



US 20040112916A1

(19) **United States**
(12) **Patent Application Publication** (10) **Pub. No.: US 2004/0112916 A1**
Hagihara et al. (43) **Pub. Date: Jun. 17, 2004**

(54) **CHECK VALVE AND LIQUID CONTAINER WITH CHECK VALVE**

(52) **U.S. Cl. 222/92; 222/490**

(76) **Inventors: Tadashi Hagihara, Tokyo (JP); Naoya Tani, Tokyo (JP)**

(57) **ABSTRACT**

Correspondence Address:
WENDEROTH, LIND & PONACK, L.L.P.
2033 K STREET N. W.
SUITE 800
WASHINGTON, DC 20006-1021 (US)

A check valve, wherein a tubular body having a through-passage is installed, a valve element formed with an elastic material having an opening part near the tip thereof is installed, so as to cover the tubular body, and a skin body having an opening part near the tip thereof is installed so as to cover the valve element. A liquid container, comprising an outlet for discharging contents, wherein a reverse flow prevention valve having an opening part closed in normal state and opened when a pressure in the container rises is installed at the outlet, a measuring container is installed at the tip of the outlet, and a cap having an intake with a reverse flow prevention valve with an opening part closed in normal state and opened when the pressure in the container is negative is fitted to the opening part, whereby, when the contents once discharged into the measuring container is distributed at the time of metered distribution, the contents beyond a metered volume is prevented from flowing out of a container body.

