claim 17, wherein the passage of the flowable material is blocked by a valve member which includes a ball freely movable in a ball compartment to alternately open and close said passageway when the container is repeatedly shaken substantially parallel to its longitudinal axis.

20. The method according to Claim 17, wherein the passage of the flowable material is blocked by a valve member having a stem movable within said passageway, and valve element at its opposite ends effective to close said opening in the inverted position of the container, but to alternately open and close said passageway when the container is shaken repeatedly substantially parallel to its longitudinal axis.

21. The method according to Claim 17, wherein said valve member includes a spring normally urging the valve member to close said passageway; said spring being deformable to cause said valve member to alternately open and close said passageway when the container is shaken repeatedly substantially parallel to its longitudinal axis.

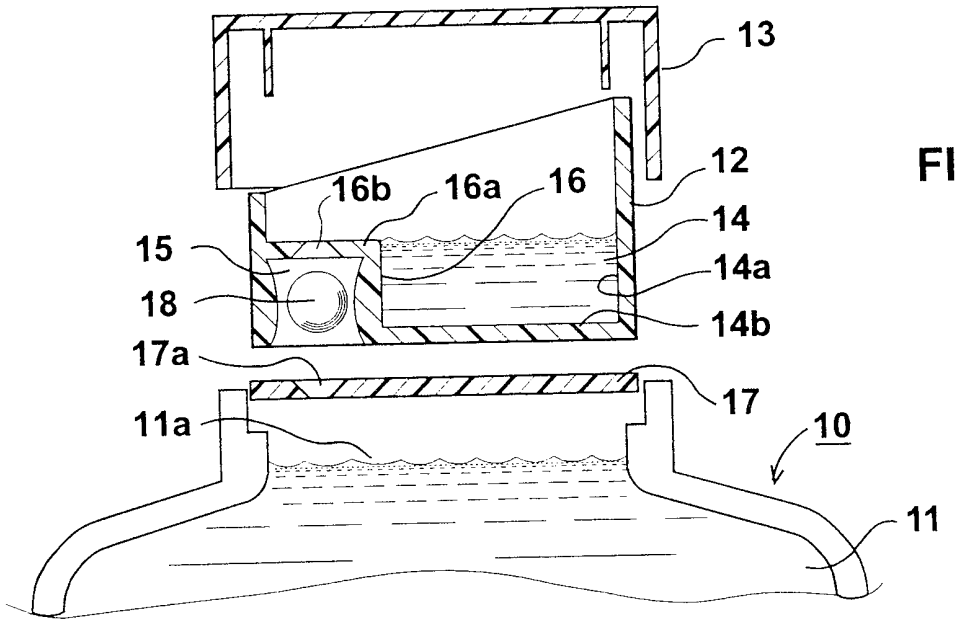


FIG. 1

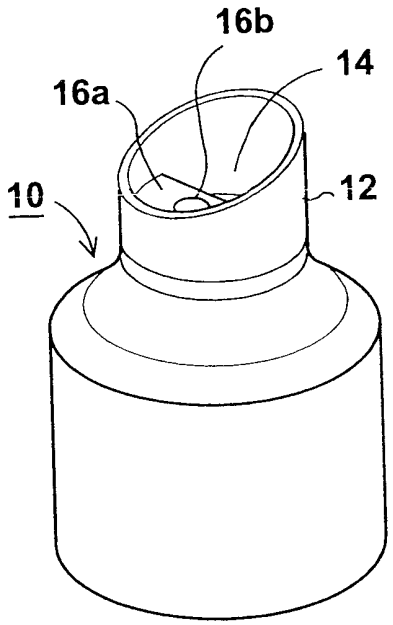


FIG. 1a

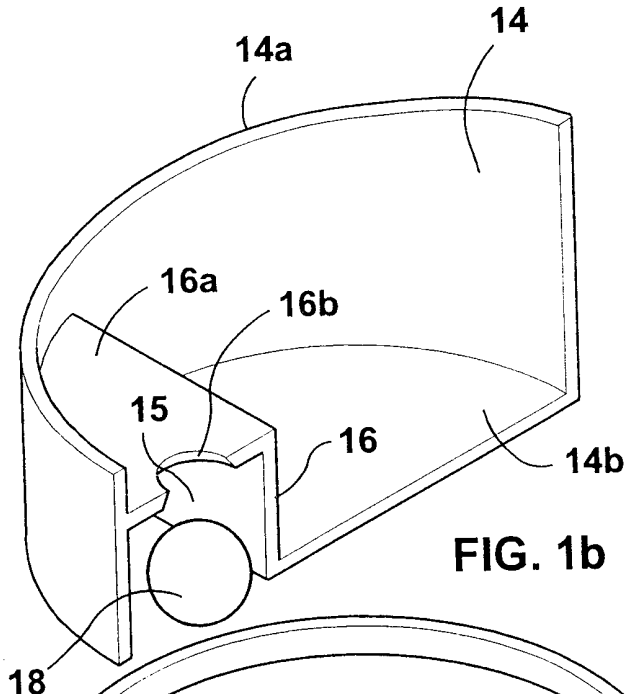
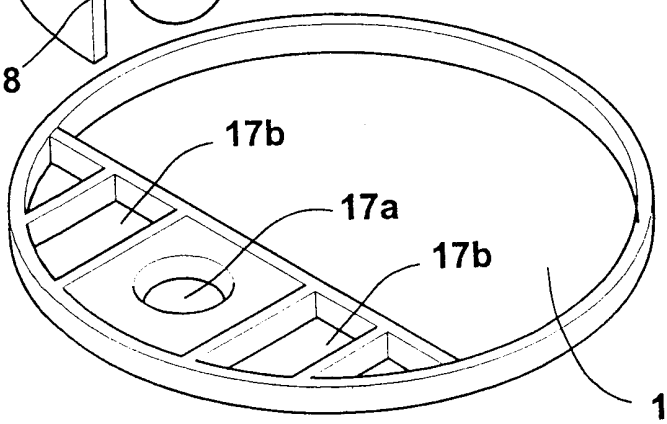


