

Description

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a high pressure gas injection device, for example. More specifically, the invention relates to a high pressure gas jetting device suitable for employing in a fire-extinguisher to be loaded on an automotive vehicle for use.

BACKGROUND OF THE INVENTION

Conventionally, known fire-extinguishers are typically filled with dried powder of baking soda in a container and mounted carbon dioxide bomb. Upon use, by gripping a handle with removing a stopper pin, a seal plate of the bomb is ruptured to jet the baking soda powder through a nozzle by the pressure of the carbon dioxide.

However, because of a shape, in which a handle is provided at the upper portion of the container and a hose is drooped from the upper portion of the container to the side portion, as well as large size of the container per se, occupied space is too large to arranged in a home or to load on the automotive vehicle. Also, such fire-extinguisher is simply colored in red to have unattractive looking.

As a measure for this, compact fire-extinguishers mainly adapted for loading on the automotive vehicle have been developed. Such fire-extinguisher has a size portable by one hand and incorporates a gas tank preliminarily filled with an extinguishing gas to tap the bottom portion of the container on a relatively hard portion to cause upward movement of a needle form member within the gas tank to pierce a seal plate of the gas tank to jet the extinguishing gas from the tip end head portion of the container.

However, in case of the fire-extinguisher jetting a gas from the tip end head portion by tapping the bottom of the container, after picking up the fire-extinguisher in finding fire, it becomes necessary to select an appropriate portion to tap with the container. Also, after actually starting jetting of gas from the tip end head portion of the container, the orientation of the container has to be changed toward the firing site to cause loss in extinguishing time, and all amount of gas filled in the gas tank cannot be used for extinguishing fire.

Also, a force for tapping the container should be variable per individual and hardness of the portion to be tapped is not uniform. Furthermore, it cannot be expected upon occurrence of fire to coolly select the portion having an appropriate hardness for tapping and to tap such portion with an appropriate force. Accordingly, it is difficult to have a design to assure jetting of extinguishing gas upon tapping with the container at any condition. In this connection, some user should repeat tapping operation for a plurality of times, and in some case, the extinguishing gas cannot be jetted.

Furthermore, in certain manner of tapping with the container, it becomes indeterminable the timing of starting jetting of the extinguishing gas. Also, since the gas is jetted from the tip end head portion of the container, it can be expected that the gas is jetted toward the face of the user to cause frightening of user to release the container from the hand.

Such problem should be true not only in the compact fire-extinguisher but also in other high pressure gas jetting device.

The present invention has been worked out in view of the problems set forth above. Therefore, it is an object of the present invention to provide a high pressure gas jetting device which can jet a gas in a condition where a jetting direction is oriented toward a target without requiring tapping of the container, will not cause influence on a jetting operation and can expect gas jetting timing in certain extent.

SUMMARY OF THE INVENTION

In order to accomplish the object set forth above, the present invention as defined in claim 1, comprises a first cylindrical member disposed a gas tank sealingly enclosing a high pressure gas, a second cylindrical member threadingly engaged with the first cylindrical member and capable of rotation relative with the former, and a needle form member provided within the second cylindrical member and moving in an axial direction by relative rotation of the first and second cylindrical members to pierce a sealing plate of the gas tank.

According to the present invention as defined in claim 2, the high pressure gas within the gas tank is jetted from the tip end hole of the second cylindrical member through a through aperture formed in the axial direction of the needle form member.

According to the present invention as defined in claim 3, the high pressure gas is non-inflammable gas of carbon dioxide, nitrogen, inert gas and the like.

According to the present invention as defined in claim 4, an angle of relative rotation of the first and second cylindrical members causes the needle form member piercing the sealing plate of the gas tank within 180°.

According to the present invention as defined in claim 5, at least one groove parallel to a rotation axis of relative rotation is formed on the outer surface of the first and second cylindrical members, and a stopper releasably engaging over both grooves in the condition where respective grooves are aligned and thus preventing relative rotation of both cylindrical members.

According to the present invention as defined in claim 6, antistatic process is provided for the first and second cylindrical members.

According to the present invention as defined in claim 7, the needle form member has a truncated cone shape at the tip end.

The present invention basically comprises a first

cylindrical member disposed a gas tank sealingly enclosing a high pressure gas, a second cylindrical member threadingly engaged with the first cylindrical member and capable of rotation relative with the former, and a needle form member provided within the second cylindrical member and moving in an axial direction by relative rotation of the first and second cylindrical members to pierce a sealing plate of the gas tank, and can be constructed in various forms. According to the present invention, the needle form member pierces the seal plate of the gas tank by relative rotation of the first and second cylindrical members.

It is preferred that the high pressure gas within the gas tank is jetted from the tip end hole of the second cylindrical member through a through aperture formed in the axial direction of the needle form member. According to this, since the high pressure gas is jetted from the tip end hole of the second cylindrical hole through the through aperture of the needle member by relatively rotating both cylindrical members in the condition directing the tip end hole of the second cylindrical member toward the target, the jetting gas can be certainly directed to the target.

As set forth, it is preferred to jet the high pressure gas from the tip end hole of the second cylindrical member through the through aperture formed in the needle form member. However, it is also possible to jet the gas from jetting hole formed on the side portion of the first or second cylindrical member.

The first and second cylindrical members can be arbitrarily selected the cross-sectional shapes, such as polygon shape, rhomboid shape, star shape and so forth in addition to circular, triangular, quadrangular shapes except for the portion where the thread is formed, and can be produced from various materials selected among resin, such as plastic, reinforced plastic, metal, such as aluminum, alloy and so forth, wood or so forth. The tip end hole to be formed in the second cylindrical member is single or a plural. When a plurality of tip end holes are formed, one of those is arranged at the center portion and remaining hole are arranged thereabout.