(21) **Appl. No.: 10/471,697**

(22) **PCT Filed: Mar. 13, 2002**

(86) **PCT No.: PCT/JP02/02390**

(30) **Foreign Application Priority Data**

Mar. 15, 2001 (JP) 2001-074962
Sep. 19, 2001 (JP) 2001-284366

Publication Classification

(51) **Int. Cl.⁷ B65D 5/72**

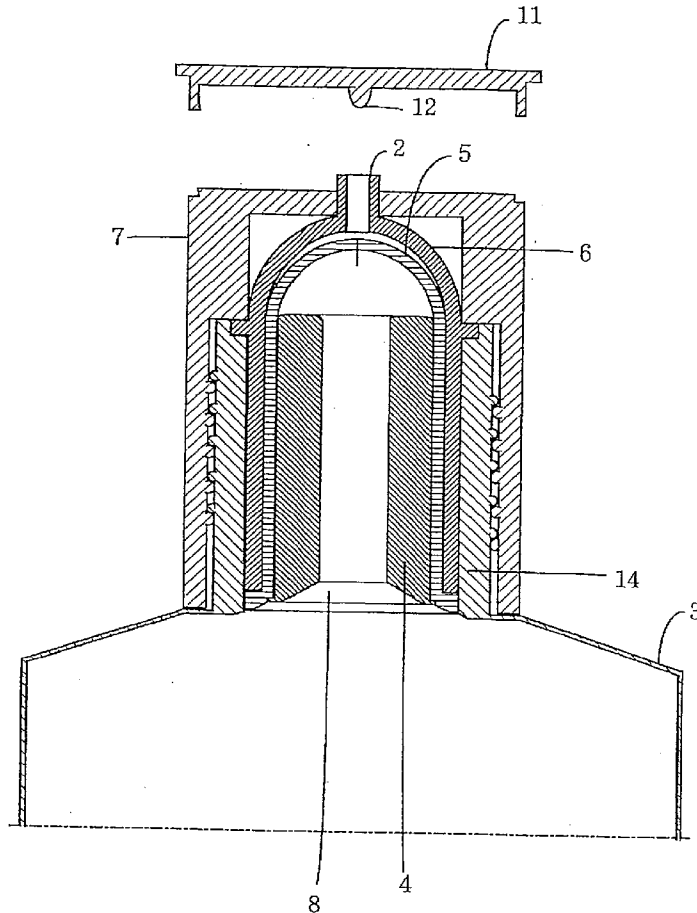


Fig.1

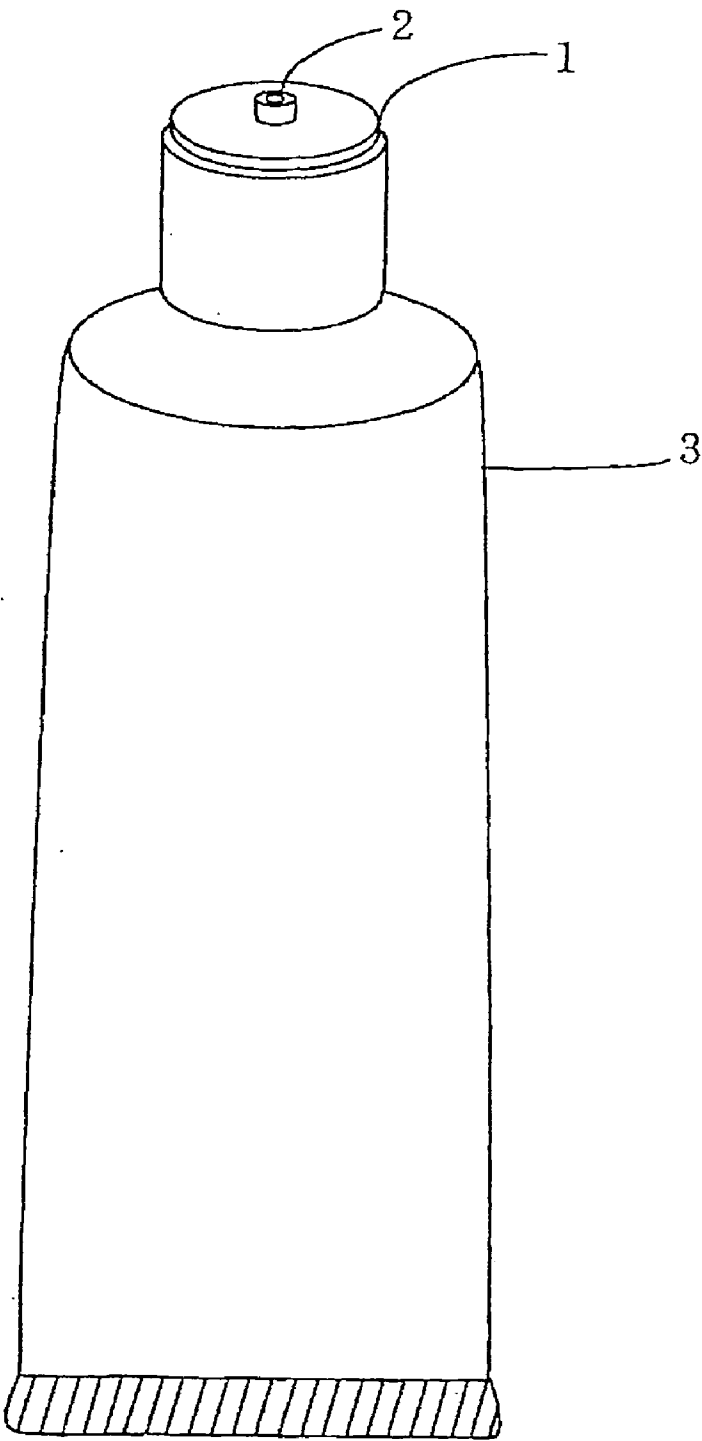


Fig.2

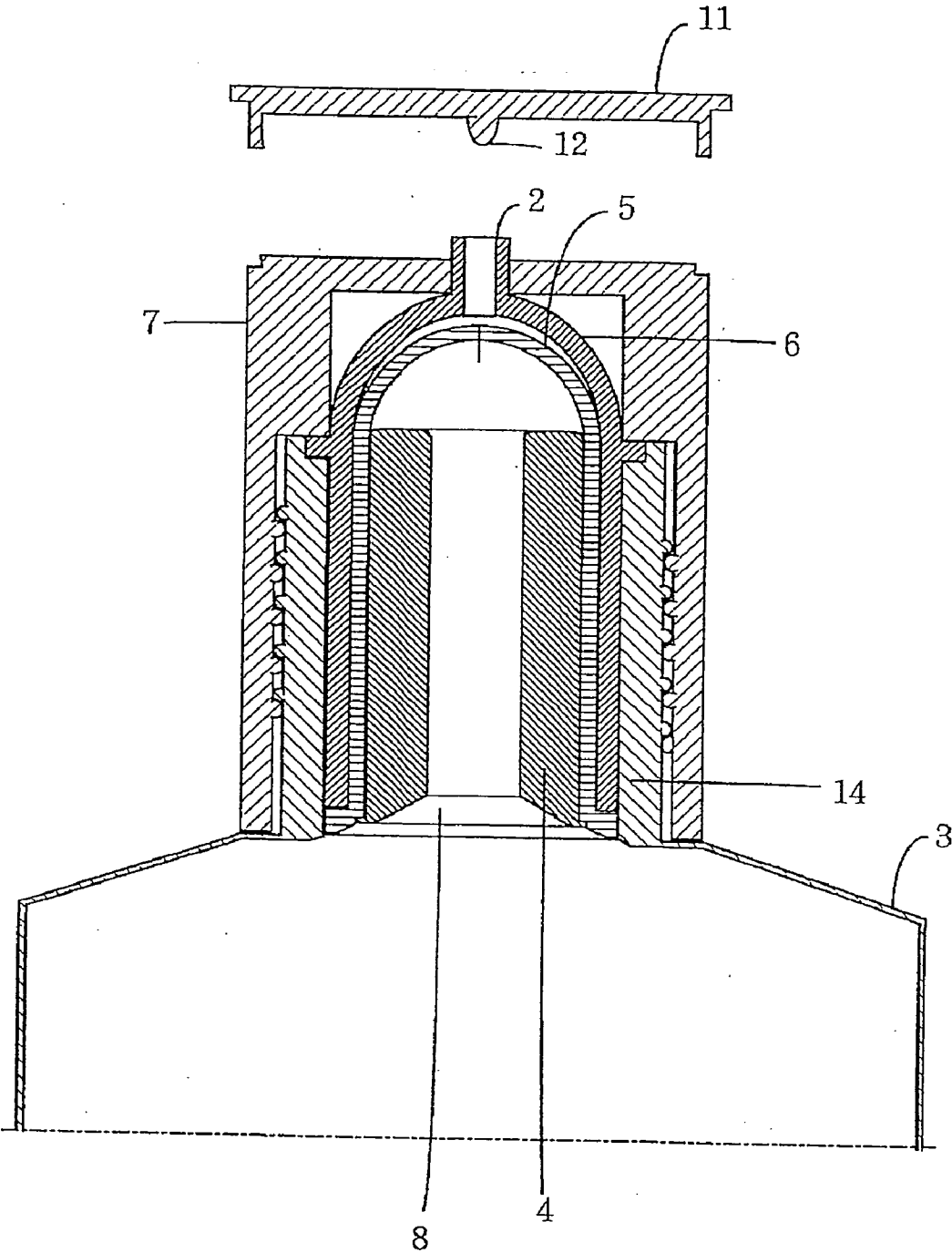


Fig.3

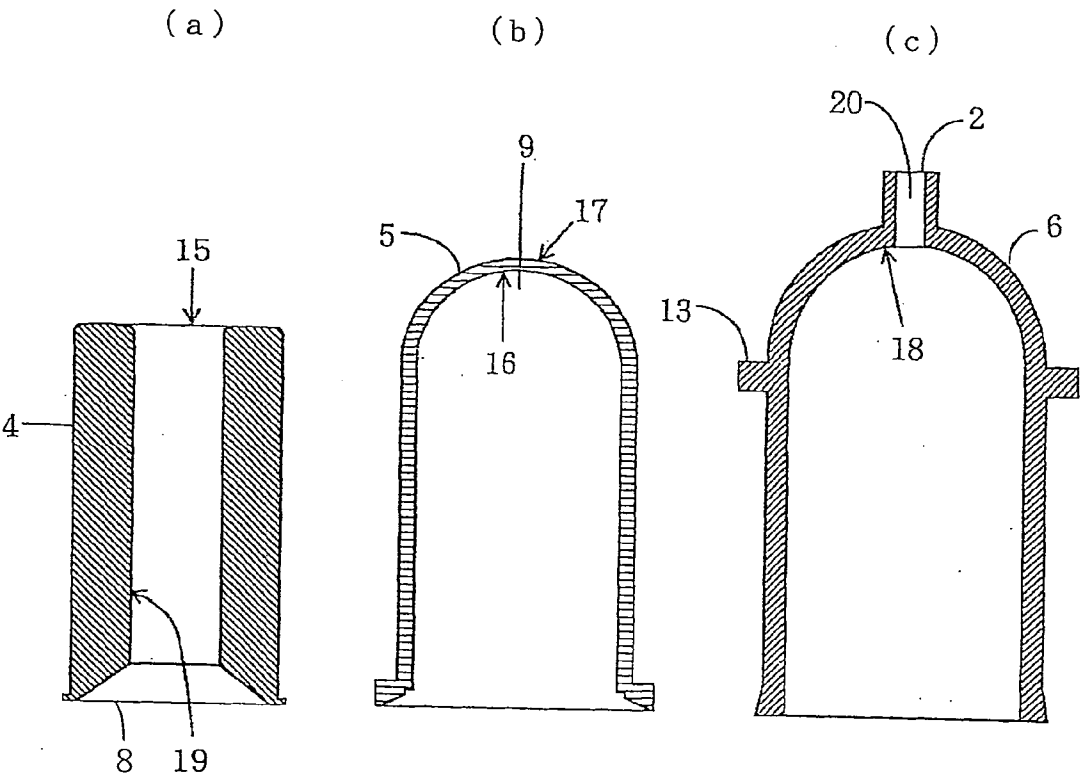


Fig.4

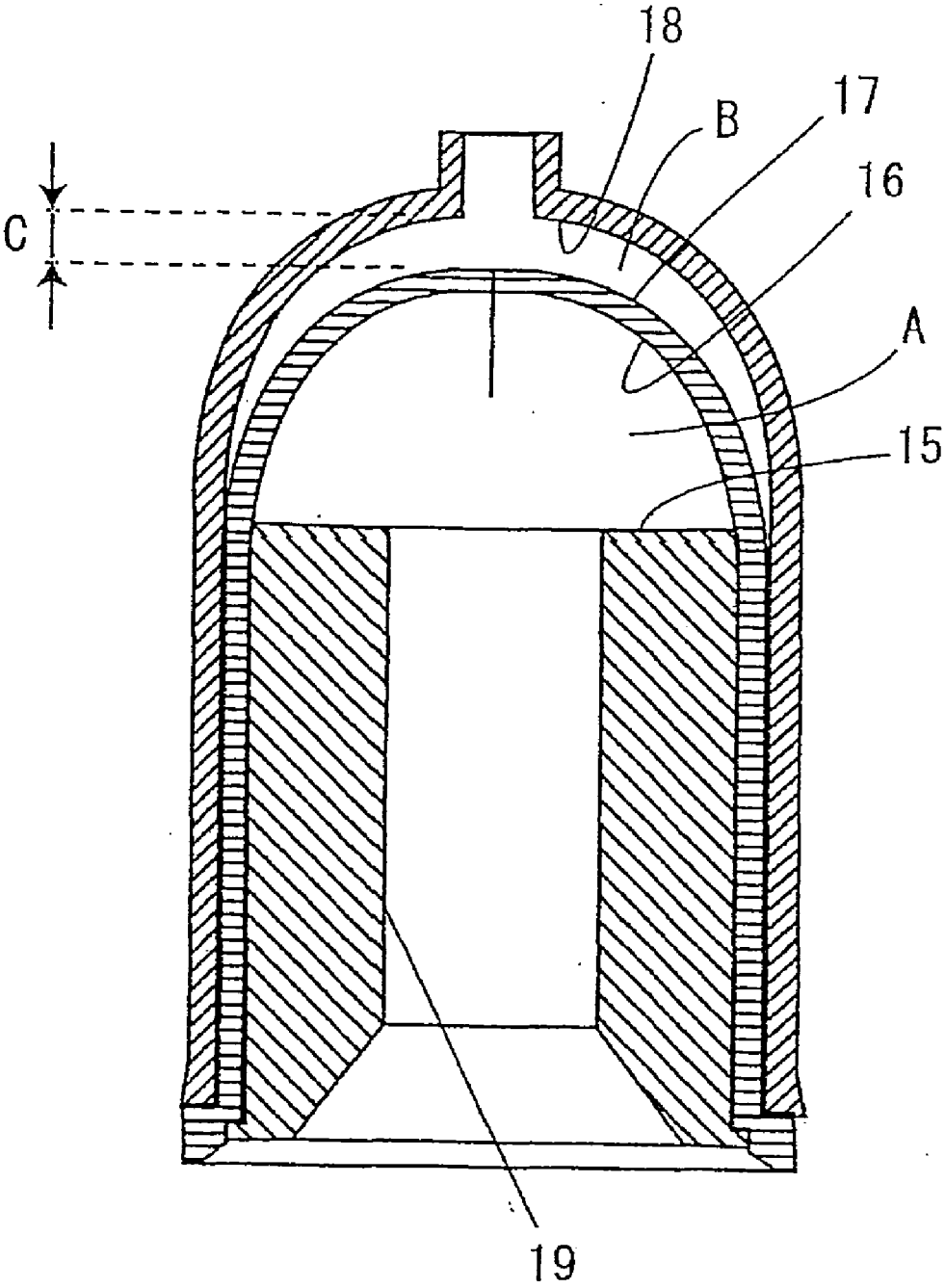


Fig.5

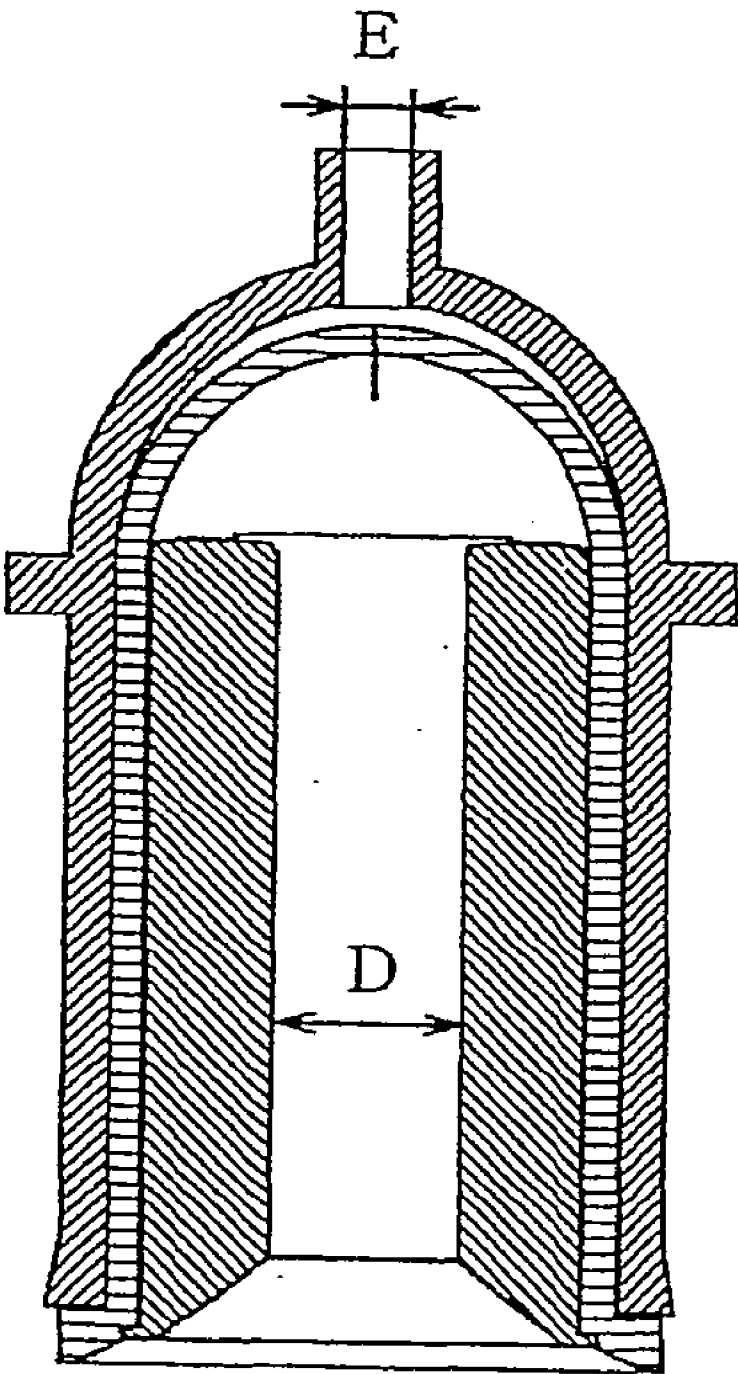


Fig.6

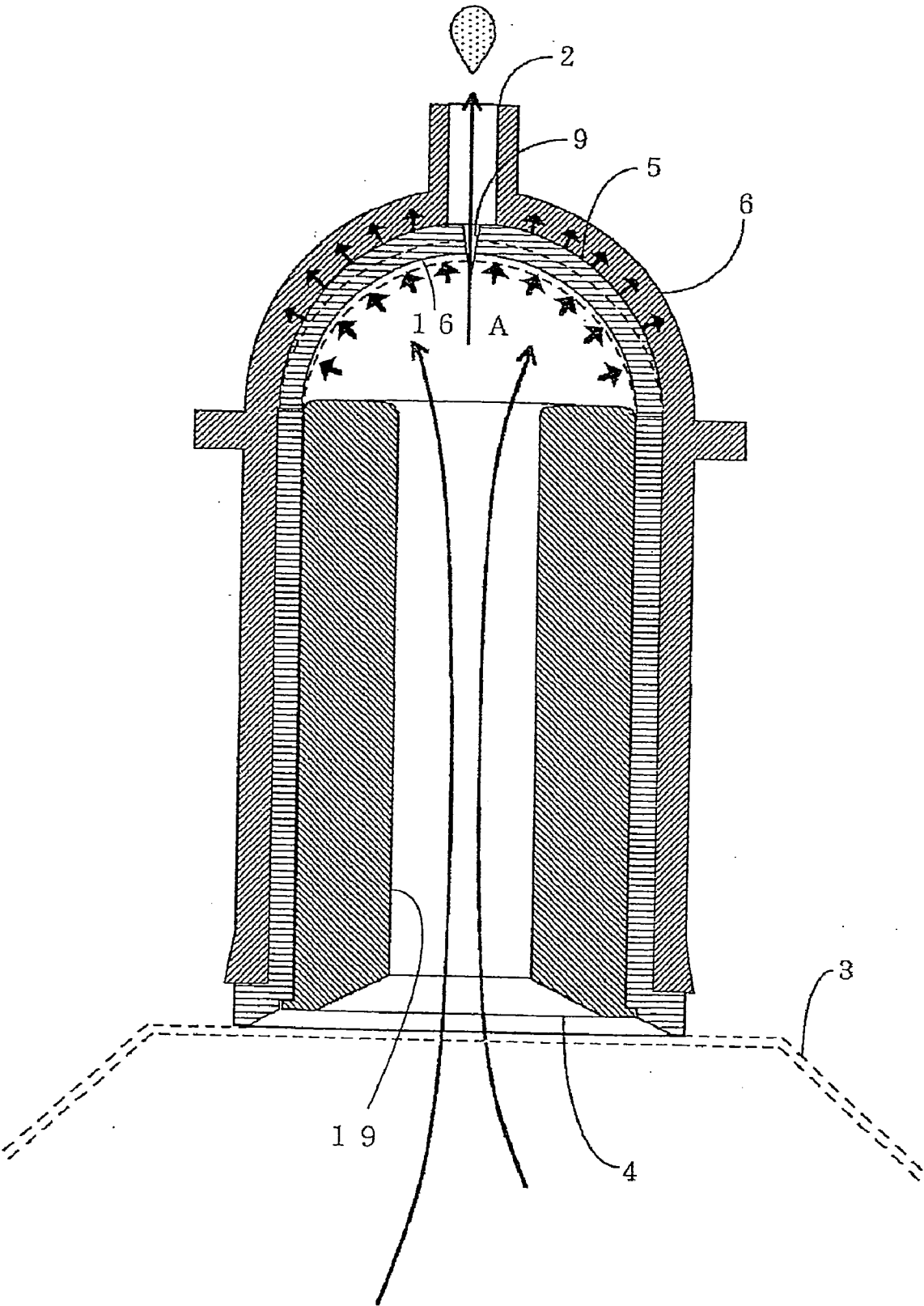


Fig.7

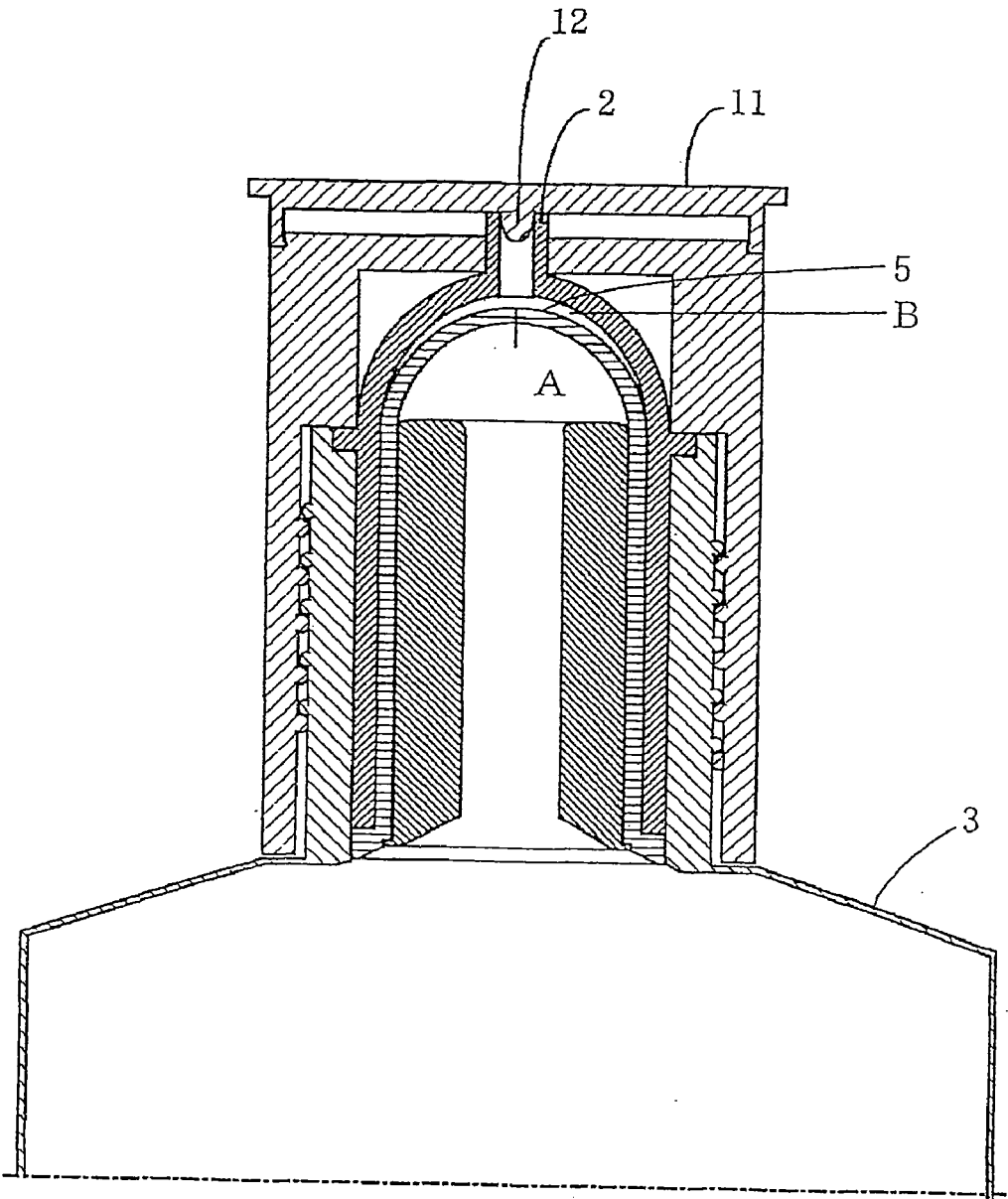


Fig.8

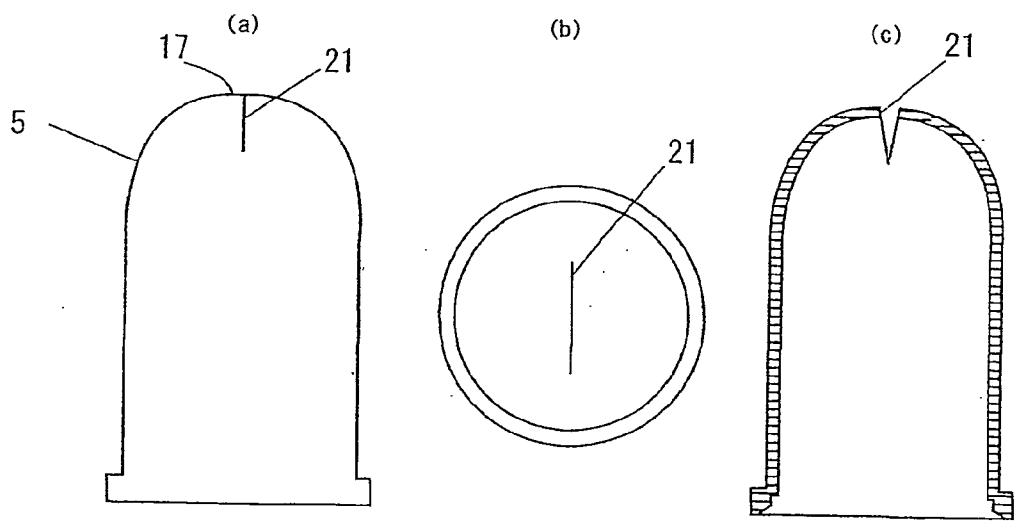


Fig.9

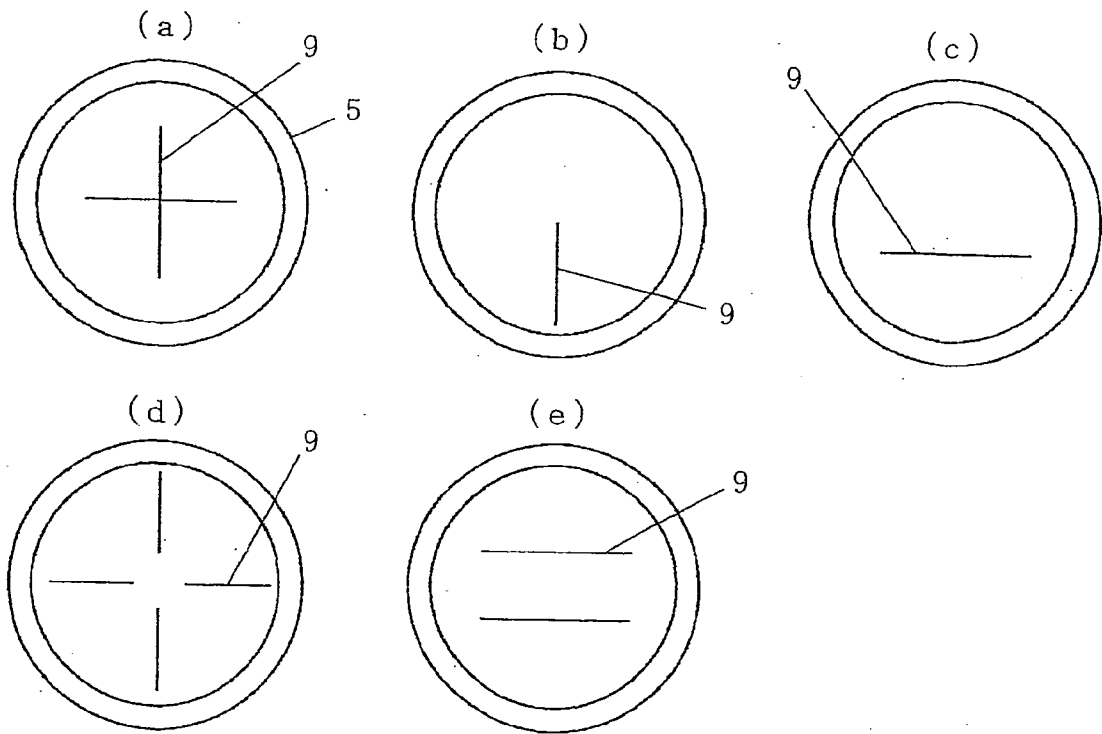


Fig.10

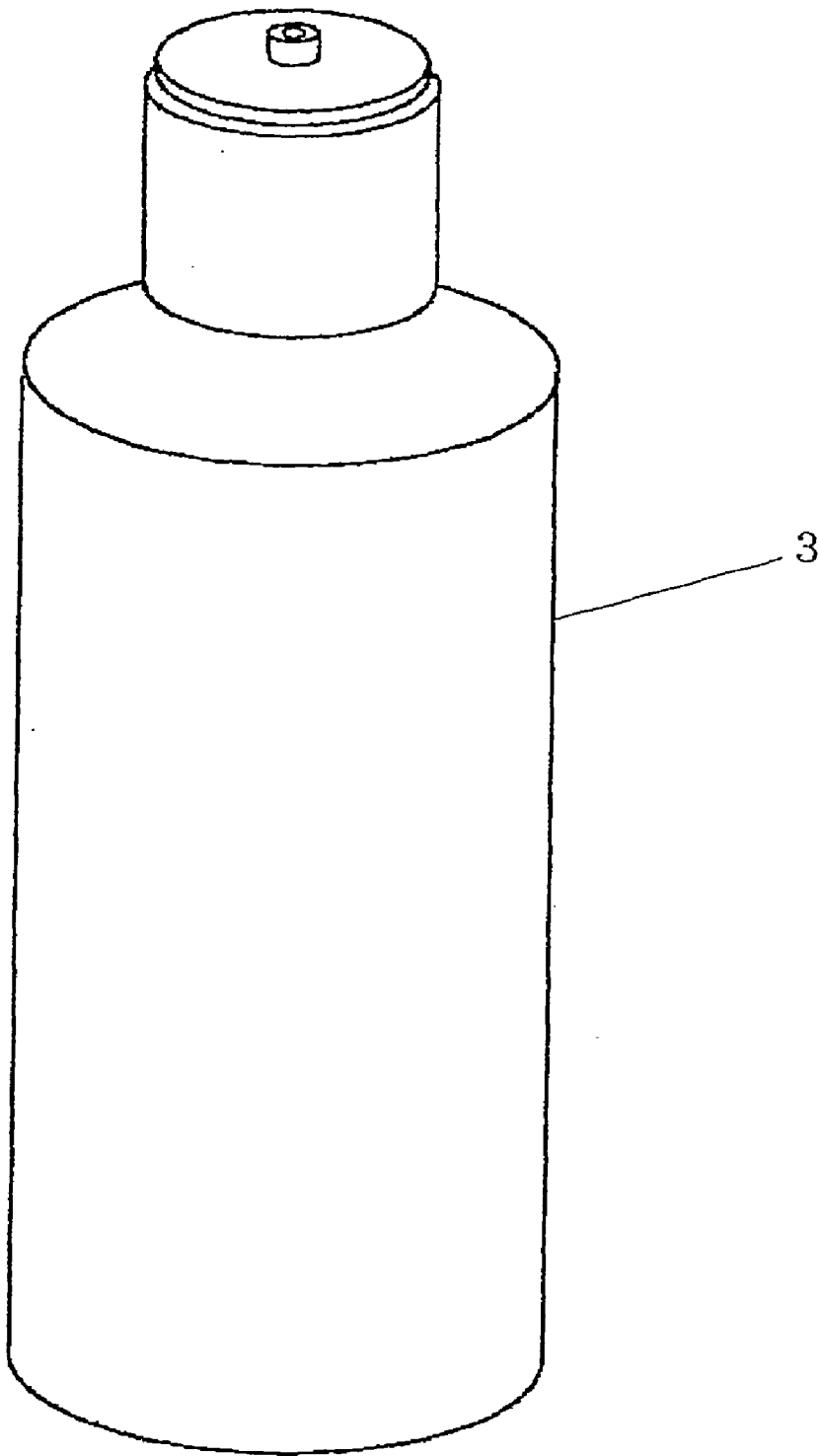


Fig.11

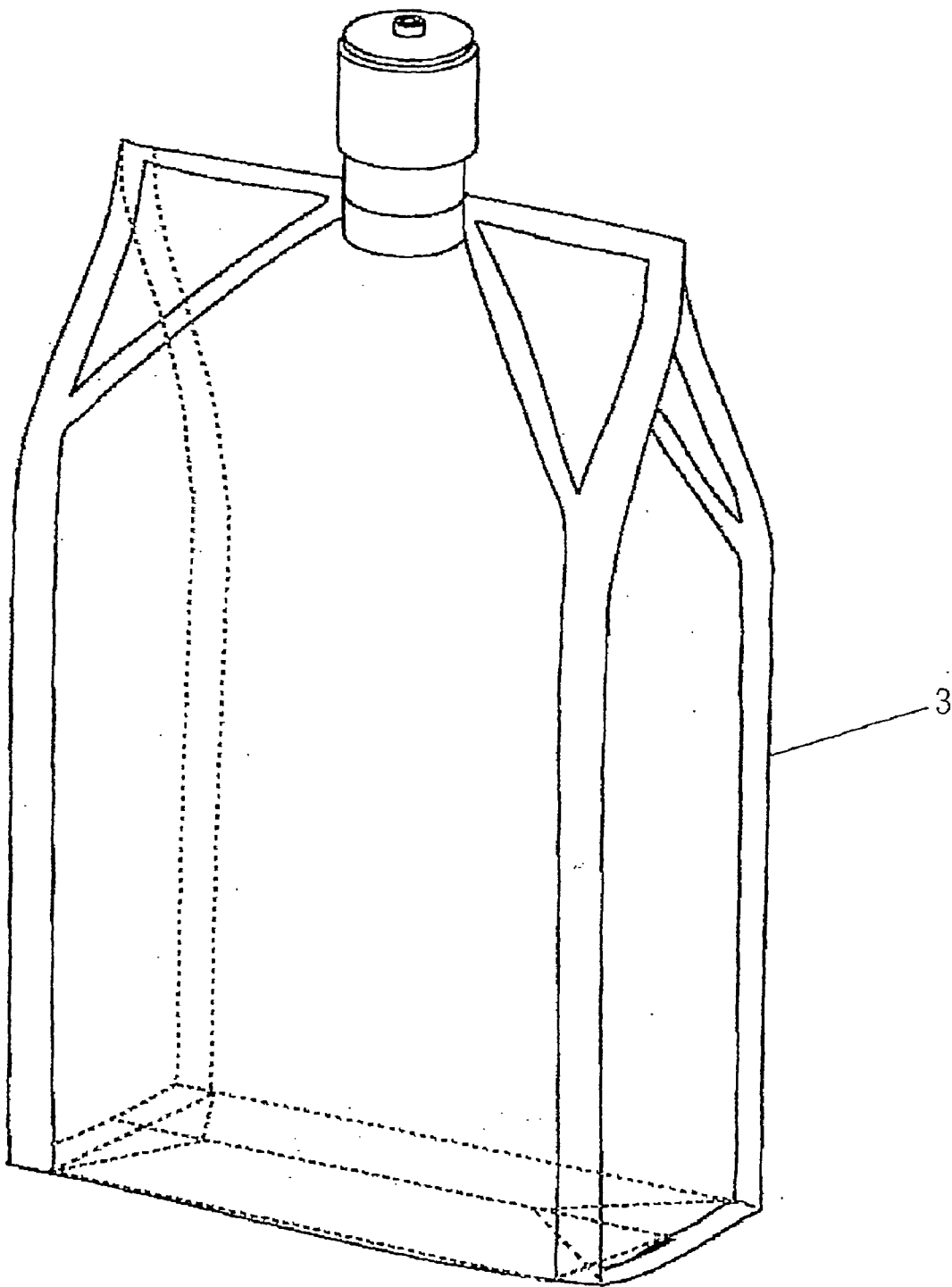


Fig.12

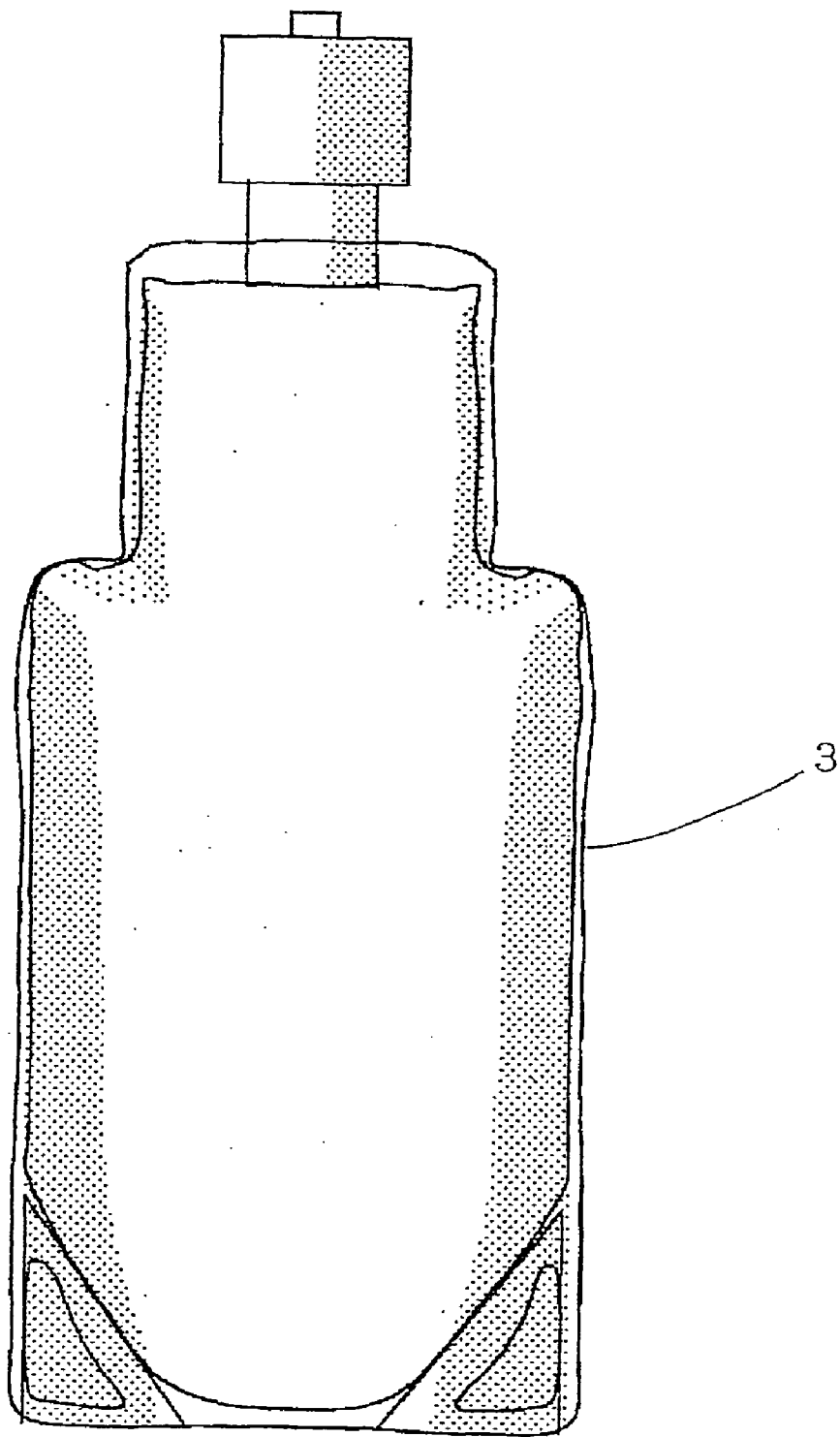


Fig.13

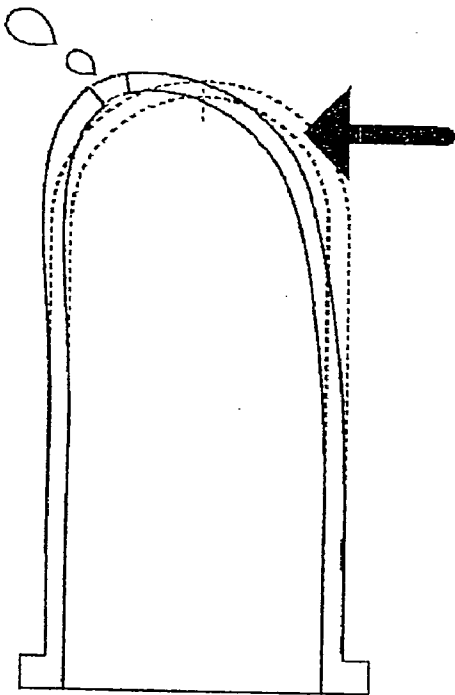


Fig.14

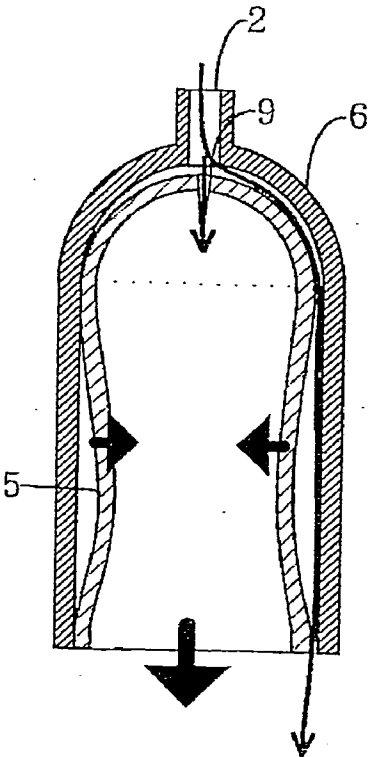


Fig.15

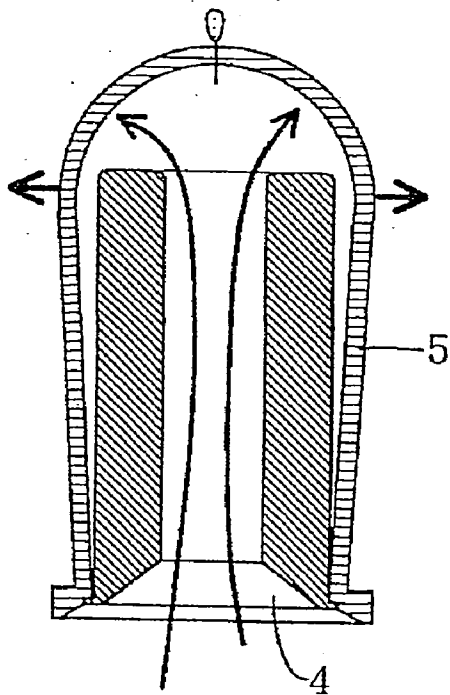


Fig.16

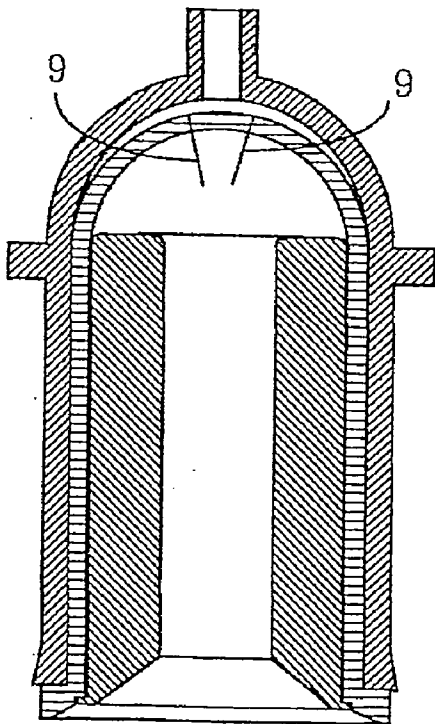


Fig.17

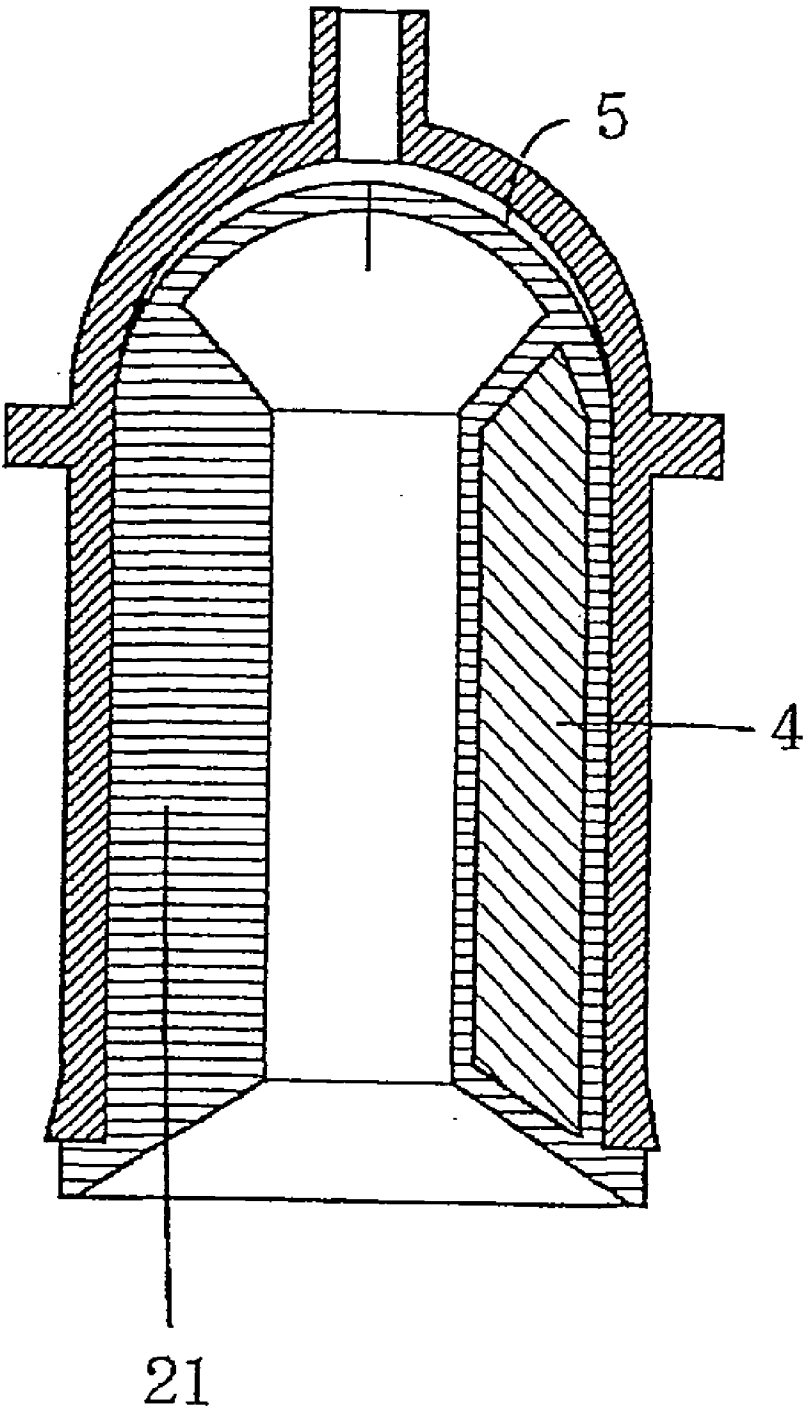


Fig.18

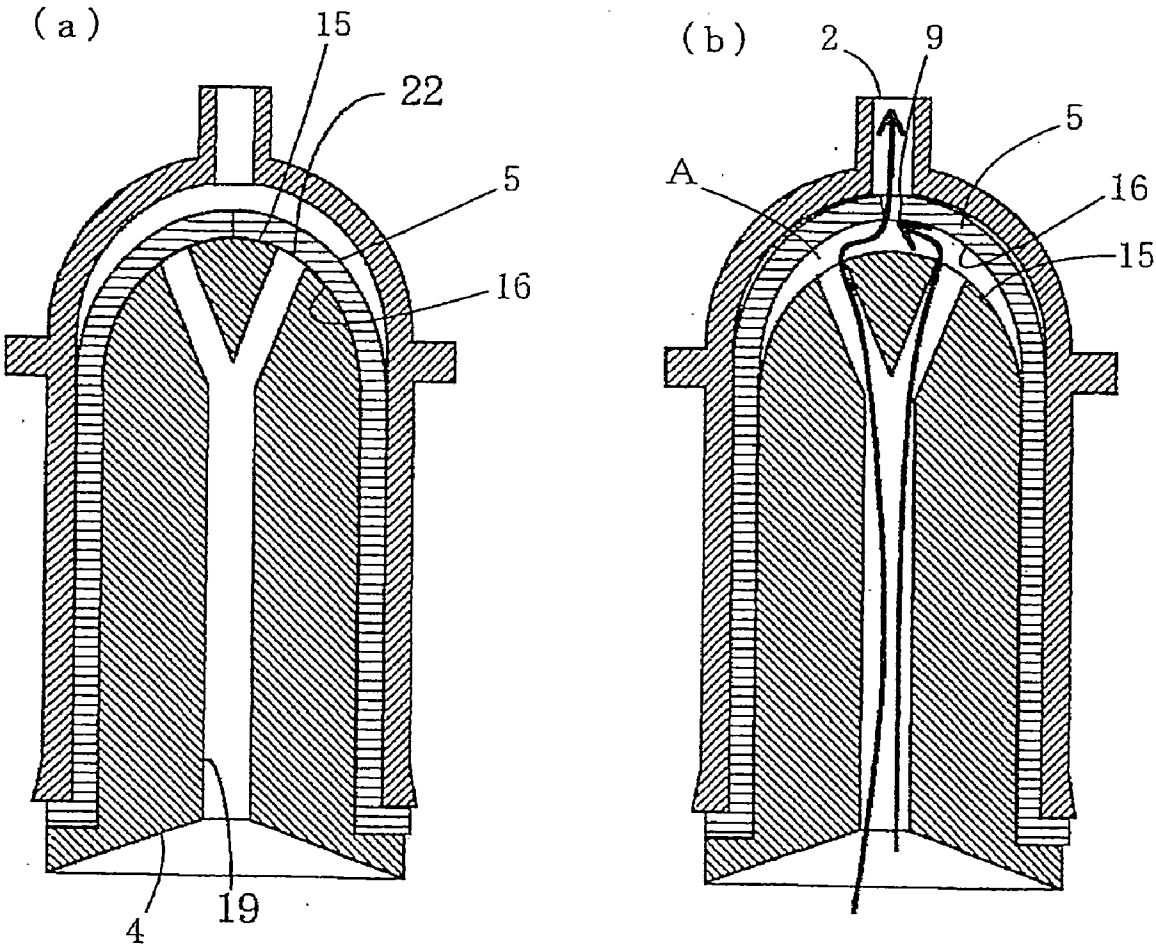


Fig.19

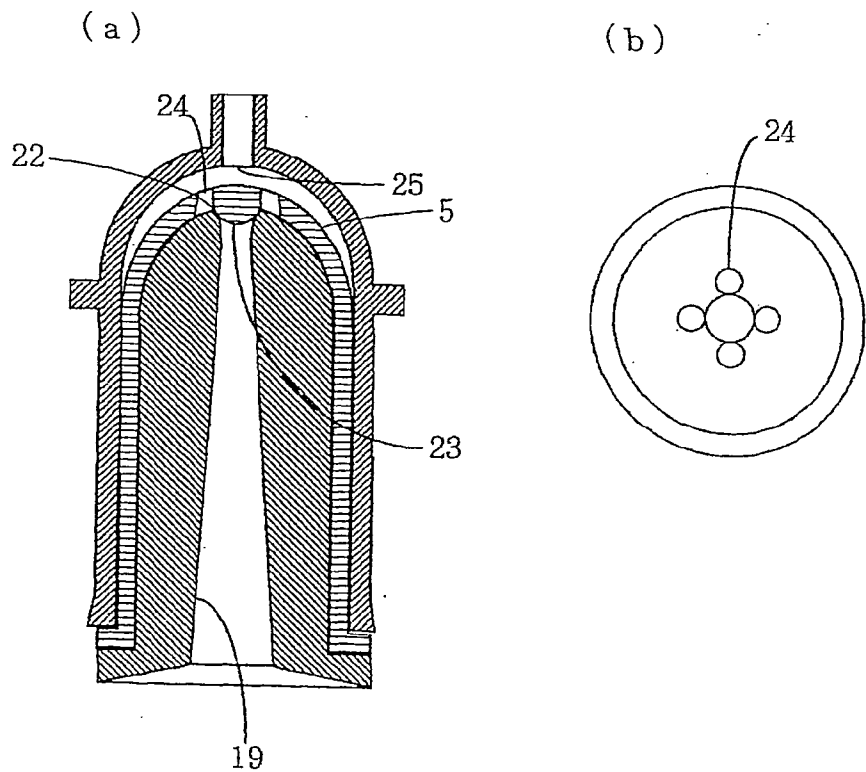


Fig.20

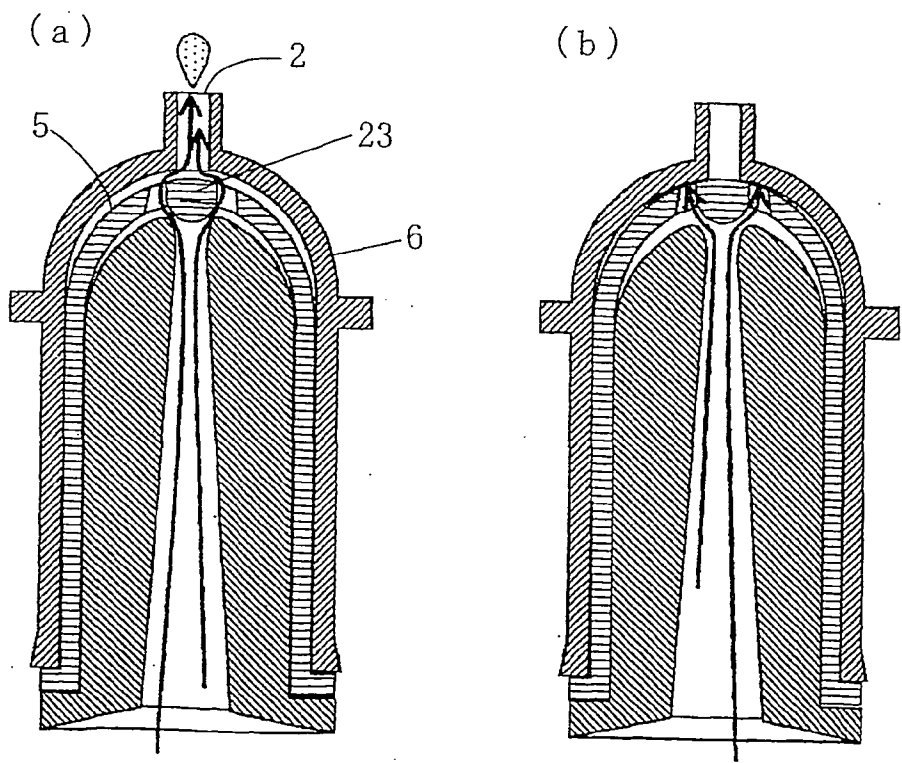


Fig.21

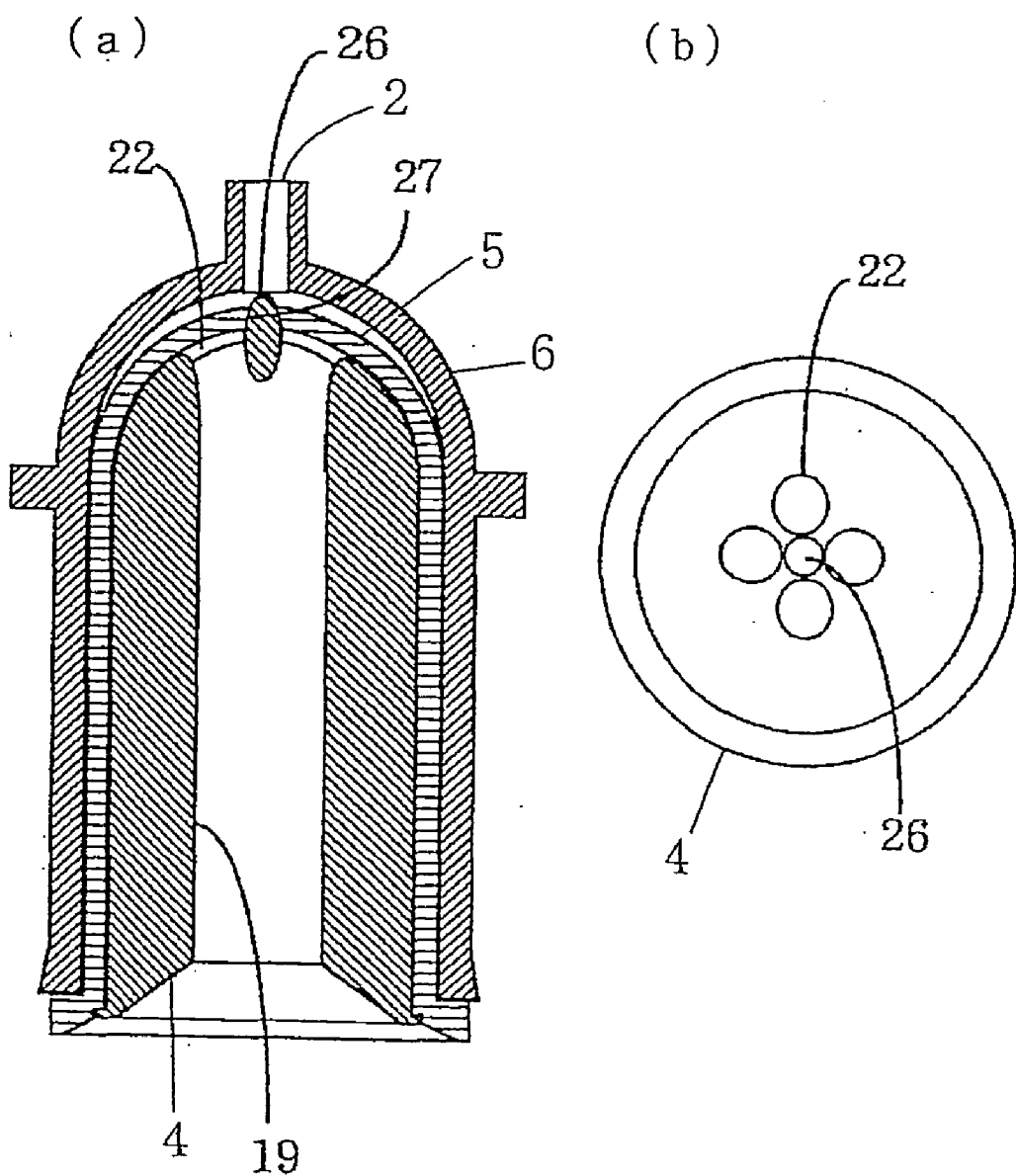


Fig.22

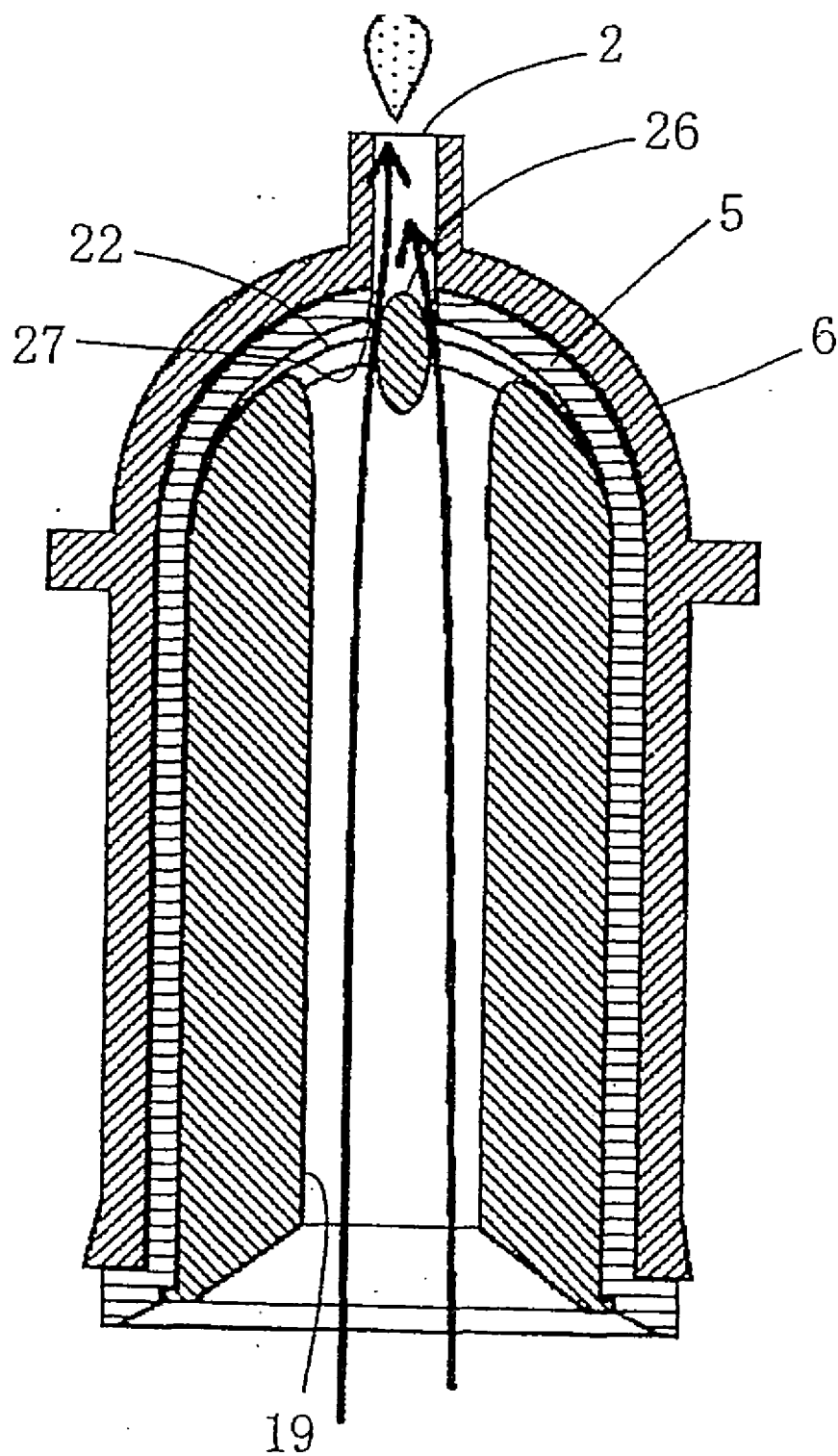


Fig.23

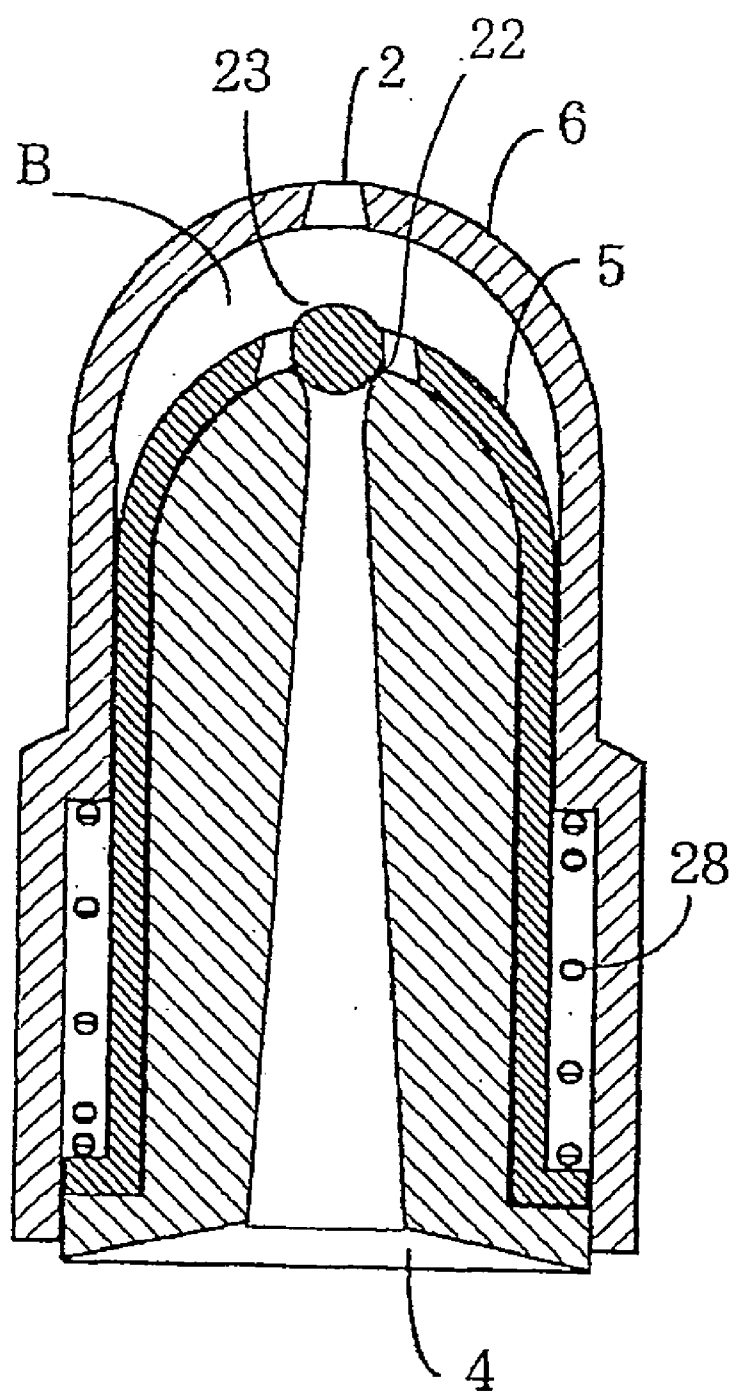


Fig.24

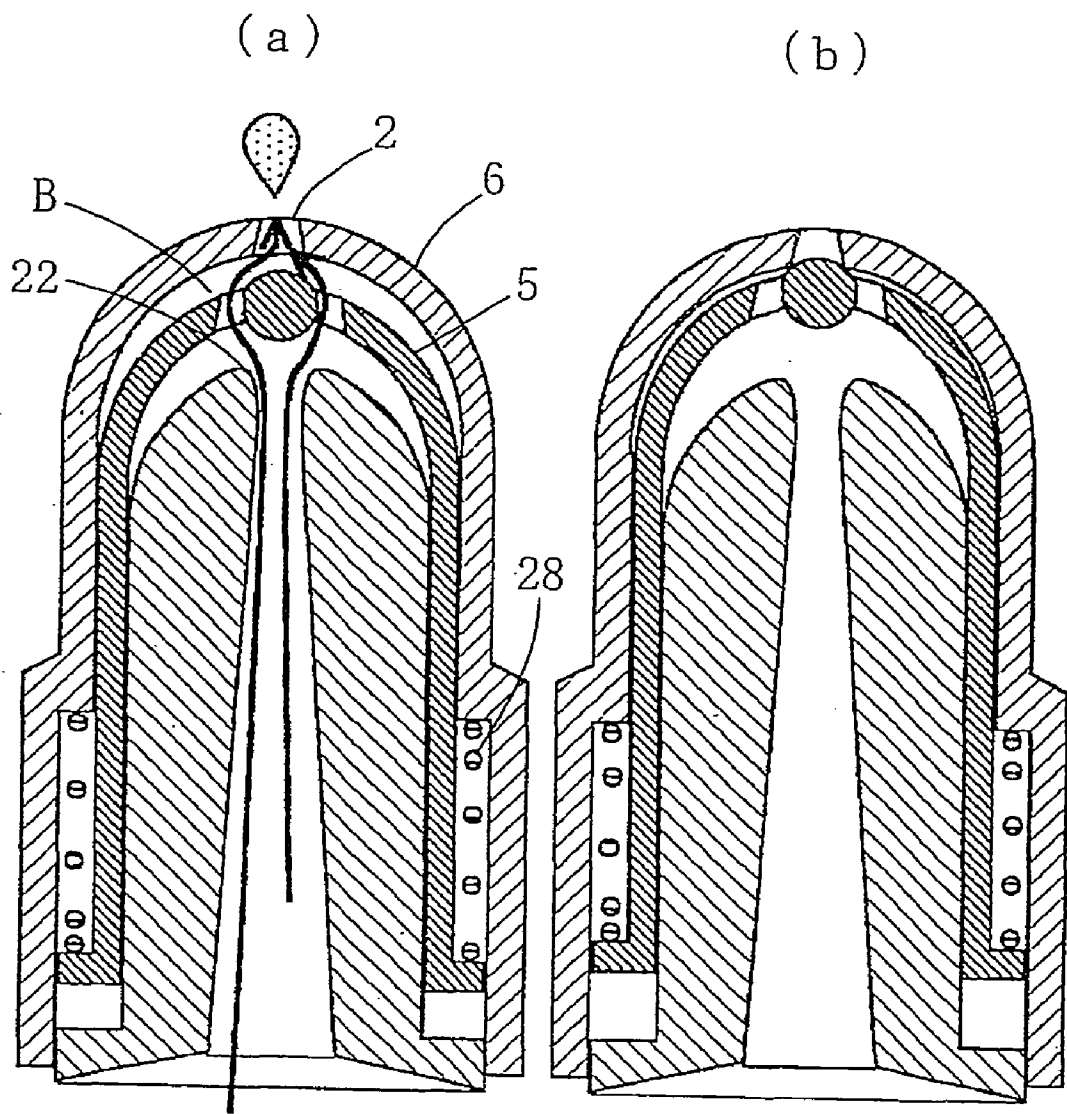


Fig.25

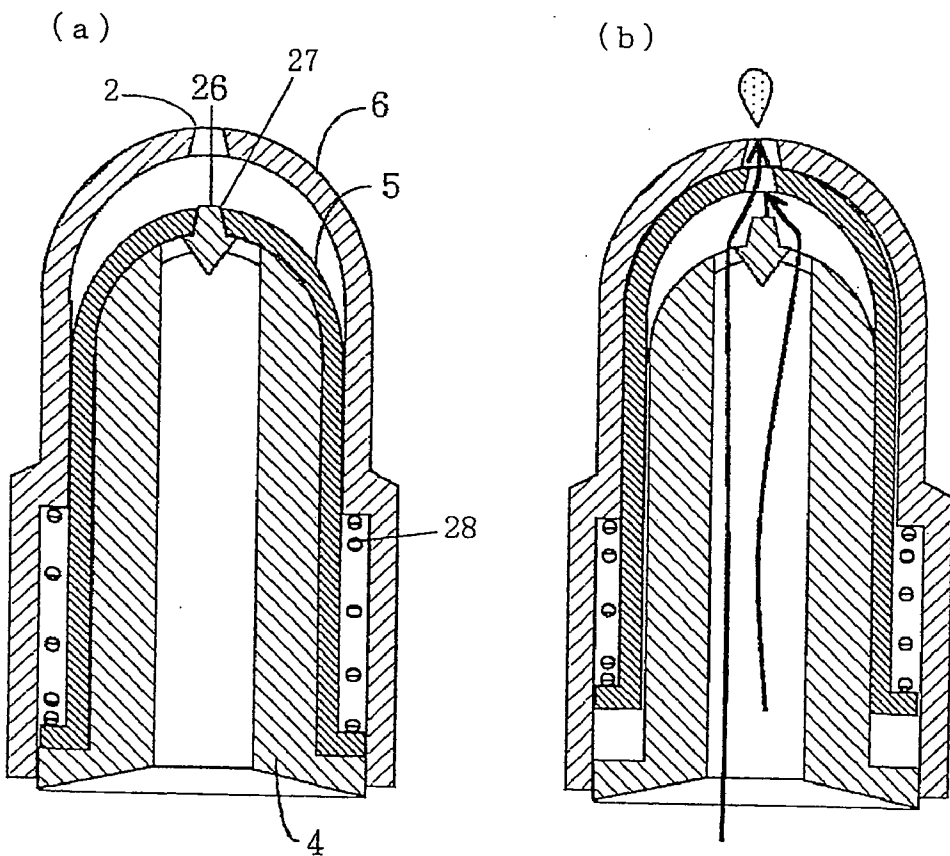


Fig.26