FIG. 1b



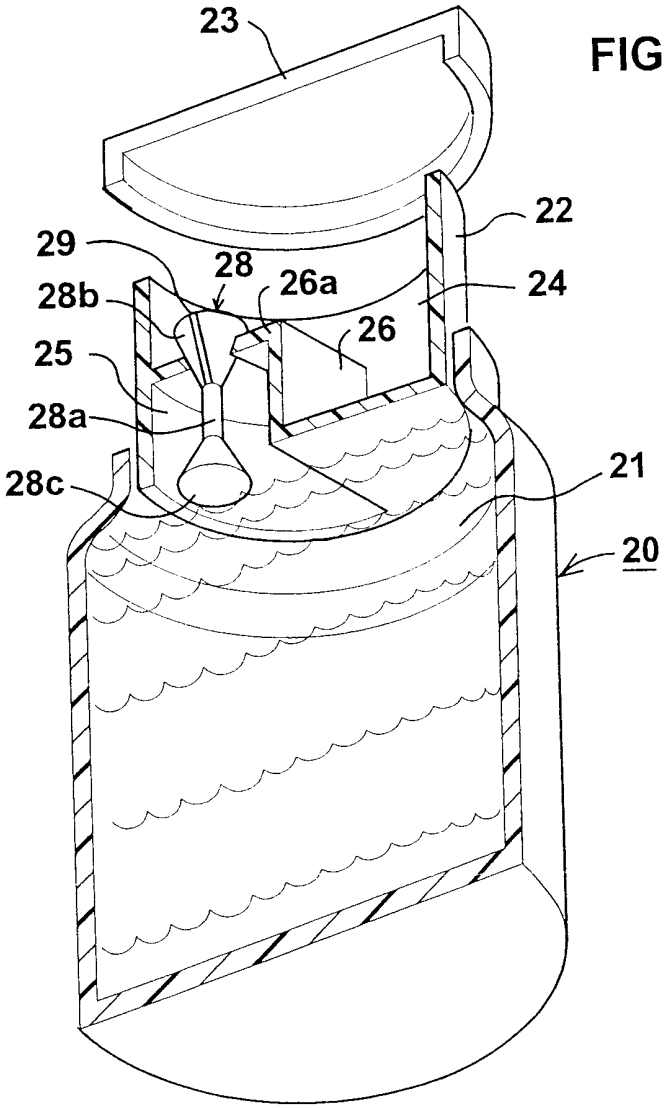


FIG.2

FIG.2a

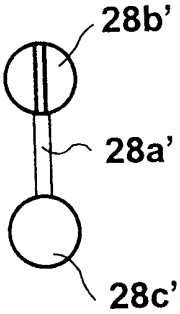
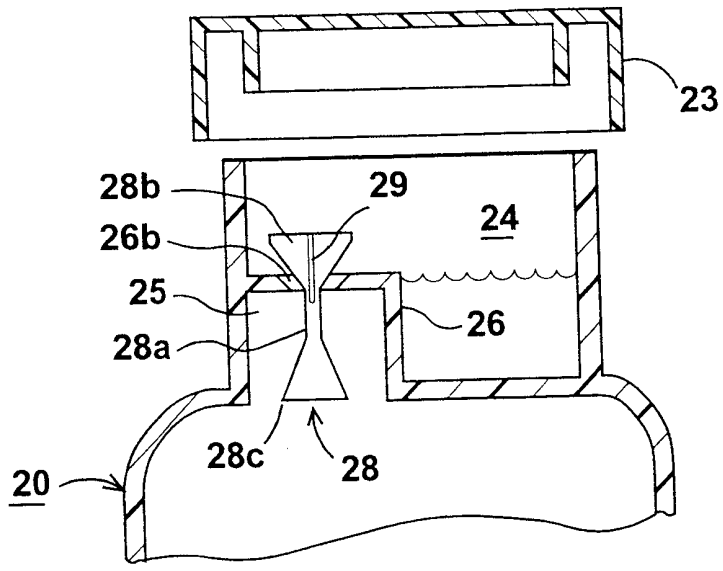