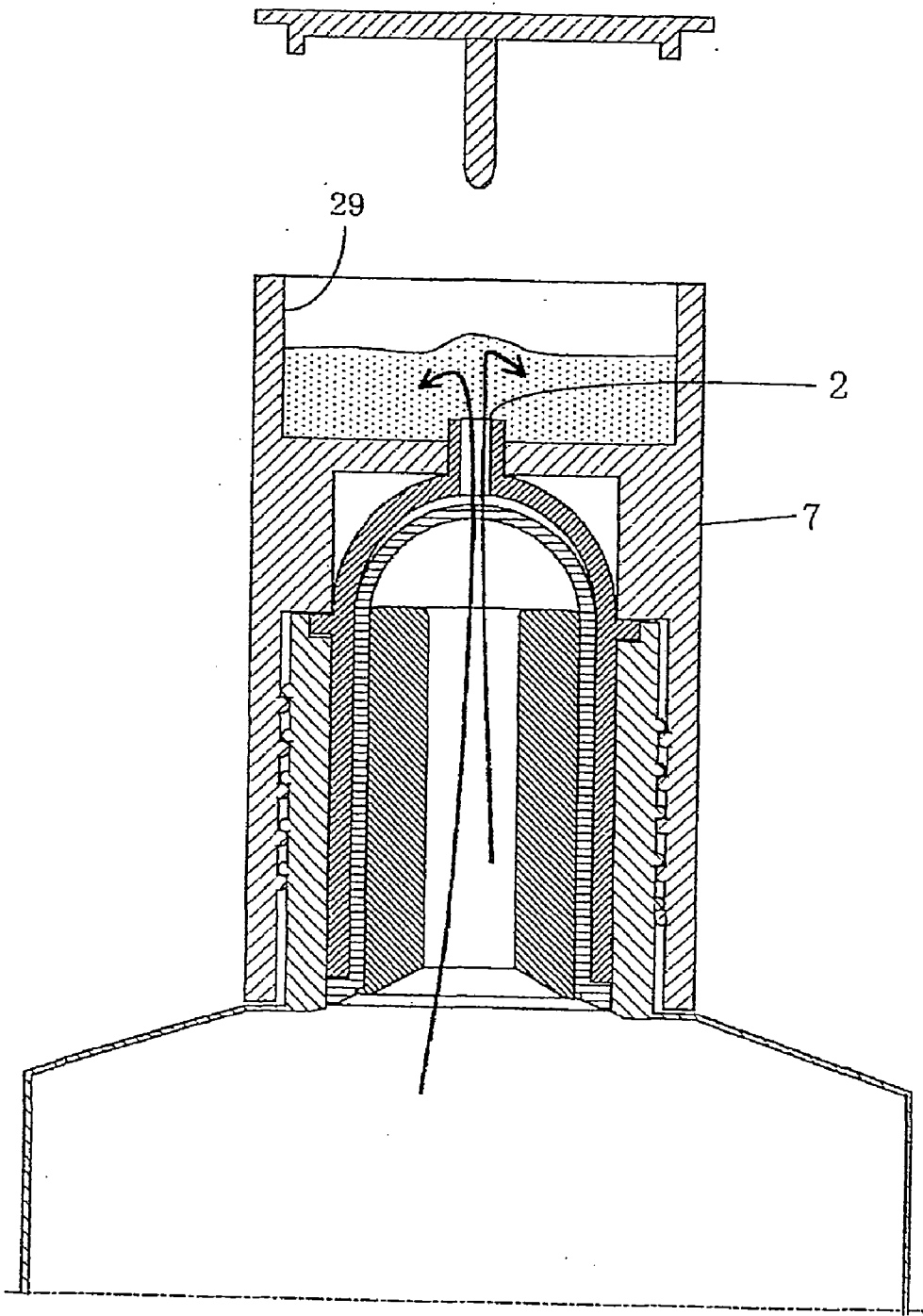


Fig.27

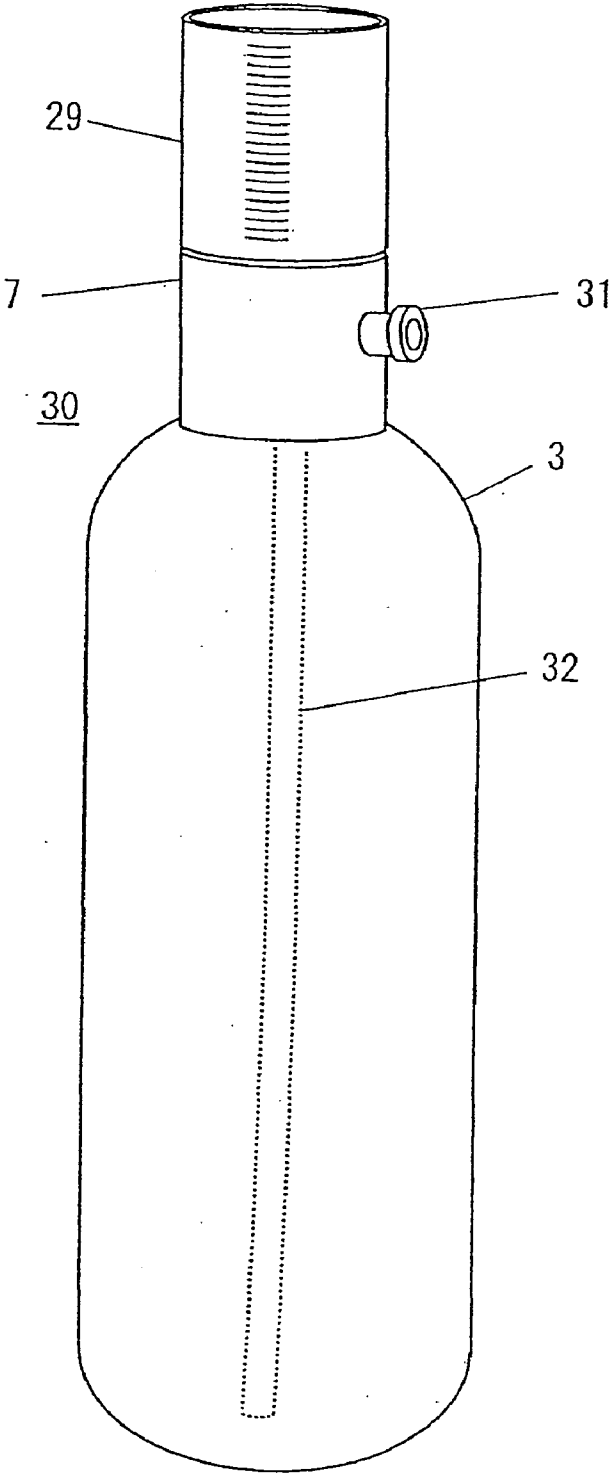


Fig.28

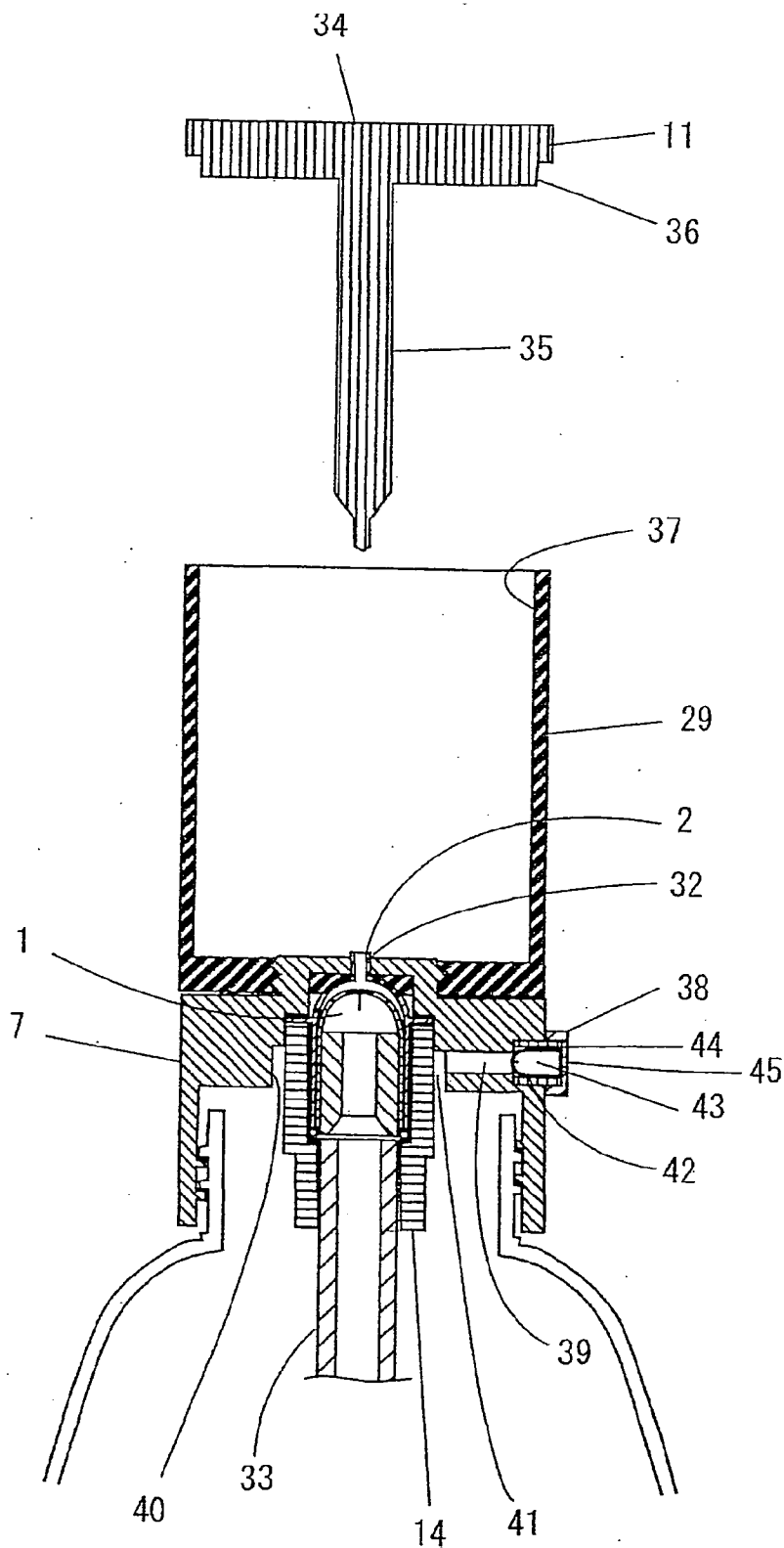


Fig.29

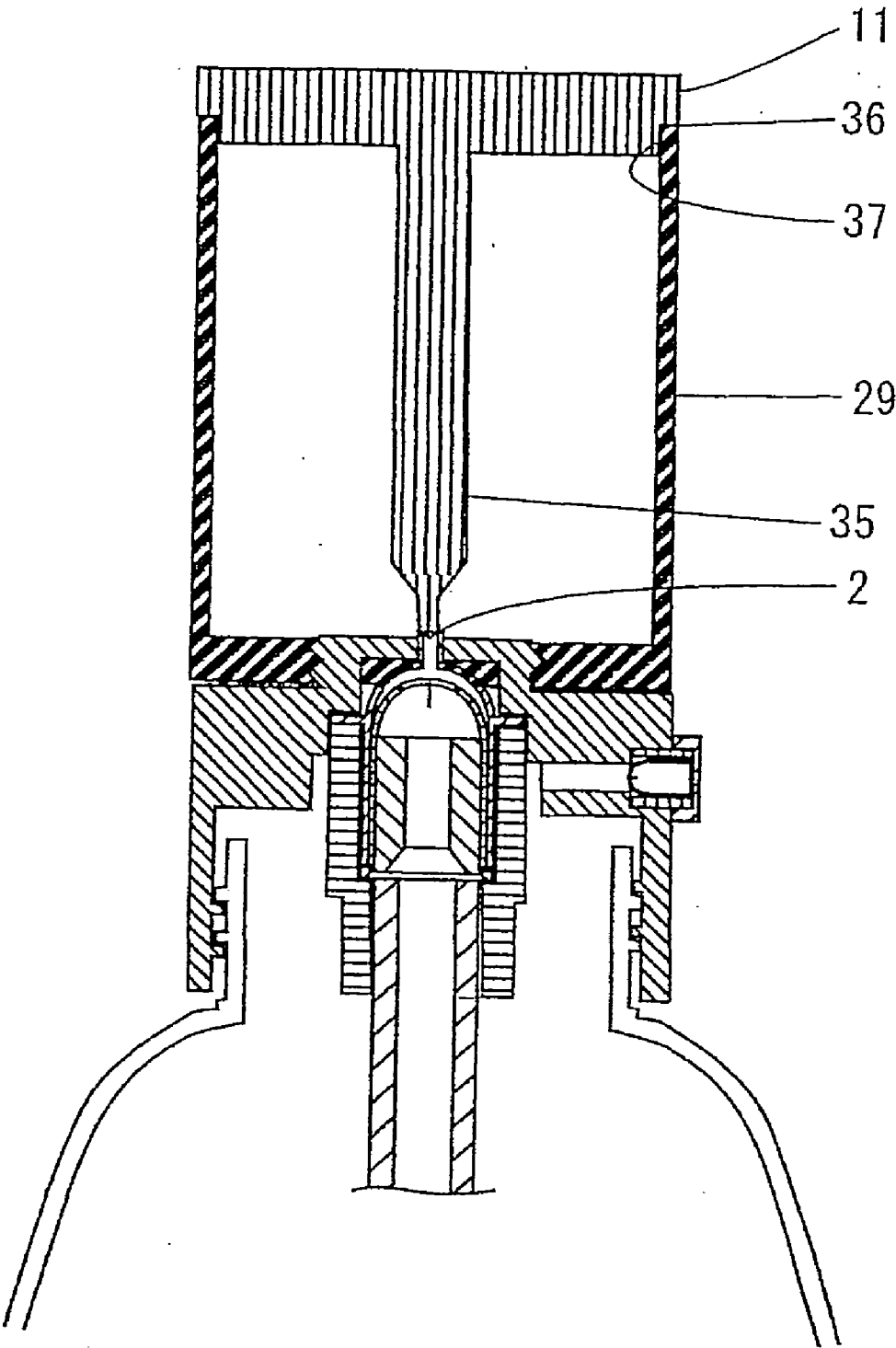


Fig.30

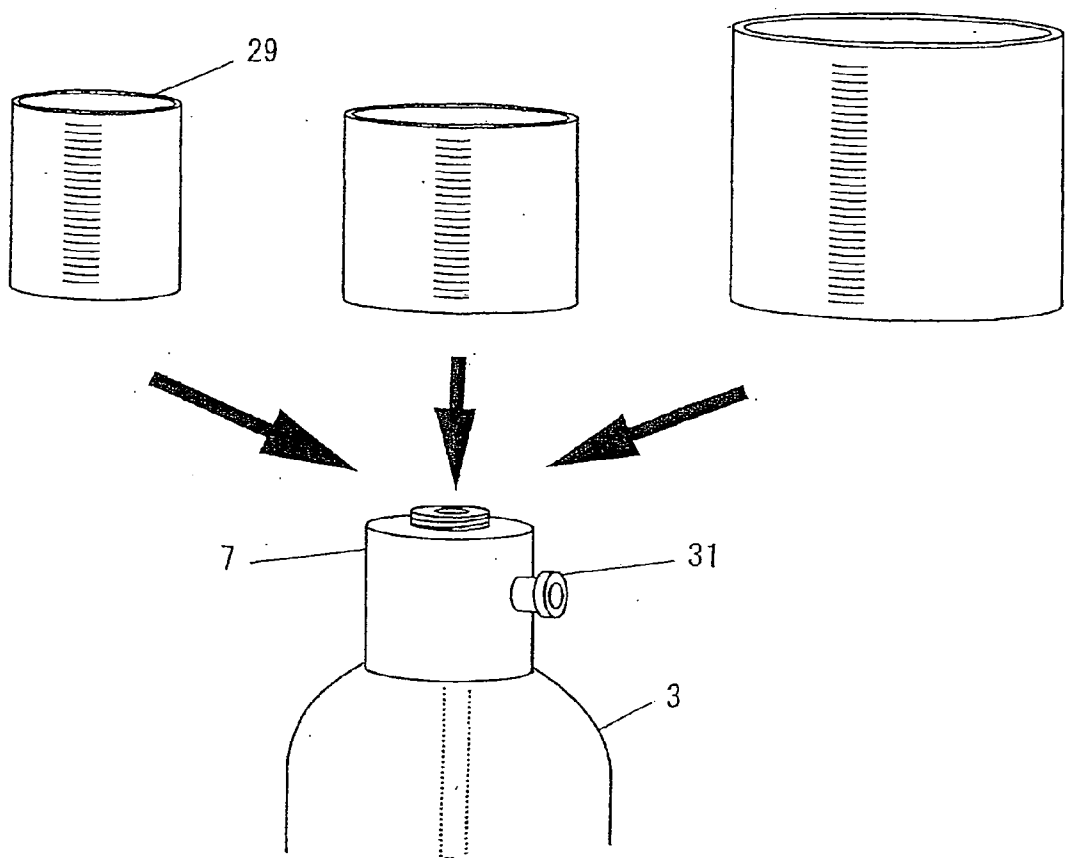


Fig.31

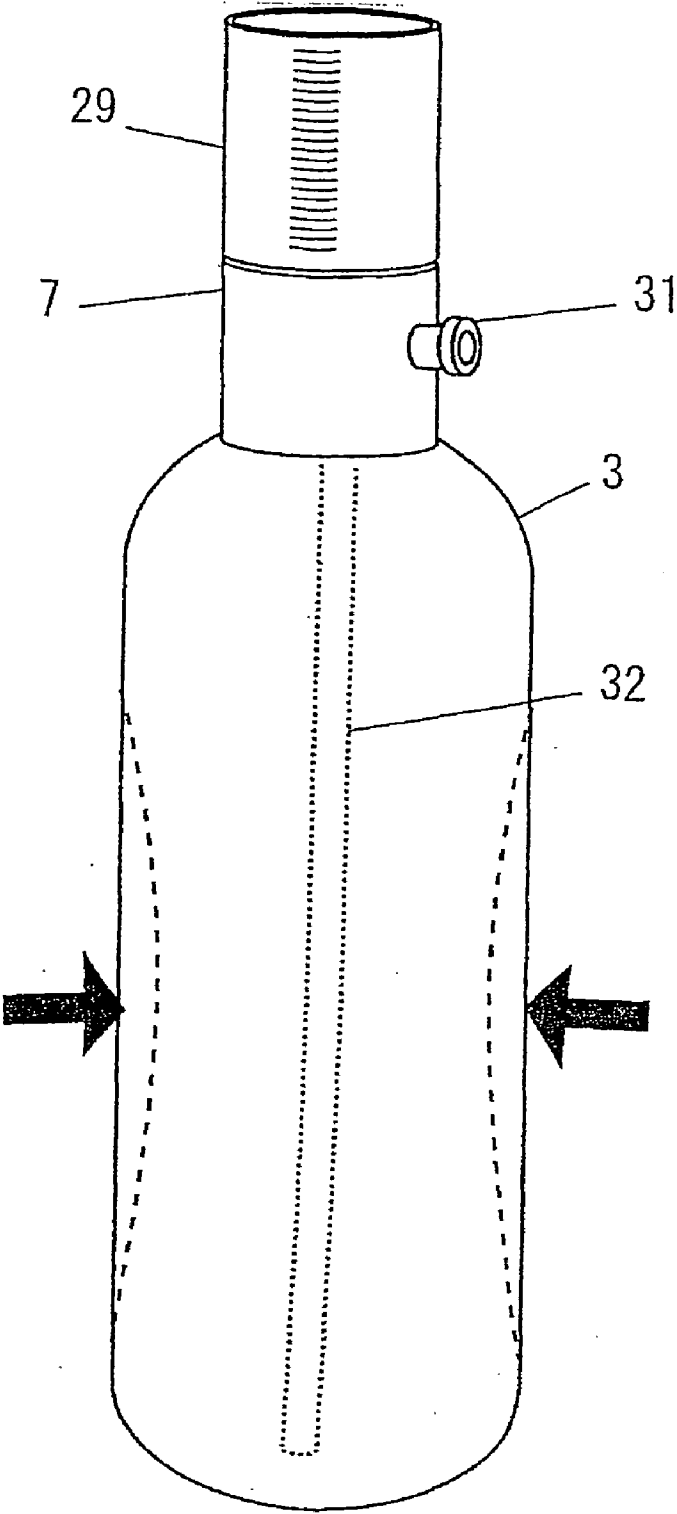


Fig.32

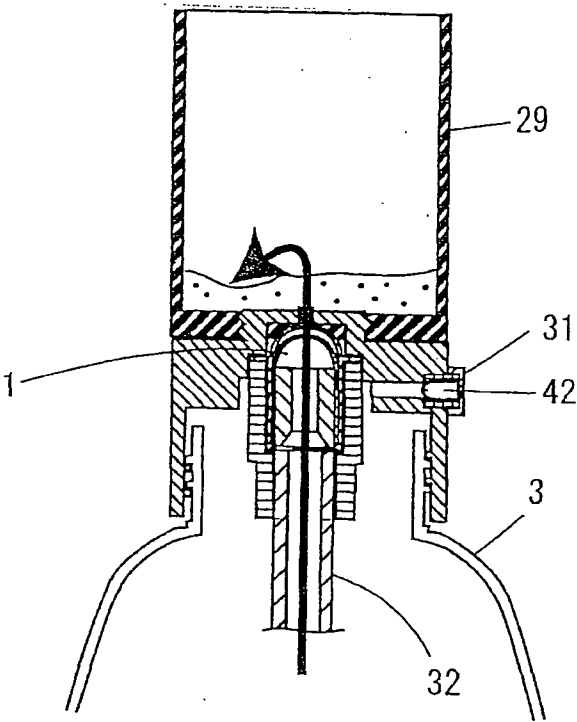


Fig.33

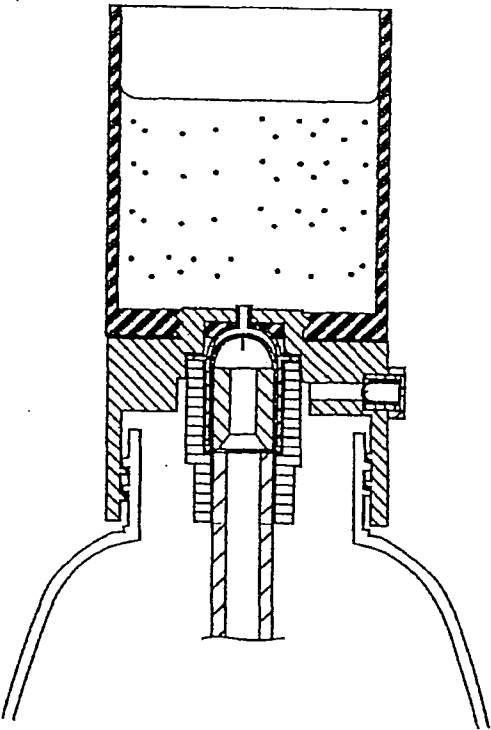
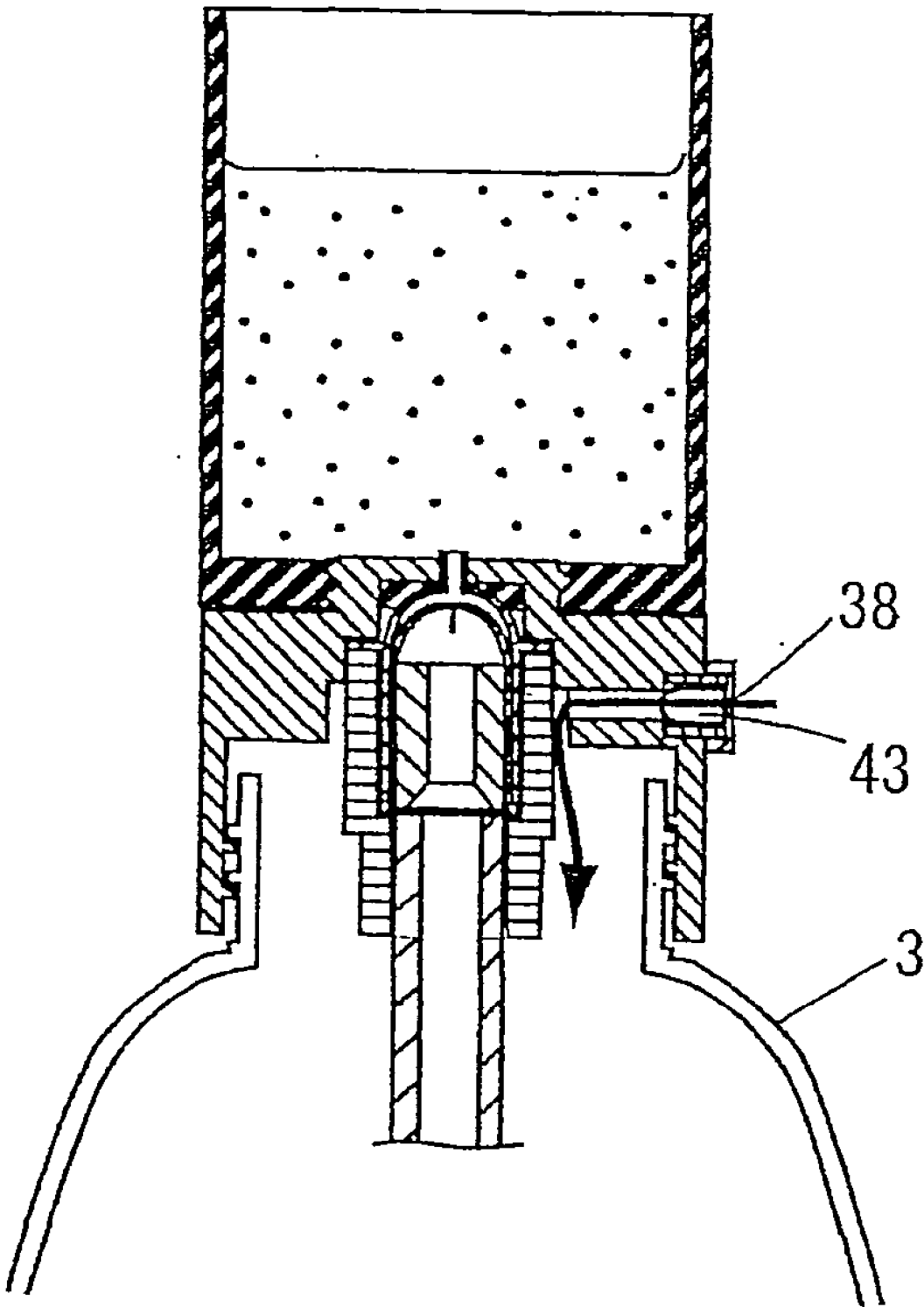


Fig.34



CHECK VALVE AND LIQUID CONTAINER WITH CHECK VALVE

TECHNICAL FIELD

[0001] The present invention is related to a check valve and a liquid holding container equipped with a check valve.

PRIOR ART TECHNOLOGY

[0002] In the prior art, Japanese Laid-Open Utility Model Publication Number SHO 60-89143 and Japanese Laid-Open Utility Model Publication Number HEI 2-83257 disclose a check valve structure or plug structure in which a slit is provided in an elastic body provided in the opening of a container, wherein the slit is pushed apart and opened by liquid or the like pushed out by internal pressure created by an outside force applied to the container, and the slit is closed by the self-restoring force of the elastic body when the outside force applied to the container body is released after the liquid or the like is discharged.

[0003] The former is a plug having a projectile-shaped external appearance and a dome-shaped cavity inside which is formed by an elastic or flexible material, and is provided with at least one slit in the tip thereof.

[0004] Further, the latter is a thin plate-shaped upper wall plate hollowed in an arc shape which is formed by an elastic material, and is provided with a slit in the center portion thereof.

[0005] However, in either of the prior art described above, because the elastic member formed with the slit which is the weak point of the valve mechanism is exposed, there are cases where the elastic member is touched carelessly.

[0006] The elastic portion needs to have suitable elasticity to prevent leakage from the slit, but if the elasticity is made higher than such requirement, it becomes difficult to discharge contents, and this lowers the convenience of the container. For this reason, an excessive elastic force is not applied, but because the mechanism uses nothing outside of the elastic force of the elastic body to close the slit, the use of only the elastic force will essentially create an insufficient force for keeping the slit sealed. Accordingly, as shown in **FIG. 13**, when some outside force acts on the elastic body, the elastic body is easily deformed and the seal of the slit is broken, whereby the liquid inside the container leaks out, and conversely air is sucked inside the container.

[0007] More specifically, these days most tube containers are made of a laminate material, and this by itself because of the elastic body will result in the container body having a strong restoring force. Namely, because negative pressure is created inside the container body by the restoring force of the container body, there are cases where the contents that have been pushed out up to the nozzle opening are pulled back inside the container again. However, in the former described above, means are provided so that the elastic portion does not expand too much by the pressure inside the container, but no means are provided to prevent the contraction of the elastic portion in reverse. For this reason, as shown in **FIG. 14**, the tubular portion collapses, whereby the elastic body is operated in the direction that opens the slit.

[0008] On the other hand, the same thing also happens in the latter example described above. Namely, in the case

where a negative pressure is created inside the container, the upper wall plate hollowed in an arc shape forms a state the exact opposite of that of the former technology described above, and this makes it easy for the slit to open.

[0009] In such cases, both examples have the disadvantage of air being sucked inside which is even more of a problem than leakage.

[0010] In this way, the prior art technology which uses a slit as a simple valve does not go beyond proposing only technology in which discharging is allowed when the pressure inside the container is high, and discharging is stopped when the internal pressure is lowered, and there are no technical ideas about preventing air from being pulled inside the container. For this reason, such technology has an extremely simple structure as a valve mechanism, but can not be used in actual practice for containers filled with contents that hate oxidation due to contact with air such as food, cosmetics, pharmaceuticals and the like.

[0011] On the other hand, liquids that need to be measured first include medicines and cosmetics, but also includes various substances such as paints, detergents and the like.

[0012] In medicines and the like, it is thought that most cases use measurements from a bottle by a measuring cup. Further, even more than medicine, when serving as a liquid container of detergents or the like in which there are many single use quantities, bottle caps made into measuring cups and pump type bottles made of synthetic resin are used widely. As for the former, a measuring cup is removed from the container body for use, and this makes it possible to freely measure a required quantity, but this is unsuitable for accurate measurements. Further, the latter is equipped with a hand pump in the upper opening of a bottle container body made of synthetic resin, and the pump is pressed by hand to dispense the contents when needed. In accordance with this, the amount discharged by a single hand pressing is roughly constant.

[0013] However, in containers equipped with measuring cups, because the contents are poured out from the container body using the measuring cup by matching the graduations provided on the measuring cup, such method is unsuitable for accurate measurements, and there are instances where overflowing occurs due to a bad pouring method, and further, because the pouring opening is normally open, excessive contents will flow out from the inside of the container body when distributing the contents measured by the measuring cup. Further, when the cap is tightened loosely, in the case where by some chance the container falls over, there is the problem that the contents will leak out.