FIG.2b



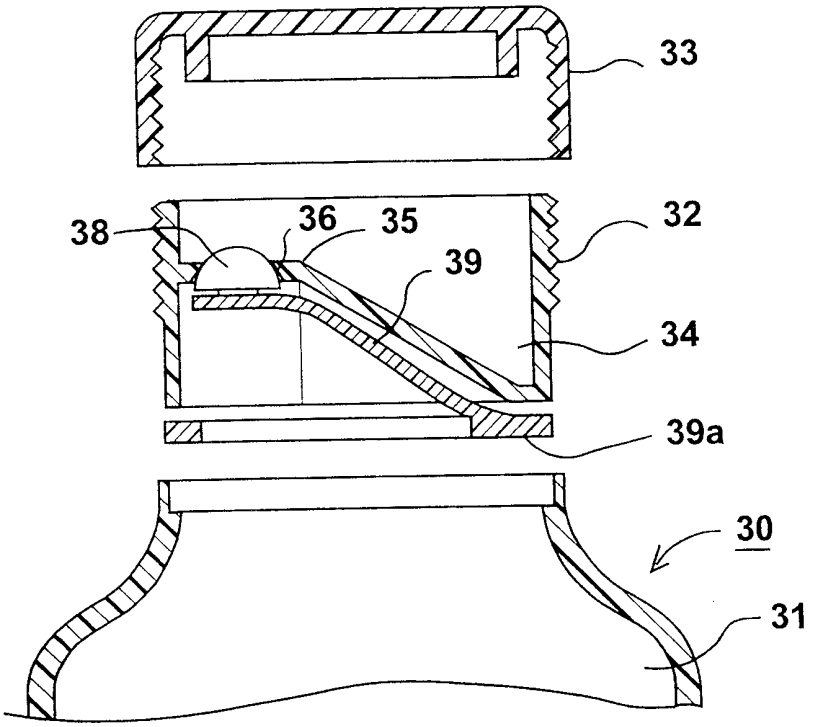


FIG. 3

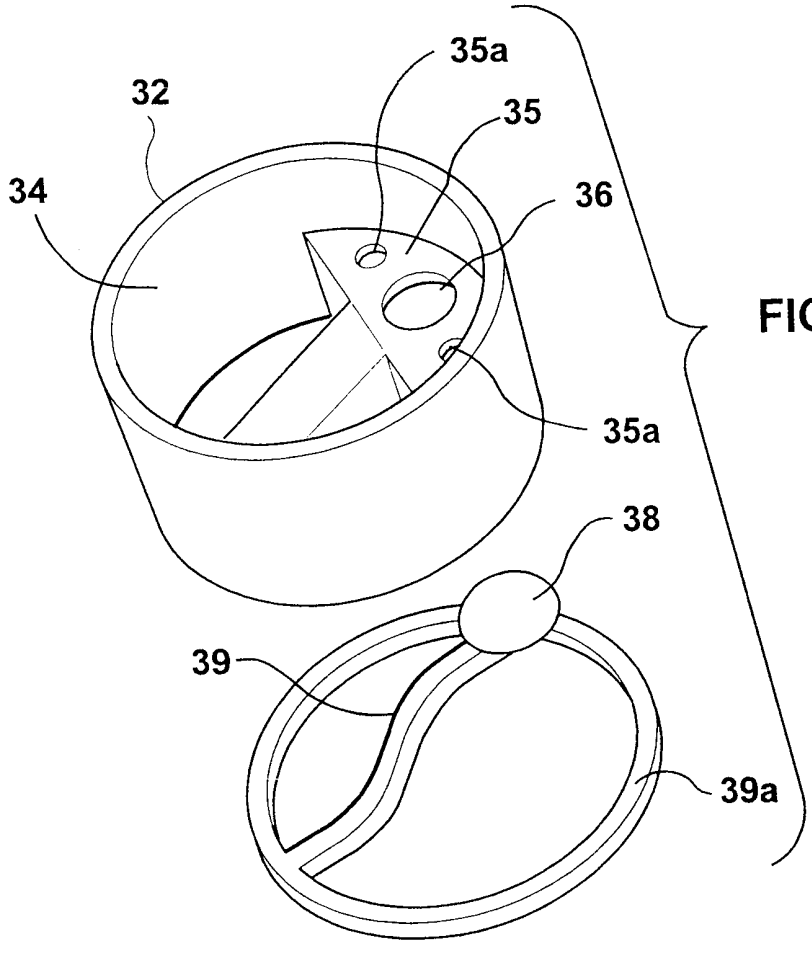


FIG. 3a

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL99/00455

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B67D 5/06
US CL : 222/205, 476

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 222/205, 454, 476, 500

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A, E	US 5,967,377 A (GLYNN) 19 October 1999, see the entire document.	1-21
A, P	US 5,927,354 A (FLEWITT) 27 July 1999, see the entire document.	1-21
A	US 3,844,454 A (BUCHTEL) 29 October 1974, see the entire document.	1-21

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search 08 NOVEMBER 1999	Date of mailing of the international search report 23 DEC 1999
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GREGORY L. HUSON Diane V. Smith for Telephone No. (703) 308-1115

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