[0014] Further, in pump type bottles, the return spring of the pump is made of metal, and even when a structure made of a single material is technically possible, such arrangement is not practical in view of the problem of cost and the like. These days, as societal awareness of environmental protection increases, the problem of garbage disposal can not be ignored.

[0015] In this regard, the present invention solves the problems of the prior art described above, and provides a check valve which functions reliably and a container equipped with such check valve.

[0016] Further, a container equipped with a liquid measuring function of the present invention solves the problems

of the prior art described above, and provides a liquid container which can be constructed by a single material, and regardless of the simple structure, prevents careless discharge by the check valve, and makes it possible to carry out accurate measurements so that the quantity of liquid which flows out of the container body is not greater than the measured liquid.

SUMMARY OF THE INVENTION

[0017] In short, the check valve of the present invention has the characteristics given below.

[0018] (1) The check valve is provided in a discharge opening of a fluid container, and includes a tubular body having a passage formed therein;

[0019] a valve body formed from an elastic material equipped with an opening near the tip thereof and provided so as to cover the tubular body; and

[0020] an outer casing equipped with an opening near the tip thereof and provided so as to cover the valve body;

[0021] (2) The check valve is provided in a discharge opening of a fluid container, and includes a tubular body having a passage formed therein, a valve body formed from an elastic material equipped with an opening near the tip thereof and provided so as to cover the tubular body, an outer casing equipped with an opening near the tip thereof and provided so as to cover the valve body, and a protection cap which exposes only the opening of the outer casing.

[0022] (3) A space is provided between the tip of the tubular member and the inside surface of the outer casing in the discharge direction of the fluid, and the valve body is provided so as to isolate the space in the front and back.

[0023] (4) The valve body is formed from an elastic material, the opening provided near the head portion is a slit which is sealed and closed in the normal state by the elastic force of the valve body itself, and the slit is opened by pressure inside the container which breaks the seal.

[0024] (5) The slit is formed by combining a plurality of cuts.

[0025] (6) The tubular body and the valve body are formed integrally.

[0026] (7) The upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, the passage of the tubular body diverges inside the tubular body, an opening is provided in the head portion at a position which avoids the opening of the valve body, the opening of the valve body is closed and the opening of the tubular body is covered by being sealed with the upper end surface of the tubular body in the normal state, and both seals are broken when the valve body expands in the direction of the discharge opening by a rise in the internal pressure of the container, whereby the opening of the valve body is opened to make it possible to discharge contents.

[0027] (8) The upper end of the tubular body and the inner surface of the valve body having mutually match-

ing shapes, a protrusion which matches and covers the passage opening of the tubular body is provided on the inside of the head portion of the valve body, an opening is provided around the protrusion, the protrusion of the valve body covers the opening of the tubular body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body protrusion is pushed out in the direction of the discharge opening by a rise in the internal pressure of the container.

[0028] (9) The upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which protrudes in the direction of the discharge opening is provided on the head portion of the tubular body, the opening of the passage is provided around the protrusion, an opening which matches the protrusion of the tubular body and covers the passage is provided in the head portion of the valve body, the protrusion of the tubular body covers the opening of the valve body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body expands in the direction of the discharge opening by a rise in the internal pressure of the container.

[0029] (10) The upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which matches and covers the passage opening of the tubular body is provided on the inside of the head portion of the valve body, an opening is provided around the protrusion, the valve body is provided to be movable in the discharge direction between the tip of the tubular body and the inside of the outer casing, a spring is provided between the valve body and the outer casing to bias the valve body in the direction where the valve body is pushed against the tubular body in the normal state, the protrusion of the valve body covers the opening of the tubular body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body protrusion is moved in the direction of the discharge opening against the resistance of the spring by a rise in the internal pressure of the container.

[0030] (11) The upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which protrudes in the direction of the discharge opening is provided on the head portion of the tubular body, the opening of the passage is provided around the protrusion, an opening which matches the protrusion of the tubular body and covers the passage is provided in the head portion of the valve body, the valve body is provided to be movable in the discharge direction between the tip of the tubular body and the inside of the outer casing, a spring is provided between the valve body and the outer casing to bias the valve body in the direction where the valve body is pushed against the tubular body in the normal state, the protrusion of the tubular body covers the opening of the valve body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body is moved in the direction of the discharge opening against the resistance of the spring by a rise in the internal pressure of the container.

[0031] (12) The valve body is open and contents are discharged from the discharge opening when an outside pressure applied to the container is less than or equal to a prescribed level, and the upper surface of the valve body and the inside surface of the outer casing are sealed to cover the opening of the valve body and stop discharge when the prescribed level is exceeded.

[0032] Further, the liquid container equipped with the check valve of the present invention is equipped with a check valve having the characteristics described above, wherein the tube and container body are formed by a flexible material into a bottle, gusset bag or standing pouch.

[0033] Furthermore, the liquid container of the present invention has the characteristics given below.

[0034] (1) The liquid container is equipped with a check valve and a discharge opening for discharging contents, and includes a check valve equipped with an opening which is closed in a normal state and opens by a rise in the internal pressure of the liquid container provided in said discharge opening, a measuring container provided in the discharge end, and a cap equipped with an air intake opening which includes the check valve equipped with the opening which is closed in the normal state and opens by a rise in the internal pressure of the liquid container provided in the opening, wherein an amount of contents more than a quantity measured from the inside of the container body is not discharged from the container body when the contents that have been discharged temporarily into the inside of the measuring container are distributed at the time of measurement and distribution.

[0035] (2) The liquid container is equipped with a check valve and a discharge opening for discharging contents, and includes a check valve provided in said discharge opening, wherein the check valve is equipped with a tubular body which includes a passage formed therein, a valve body which is provided near the tip to cover the tubular body and is formed from an elastic material equipped with an opening which is closed in a normal state and opens by a rise in the internal pressure of the liquid container, and an outer casing which covers the valve body and is equipped with an opening near the tip; a measuring container provided in the discharge end; and a cap equipped with an air intake opening which includes the check valve formed from an elastic material and equipped with the opening which is closed in the normal state and opens by a rise in the internal pressure of the liquid container near the tip provided in the opening; wherein an amount of contents more than a quantity measured from the inside of the container body is not discharged from the container body when the contents that have been discharged temporarily into the inside of the measuring container are distributed at the time of measurement and distribution.

[0036] (3) The opening of the valve body is a slit.

[0037] (4) The measuring container described above can be replaced with different capacity containers.

PREFERRED EMBODIMENTS OF THE INVENTION

[0038] The preferred embodiments of the present invention will be described with reference to the appended drawings.

[0039] FIG. 1 is an outside perspective view showing a first embodiment of the present invention. In FIG. 1, 1 is a check valve body, 2 is a discharge opening and 3 is a container body. FIG. 2 is a vertical cross-sectional view of an essential portion around the check valve body.

[0040] The check valve 2 is constructed from a tubular body 4, a valve body 5 and an outer casing 6 respectively shown in FIGS. 3(a), (b) and (c), and a protection cap 7 shown in FIG. 2. As shown in FIG. 2 and FIG. 3, the tubular body 4 has a container body side end portion 8 which is formed in a tapered shape to reduce fluid resistance. Because the tubular body 4 is also equipped with a function of maintaining the shape of the valve body 5, a material having a hardness at a degree which does not easily deform is preferred.

[0041] As shown in FIG. 3(b), the valve body 5 is formed into a hollow projectile shape, and a slit 9 is provided in the tip thereof. The valve body 5 is formed by an elastic material such as rubber or the like, wherein the slit 9 is normally sealed by the elastic force (restoring force) of the valve body 5 itself, but when the container body 3 is pressed by hand or the like to apply an outside pressure to deform the container, the seal of the slit 9 is easily broken by the inside pressure to form an opening.

[0042] Further, as shown in FIG. 3(c), the outer casing 6 is provided to cover the valve body 5. The outer casing 6 also has a function of restricting expansion deformation of the valve body 5. The shape is roughly the same as that of the valve body 5, and the discharge opening 2 which is normally open is provided in the tip thereof. The material is preferably equipped with some elasticity. The discharge opening 2 is provided so as to match a protrusion 12 provided in a cap 11 shown in FIG. 2, and by sealing both, the contents (a liquid, a semi-fluid or the like) remaining inside a discharge opening passage 20 is prevented from being oxidized by contact with air.

[0043] A flange portion 13 is provided on the outer surface of the outer casing 6, and as shown in FIG. 2, the flange portion 13 is fitted into the tip of a tubular portion 14 of the container body 3. The protection cap 7 is formed so as to screw onto a screw provided on the outside of the tubular portion 14 of the container body 3.

[0044] In the case where it is assumed that such structure is not provided, namely, in the case where there is no tubular body like that shown in FIG. 14, then in the case where the pressure inside the container forms a negative pressure by the elastic (restoring) force of the container body 3, the valve body 5 is deformed inward and this opens the slit 9, whereby a gap is created between the valve body and the outer casing, and this allows air to flow into the inside of the container body. Further, as shown in FIG. 16, in the case where there is no outer casing 6, usually only expansion occurs without opening the slit 9 of the valve body. Accordingly, as is required in the present invention, the three functions of the tubular body 4, the valve body 5 and the outer casing 6 preferably work together systematically.

[0045] As shown in FIG. 3 and FIG. 4, spaces A, B are provided respectively between the tip 15 of the tubular body 4 and an inside surface 16, and between a valve body tip 17 and an outer casing inner surface 18. The space A collects contents which have passed through the passage 19 of the

tubular body 4 from the inside of the container body, and as the volume thereof becomes large, the inner surface 16 of the valve body 5 is pressed by the dispersed pressure. The space B determines the transfer quantity of the valve body 5. As the depth (the height in the up and down direction in the drawings) C of the space B becomes large, the valve body 5 undergoes a large expansion, and this opens the slit 9 by a large amount, whereby the opening also becomes large. Then, by appropriately changing the spaces A, B in accordance with the hole diameter D of the passage of the tubular body 4 and the hole diameter E of the discharge opening shown in FIG. 5, and the viscosity of the contents, it is possible to adjust the discharge quantity and the ease of discharge (the amount of outside pressure applied to the container body for discharging).

[0046] The check valve 2 of the invention having the structure described above operates as shown in FIG. 6.

[0047] Namely, when the container body 3 is pressed by hand or the like, the pressure inside the container rises due to the applied outside pressure, and this pushes out the contents toward the discharge opening 2 as shown by the long arrows in the drawing. The pushed out contents pass through the passage 19 of the tubular body 4 and enter the space A. When that happens, the pressure inside the space A increases, and because the inner surface 16 of the tip of the valve body 5 is pushed to the outside, the valve body tip 17 expands while the space B contracts until contact is made with the inner surface 18 of the outer casing 6. At the same time, the slit 9 provided in the tip of the valve body 5 is opened, and the contents flow out and are discharged from the discharge opening 2 of the tip of the outer casing 6.

[0048] When the outside pressure of the container body 3 is released, the slit 9 is closed by the elastic (restoring) force of the valve body 5 and discharging is stopped, but because the valve body 5 is closed in a state where it is soaked in the contents as a valve functional characteristic, air is not sucked into the side of the container body 3 from the valve body 5.

[0049] When not in use, if the cap 11 is closed as shown in FIG. 7, the protrusion 12 provided in the center thereof forms a contact seal with the tip of the discharge opening 2, and this cuts off contact with air. By making this kind of structure, even in a structure where the space A is inside the valve body 5 and the valve body 5 is easily deformed to the side of the container body 3, because the pressure between the spaces A, B partitioned by the valve body 5 is balanced as much as possible, even if there is a temporary pull into the side of the container body 3 and the slit 9 is opened, if there is balance, the system will return to a normal state and the slit 9 will continue to be sealed. As for the cap 11 itself, in addition to the fitting type shown in FIG. 7, various types may be selected including a hinge attachment type and a screw type, but no matter which type, it is necessary to provide the protrusion 12 in the middle to make a structure which covers the discharge opening 2.

[0050] As described above, by adjusting the hole diameter D of the tubular body 4, the hole diameter E of the discharge opening and the spaces A, B, it is possible to freely control the discharging of contents from the discharge opening 2 from a drip to a continuous flow.

[0051] FIGS. 8(a) through 8(c) each show the slit 9 provided in the tip of the valve body 5. FIG. 8(a) is a front

view of the case where one slit 9 is provided, FIG. 8(b) is a plan view thereof, and FIG. 8(c) is a vertical cross-sectional view of the state where the slit is open.

[0052] FIGS. 9(a) through 9(e) are plan views of different embodiments of the slit 9.

[0053] Further, the opening provided in the valve 5 is not limited in this way to the slit 9, and there is no limit on the mechanism as long as such mechanism is opened by a rise in the pressure inside the container and automatically closed when the pressure inside the container is released, and as described later, it is of course possible to use a so-called opening hole.

[0054] FIG. 10 through FIG. 12 are examples in which the check valve 2 of the present invention is applied to various container bodies 3. FIG. 10 is an example applied to a plastic bottle having a container body deformable by outside pressure widely used for shampoo and the like, FIG. 11 is an example applied to a gusset bag, and FIG. 12 is an example applied to a standing pouch container. Both FIG. 11 and FIG. 12 are so-called pouch containers. In this way, it is possible to apply the check valve of the present invention to various types of containers in which the container body 3 is pressed by hand to apply an outside pressure which creates an internal pressure inside the container body to discharge the contents. Conversely, the present invention can not be applied to containers having container bodies which are not deformed by outside pressure such as glass bottles and the like.

[0055] FIG. 16 through FIG. 20 show other embodiments of the check valve 2 of the present invention.

[0056] FIG. 16 shows a check valve equipped with two slits, and FIG. 17 shows the case where the tubular body 4 and the valve body 5 are formed integrally. In this case, there is the case where all of it is formed integrally by an elastic material such as rubber or the like, or the tubular body 4 may be formed by a hard material such as plastic or the like which is then covered by an elastic material. Even if it is assumed that all of it is formed by a flexible material, it is possible to inhibit deformation toward the inside if sufficient thickness is provided to a tubular body portion 21, but preferably the tubular body portion 21 is hard, and it is better for the head portion which has the opening to be soft as long as sufficient elasticity required for closing the opening can be secured.

[0057] In FIGS. 18(a) and 18(b), the passage 19 of the tubular body 4 extends up to the vicinity of the head portion in contact with the valve body 5, and diverges into a fork. In this case, the head portion 15 of the tubular body 4 and the tip portion inside 16 are sealed and form a shape which covers the opening of the passage 19. Accordingly, as a valve mechanism, this portion and the slit 9 provided in the valve body 5 form a two-step structure. Namely, as shown by the arrows in FIG. 18(b), the contents that have been pushed out from the container body 3 and passed through the passage 19 of the tubular body 4 are pushed up through the valve body 5 and create (collect in) the space A between the tubular body tip 15 and the valve body tip portion inside 16, and this internal pressure causes the valve body 5 to be pushed up further and expand, whereby the slit 9 is opened widely. Then, such contents are discharged from the discharge opening 2 of the outer casing 6. Of course, because even only the former achieves a sufficient function as a

valve, it is of course possible to provide an opening hole in the valve body 5 instead of the slit 9, and this may be used properly depending on the viscosity of the liquid being used.

[0058] FIG. 19 and FIG. 20 show the case where the check valve is provided with a discharge adjustment mechanism. Namely, normally, when the valve and the discharge opening are open, the discharge quantity changes as the pressure inside the container increases, and in the case where the pressure inside the container body 3 is raised carelessly, the contents will fly out from the discharge opening 2. In this regard, the discharge adjustment mechanism makes it possible to prevent such problem. FIG. 19(a) is a vertical cross-sectional view of the normal state, FIG. 19(b) is a plan view of the valve body, FIG. 20(a) is a vertical cross-sectional view of the discharge state, and FIG. 20(b) is a vertical cross-sectional view of the closed state. In all of these drawings, the flow of the contents (a liquid, a semi-fluid or the like) is shown by arrows.

[0059] Namely, a protrusion 23 is provided in the valve body 5 toward the inside to match the opening 22 of the tip of the tubular body 4, and in the normal state shown in FIG. 19(a), the tip opening 22 of the tubular body 4 and the protrusion 23 of the valve body 5 are matched and sealed to cover the opening 22 of the passage 19. Then, the contents that have been pushed out by a rise in the pressure inside the container body 3 and passed through the passage 19 push up the protrusion 23 of the valve body 5 described above, whereby both seals are broken. When this happens, because a gap is opened, the contents flow out through such gap from an opening 24 provided around the protrusion 23 of the valve body 5 and are discharged from the discharge opening 2 of the outer casing 6.

[0060] However, when the pressure inside the container body is raised further, the protrusion 23 of the valve body 5 is pushed up further, and the top surface thereof, namely, the tip 17 of the valve body 5 makes contact with a bottom end 25 of the discharge opening 2 of the outer casing 6, whereby the discharge opening 2 is covered.

[0061] By constructing the check valve in this way, the contents are discharged only when the pressure inside the container body is constant. Namely, the contents are not discharged for complex outside pressures such as when the container body 3 is pressed carelessly. Accordingly, this structure is preferred very much for the case where the contents need to be dripped, wherein it is possible to prevent a continuous discharge.

[0062] Further, the setting of the range of outside pressures applied to the container body 3 capable of discharging the contents may be carried out by appropriately adjusting the strength of the elasticity of the valve body 5 and the distance from the tip of the valve body 5 to the discharge opening of the outer casing 6 in addition to the inner diameter D of the passage 19 of the tubular body 4, the hole diameter of the opening of the valve body 5 and the hole diameter E of the discharge opening 2 of the outer casing 6 shown in FIG. 5 as described above. In this case, a protrusion may be provided on the head of the valve body 5 in the case where there is a need to secure the volume of the space B between the valve body 5 and the outer casing 6.

[0063] FIG. 21 and FIG. 22 show the structure in which a protrusion 26 provided on the head of the tubular body 4

and a opening hole 27 provided on the valve body 5 are matched to form a valve mechanism. FIG. 21(a) is a vertical cross-sectional view of the normal state, FIG. 21(b) is a plan view of the tubular body 4, and FIG. 22 is a vertical cross-sectional view of the discharge state.

[0064] Opening holes 22 is provided around the protrusion 26 of the tubular body 4. Four opening holes are shown in the drawings, but it is of course possible to provided any number of such opening holes.

[0065] As shown in FIG. 22, the contents pushed out from the container body 3 not shown in the drawings pass through the passage 19 of the tubular body 4 and push the valve body 5 covering the opening holes 22 from the inside. When this happens, the opening holes 22 of the valve body 5 sealed with the protrusion 26 of the tubular body 4 is pushed up, and this creates a gap between both, whereby the contents are discharged from the discharge opening 2 of the outer casing 6.

[0066] FIG. 23 through FIG. 25 shown other different embodiments of the present invention.

[0067] In both of these, the valve body 5 is provided so as to be movable in the space B provided between the tubular body 4 and the outer casing 6. In this embodiment, a spring 28 is provided between the valve body 5 and the outer casing 6, and the check valve is constructed so that the valve body 5 is sealed against the tubular body 6 in the normal state.

[0068] The specific valve mechanism is the same as that of each of the structures described above. Namely, FIG. 23 shows the type where the protrusion 23 provided on the valve body 5 forms a contact seal against the tip opening 22 of the tubular body 4, and FIG. 25 shows the type where the protrusion 26 of the tip of the tubular body 4 and the opening hole 27 of the valve body 5 are sealed.

[0069] In either type, when the contents that have been pushed out by a rise in the pressure inside the container body 3 push up the valve body 5, because the valve body 5 slides open against the resistance of the spring 28, the contents flow out from there and are discharged from the discharge opening 2 of the outer casing 6. FIG. 23 and FIG. 24 are the same as the example of FIG. 19, and when the pressure inside the container body is above a prescribed level, the valve body 5 covers the discharge opening 2 of the outer casing 6, and this stops the discharging of contents. FIG. 23 shows the normal state, FIG. 24(a) shows the discharge state, and FIG. 24(b) shows the closed state.

[0070] FIG. 26 shows the case where the upper portion of the protection cap 7 is formed in the shape of a cup to provide a measuring portion 29. In this way, it is possible to measure the contents discharged from the discharge opening 2. In this case, the measuring portion 29 is preferably formed by a transparent material.

[0071] In this example, after the cap 11 is removed, the measuring portion 29 is directed upward, and then the container body 3 is pressed to measure out a required quantity. This is ideally suited to medicine and detergent containers.

[0072] Next, a description will be given for an embodiment of the case where the check valve of the present invention is applied to a container equipped with a liquid measuring function.

[0073] FIG. 27 is a perspective view showing a liquid measuring container of the present invention. In this drawing, 30 is a liquid measuring container, 3 is a container body, 7 is a protection cap, 29 is a measuring container (referred to as a cup below), 31 is an air intake opening and 32 is a suction tube.

[0074] FIG. 28 is a vertical cross-sectional view of the vicinity of the protection cap 7 which is an essential portion of the present invention. The check valve 1 is provided in a concave portion in the center portion inside the protection cap 7, and the discharge opening 2 of the tip thereof is inserted into an opening 32 provided in the center of the protection cap 7.

[0075] The check valve 1 is inserted into a tubular member 14, and the tubular member 14 is fitted into the concave portion inside the protection cap 7. A screw may be used to engage the protection cap 7 and the tubular member 14. Further, the suction tube 33 hangs down in the lower portion of the tubular member 14, and the tip thereof reaches the bottom of the container body 3. This arrangement makes it possible to suck up liquid from the bottom of the container body 3. Further, the thickness (inner diameter) of the suction tube 33 can be changed in accordance with the viscosity of the liquid being used. The inner diameter is made thick in the case of a high viscosity liquid, and made thin in the reverse case of a low viscosity liquid.

[0076] In FIG. 28, 11 is a cover of the cup 29. The cover 11 has a T-shaped vertical cross section, namely, a shape in which a rod-shaped member 35 protrudes from the center of a disc-shaped member 34, wherein a step 36 is provided on the periphery of the disc-shaped member 34, and as shown in FIG. 29, the step 36 fits into an upper end 37 of the cup 29, and the tip of the rod-shaped member 35 is tapered and protrudes against the tip portion opening 2 of the check valve 1 to cover the opening.

[0077] The cup 29 is fixed by a screw to the upper end of the protection cap 7. As for the method of connecting the protection cap 7 and the cup 29, fitting may be carried out in place of a screw, but the liquid collected in the cup 29 must be prevented from leaking. For this reason, the use of an O-ring is also effective. However, the cup 29 is not fixed and is capable of being removed. In this way, the cup 29 can be easily removed and washed, and as shown in FIG. 30, the cup 29 is preferably replaced by different capacity cups to match the measured quantity. Further, the cup 29 is preferably a transparent material, and graduations are preferably provided to make it possible to easily measure quantities from the side.

[0078] As shown in FIG. 28, an air intake opening 38 is provided in the side of the protection cap 7. In FIG. 28, a through hole 39 is provided toward the center from the side of the protection cap 7. There is a step 40 inside the protection cap, and a gap 41 is provided between the step 40 and the periphery of the tubular member 14. The through hole 39 opens into the gap 41.

[0079] A side surface side opening of the through hole 39 has a wide inner diameter at a prescribed depth, a tubular member 42 is fitted into such portion, a check valve 43 is inserted into the inside thereof, and a cap 44 prevents removal of the check valve 43. In the cap 44, an air intake hole 45 is open in the center thereof.

[0080] The check valve 43 has a simpler structure than the check valve 1 of the discharge path described above. Of course, this does not deny the use of the same structure as the check valve 1 described above. Preferably, such air intake opening is closed when the pressure inside the container body is a positive pressure, and opened when there is a negative pressure.

[0081] Further, in the present embodiment, the air intake opening 38 is provided in the cap 7, but it is of course possible to provide such opening in the container body.

[0082] The liquid measuring container of the present invention having the structure described above is used as follows below.

[0083] As shown in FIG. 31, the container body 3 is pressed by fingers or the like to raise the pressure inside. The rise in internal pressure causes the contents (liquid) to enter into the suction tube 32 and move toward the discharge opening. Then, as shown in FIG. 32, the check valve 1 is opened and the contents flow out into the inside of the cup 29. At this time, only the check valve 1 of the discharge side is opened, and the check valve 43 of the air intake side is closed. Pressure is continuously applied to the container body 3 until the surface of the liquid reaches a graduation of the cup.

[0084] FIG. 33 shows the state where a prescribed quantity is measured into the inside of the cup. When a prescribed quantity has collected in the cup 29, if the hand pressing the container body 3 is released to remove the outside pressure applied to the container body 3, the check valve 1 is automatically closed by the elasticity of the valve body 5. When this happens, a negative pressure is formed inside the container body by the restoring force due to the elasticity of the container body 3 as shown in FIG. 34, and then the check valve 43 of the air intake opening 38 is opened, whereby outside air flows into the inside of the container body. When the pressure inside the container body and the air pressure outside the container are balanced, the check valve 43 of the air intake opening 38 is automatically closed by its own elastic force. Then, the contents inside the cup may be distributed.

[0085] As a result, there is no excessive flow from the discharge opening 2 when the measured contents are discharged (distributed) from the inside of the cup, and contents are not discharged even in the case where the container body falls over for some reason.

INDUSTRIAL APPLICATION

[0086] Because the present invention has the structures described above, it is possible to provide a check valve ideally suited to drip discharge of contents (a liquid, a semi-fluid or the like) and a container having a high preservability equipped with such check valve.

[0087] Namely, the pressure applied to the container can be very easily controlled to carry out a drip discharge of the contents, and because the valve mechanism portion is not exposed, the check valve can be operated reliably without the valve mechanism receiving outside pressure or the like, and it is possible to reliably prevent the reverse flow of air to the inside of the container body.

[0088] Accordingly, the present invention is ideally suited for use with anaerobic contents (food, cosmetics, pharmaceuticals and the like) that hate contact with air.

[0089] The adjustment of the discharge quantity of the contents can be freely adjusted in accordance with the viscosity.

[0090] Further, the liquid container equipped with the measuring function of the present invention can be applied to various containers as long as such containers are flexible liquid containers, and it is possible to carry out measurements without difficulty while easily carrying out adjustment of the discharge quantity of the contents.

[0091] Now, because the contents are not discharged even when an outside pressure is carelessly applied to the container body, an excessive amount more than the measured quantity is not discharged from the container body, and this achieves a high measuring accuracy.

[0092] Furthermore, because the measuring cup can be removed and washed, such structure is hygienic.

BRIEF DESCRIPTION OF THE DRAWINGS

[0093] FIG. 1 is a perspective view showing the first embodiment of a check valve of the present invention. FIG. 2 is a vertical cross-sectional view of an essential portion thereof. FIG. 3(a) is a vertical cross-sectional view of a tubular body, FIG. 3(b) is a vertical cross-sectional view of a valve body, and FIG. 3(c) is a vertical cross-sectional view of an outer casing. FIG. 4 is an explanatory view of the space partitioned by the valve body. FIG. 5 is an explanatory view showing the adjustment dimensions. FIG. 6 is an explanatory view showing the operation. FIG. 7 is an explanatory view showing the state where the cap is closed. FIG. 8(a) is a front view of the case where one slit is provided, FIG. 8(b) is a plan view thereof, and FIG. 8(c) is a vertical cross-sectional view showing the state where the slit is open. FIGS. 9(a)~9(e) are explanatory views showing applied examples of the slit. FIG. 10 is an explanatory view showing an example applied to a bottle. FIG. 11 is an explanatory view showing an example applied to gusset bag. FIG. 12 is an explanatory view showing an example applied to standing pouch. FIG. 13 is an explanatory view showing prior art. FIG. 14 and FIG. 15 are explanatory views showing the case where part of a function is omitted. FIG. 16 and FIG. 17 are vertical cross-sectional views of an essential portion showing one example of a variation of the tubular body and the valve body. FIG. 18(a) and FIG. 18(b) are vertical cross-sectional views of an essential portion respectively showing the normal state and the discharge state for one example of a variation of the tubular body and the valve body. FIG. 19(a) is a vertical cross-sectional view of an essential portion showing the normal state for one example of a variation of the tubular body and the valve body, and FIG. 19(b) is a plan view of the valve body. FIG. 20(a) and FIG. 20(b) are vertical cross-sectional views of an essential portion respectively showing the normal state and the discharge state for one example of a variation of the tubular body and the valve body. FIG. 21(a) is a vertical cross-sectional view of an essential portion showing one example of a variation of the tubular body and the valve body, and FIG. 21(b) is a plan view of the tubular body. FIG. 22 is a vertical cross-sectional view of an essential portion showing the discharge state for one example of a variation of the tubular body and the valve body. FIG. 23 is a vertical cross-sectional view of an essential portion showing the normal state for one example of a variation of the

tubular body and the valve body in a second embodiment. FIG. 24(a) and FIG. 24(b) are vertical cross-sectional views of an essential portion respectively showing the discharge state and the closed state for one example of a variation of the tubular body and the valve body in the second embodiment. FIG. 25(a) and FIG. 25(b) are vertical cross-sectional views of an essential portion respectively showing the normal state and the discharge state for one example of a variation of the tubular body and the valve body in the second embodiment. FIG. 26 is a conceptual view of the case where the check valve of the present invention is applied to a container equipped with a liquid measuring function. FIG. 27 is a perspective view showing the first embodiment of a container equipped with a liquid measuring function of the present invention. FIG. 28 is a vertical cross-sectional view of an essential portion showing the state where the cover is removed. FIG. 29 is vertical cross-sectional view of an essential portion showing the state where the cover is attached. FIG. 30 is a perspective view of an essential portion showing the state where the measuring container is replaced. FIG. 31 is a perspective view showing the state of use. FIG. 32 is a vertical cross-sectional view of an essential portion showing the discharge state. FIG. 33 is a vertical cross-sectional view of an essential portion showing the state where measuring is complete. FIG. 34 is a vertical cross-sectional view of an essential portion showing the state where outside air is sucked in.

1. A check valve provided in a discharge opening of a fluid container, comprising:

a tubular body having a passage formed therein;

a valve body formed from an elastic material equipped with an opening near the tip thereof and provided so as to cover the tubular body; and

an outer casing equipped with an opening near the tip thereof and provided so as to cover the valve body;

2. A check valve provided in a discharge opening of a fluid container, comprising:

a tubular body having a passage formed therein;

a valve body formed from an elastic material equipped with an opening near the tip thereof and provided so as to cover the tubular body;

an outer casing equipped with an opening near the tip thereof and provided so as to cover the valve body; and

a protection cap which exposes only the opening of the outer casing.

3. The check valve described in claim 1 or claim 2, wherein a space is provided between the tip of the tubular member and the inside surface of the outer casing in the discharge direction of the fluid, and the valve body is provided so as to isolate the space in the front and back.

4. The check valve described in any one of claim 1 through claim 3, wherein the valve body is formed from an elastic material, the opening provided near the head portion is a slit which is sealed and closed in the normal state by the elastic force of the valve body itself, and the slit is opened by pressure inside the container which breaks the seal.

5. The check valve described in claim 4, wherein the slit is formed by combining a plurality of cuts.

6. The check valve described in any one of claim 1 through claim 5, wherein the tubular body and the valve body are formed integrally.

7. The check valve described in any one of claim 1 through claim 3, wherein an upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, the passage of the tubular body diverges inside the tubular body, an opening is provided in the head portion at a position which avoids the opening of the valve body, the opening of the valve body is closed and the opening of the tubular body is covered by being sealed with the upper end surface of the tubular body in the normal state, and both seals are broken when the valve body expands in the direction of the discharge opening by a rise in the internal pressure of the container, whereby the opening of the valve body is opened to make it possible to discharge contents.

8. The check valve described in any one of claim 1 through claim 3, wherein an upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which matches and covers the passage opening of the tubular body is provided on the inside of the head portion of the valve body, an opening is provided around the protrusion, the protrusion of the valve body covers the opening of the tubular body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body protrusion is pushed out in the direction of the discharge opening by a rise in the internal pressure of the container.

9. The check valve described in any one of claim 1 through claim 3, wherein an upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which protrudes in the direction of the discharge opening is provided on the head portion of the tubular body, the opening of the passage is provided around the protrusion, an opening which matches the protrusion of the tubular body and covers the passage is provided in the head portion of the valve body, the protrusion of the tubular body covers the opening of the valve body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body expands in the direction of the discharge opening by a rise in the internal pressure of the container.

10. The check valve described in any one of claim 1 through claim 3, wherein an upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which matches and covers the passage opening of the tubular body is provided on the inside of the head portion of the valve body, an opening is provided around the protrusion, the valve body is provided to be movable in the discharge direction between the tip of the tubular body and the inside of the outer casing, a spring is provided between the valve body and the outer casing to bias the valve body in the direction where the valve body is pushed against the tubular body in the normal state, the protrusion of the valve body covers the opening of the tubular body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body protrusion is moved in the direction of the discharge opening against the resistance of the spring by a rise in the internal pressure of the container.

11. The check valve described in any one of claim 1 through claim 3, wherein an upper end of the tubular body and the inner surface of the valve body having mutually matching shapes, a protrusion which protrudes in the direc-

tion of the discharge opening is provided on the head portion of the tubular body, the opening of the passage is provided around the protrusion, an opening which matches the protrusion of the tubular body and covers the passage is provided in the head portion of the valve body, the valve body is provided to be movable in the discharge direction between the tip of the tubular body and the inside of the outer casing, a spring is provided between the valve body and the outer casing to bias the valve body in the direction where the valve body is pushed against the tubular body in the normal state, the protrusion of the tubular body covers the opening of the valve body in the normal state, and the passage is opened to make it possible to discharge contents when the valve body is moved in the direction of the discharge opening against the resistance of the spring by a rise in the internal pressure of the container.

12. The check valve described in any one of claim 7 through claim 11, wherein the valve body is open and contents are discharged from the discharge opening when an outside pressure applied to the container is less than or equal to a prescribed level, and the upper surface of the valve body and the inside surface of the outer casing are sealed to cover the opening of the valve body and stop discharge when the prescribed level is exceeded.

13. A liquid container equipped with the check valve described in any one of claim 1 through claim 11.

14. A liquid container equipped with the check valve described in claim 12, wherein the container is a bottle formed by a flexible material.

15. A liquid container equipped with the check valve described in claim 12, wherein the container is a gusset bag.

16. A liquid container equipped with the check valve described in claim 12, wherein the container is a standing pouch.

17. A liquid container equipped with a check valve and a discharge opening for discharging contents, comprising:

a check valve equipped with an opening which is closed in a normal state and opens by a rise in the internal pressure of the liquid container provided in said discharge opening;

a measuring container provided in the discharge end; and

a cap equipped with an air intake opening which includes the check valve equipped with the opening which is closed in the normal state and opens by a rise in the internal pressure of the liquid container provided in the opening;

wherein an amount of contents more than a quantity measured from the inside of the container body is not discharged from the container body when the contents that have been discharged temporarily into the inside of the measuring container are distributed at the time of measurement and distribution.

18. A liquid container equipped with a check valve and a discharge opening for discharging contents, comprising:

a check valve provided in said discharge opening, wherein the check valve is equipped with a tubular body which includes a passage formed therein, a valve body which is provided near the tip to cover the tubular body and is formed from an elastic material equipped with an opening which is closed in a normal state and opens by a rise in the internal pressure of the liquid container,

and an outer casing which covers the valve body and is equipped with an opening near the tip;
a measuring container provided in the discharge end; and
a cap equipped with an air intake opening which includes the check valve formed from an elastic material and equipped with the opening which is closed in the normal state and opens by a rise in the internal pressure of the liquid container near the tip provided in the opening;

wherein an amount of contents more than a quantity measured from the inside of the container body is not discharged from the container body when the contents that have been discharged temporarily into the inside of the measuring container are distributed at the time of measurement and distribution.

19. The liquid container equipped with a check valve described in claim 18, wherein the opening of the valve body is a slit.

* * * * *