As a mechanism for causing relative rotation of the first cylindrical member and the second cylindrical member, a toy pistol form may be applied and a power transmission mechanism for rotating the other in response to actuation of a trigger with fixing either one of the first and second cylindrical members.

The high pressure gas may be non-inflammable gas of carbon dioxide, nitrogen, inert gas and the like as used for fire-extinguisher. As used as an oxygen bomb, oxygen may be used. Since the high pressure gas is low temperature, remarkable extinguishing effect can be achieved together with the extinguishing action and cooling effect of the non-inflammable gas when the present invention is used as the fire-extinguisher. When non-inflammable gas is used as the high pressure gas, it may be applicable as a washing device for washing

dust or so forth depositing on various devices by utilizing the jetting pressure. Also, when insect killer, agricultural chemicals or so forth is admixed with the high pressure gas, it can be used for spraying these insect killer, agricultural chemicals and so forth.

It is preferred that an angle of relative rotation of the first and second cylindrical members may cause the needle form member piercing the sealing plate of the gas tank within 180° so that, after initially gripping both cylindrical members, relative rotation becomes possible to jet the gas without changing grip, a period required for extinguishing operation can be shortened.

It is further preferred that at least one groove parallel to a rotation axis of relative rotation is formed on the outer surface of the first and second cylindrical members, and a stopper releasably engaging over both grooves in the condition where respective grooves are aligned and thus preventing relative rotation of both cylindrical members.

When a plurality of grooves are formed on the cylindrical members, stable grip feeding can be attained when the cylindrical members are gripped by hand and can prevent slippage upon causing relative rotation. Furthermore, it can be provided superior appearance in design. By releasably engaging the stopper over both grooves in the condition where respective grooves are aligned and thus preventing relative rotation of both cylindrical members. In order to attain superior grip feeling and improvement of the appearance, it is provided roughening process for forming fine projections or fine recesses together in place of or together with the grooves. It is preferred to connect the first and second cylindrical members preliminarily by a string so that the stopper may not be released from the device.

The first and second cylindrical members is preferably formed with the material difficult to be charged, with plating the inner peripheral surface of the cylindrical member, or with providing a conductive body on the inner peripheral surface to provide antistatic process. In this case, releasing of the cylindrical member held by the user due to occurrence of static electricity can be prevented.

It is preferred that the needle form member has a truncated cone shape at the tip end. In this case, the needle form member can certainly pierce the seal plate of the gas tank by relative rotation of the first and second cylindrical members. More preferably, stepped portion extending in circumferential direction is formed on a tapered surface/ However, the configuration of the tip end of the needle form member is not limited to this, but can be the tip end configuration of an injection syringe, threaded one, curved one and other arbitrary shape.

On the other hand, cross-sectional shape of the needle form member may be arbitrarily selected among polygon shape, rhomboid shape, start shape and so forth in addition to circular, triangular, quadrangular. Also, material may be arbitrarily selected among various materials, such as stainless, steel,

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(preferably provided plating process with No. 3 chromium), ceramic and the like.

The present invention is applicable not only for the case where the device is actuated manually but for the case where the device is actuated automatically. Namely, by fixing one end of a biasing means, such as coil spring on the inner portion or outer portion of either one of the first and second cylindrical member and fixing the other end on the other member via a stepper which is molten at a predetermined temperature, it becomes possible to cause relative rotation of the first and second cylindrical members by the biasing means with melting down the stopper upon occurrence of fire. Such automatic high pressure gas jetting device may be installed in high-vision, in the vicinity of gasoline tank, ceiling portion of a public telephone box, ceiling of cash-dispenser box as well as a guest room in the hotel, general home. Also, by employing non-inflammable gas as the high pressure gas, such automatic has jetting device may be formed into a fire-extinguisher which is thrown into the fire to be actuated by the heat of the fire.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1(a) is a perspective view showing the preferred embodiment of the present invention, (b) is a longitudinal section of (a);

Fig. 2 is an enlarged view of the major part of Fig. 1;

Fig. 3 is a section showing another embodiment; and

Fig. 4 is a perspective view of a further embodiment.

BEST MODE FOR IMPLEMENTING THE INVENTION

Figs. 1(a), (b) and 2 show a form under normal condition of an embodiment, in which a high pressure gas jetting device according to the present invention is applied for a compact fire-extinguisher. The extinguisher is generally constructed with a hollow cylindrical container main body 2 (first cylindrical member), in which a longitudinally elongated bottle form gas tank 1 (e.g. made of Nippon Tansan Gas Kabushiki Kaisha) sealingly containing carbon dioxide as a high pressure gas, is received, and a hollow cylindrical cap 3 (second cylindrical member) rotatable relatively with threading engagement with a front portion (upper side in the drawing) of the container body 2. The gas tank 1 is projectingly formed with a mouth portion 4. An opening end of the mouth portion 4 is sealed with a sealing plate (not shown). A threaded groove 5 is formed on the outer peripheral surface of the mouth portion 4.

The container body 2 and the cap 3 are formed of

plastic which is difficult to be charged, and are provided substantially the same diametric dimensions and substantially the same colors.

The tip end portion of the container body 2 is formed with a thick inner cylinder portion 6 projecting in the axial direction, at the center portion. On the inner periphery of the inner cylinder portion 6, an internal thread portion 7 threadingly engageable with the mouth portion 4 of the gas tank 1 is formed. It should be noted that the container body 2 is divided into two (2a, 2b). The mouth 4 of the gas tank 1 in the condition divided into two is threadingly engaged with the inner thread portion 7 to fix the gas tank 1 on the container body 2. Here, between the container body 12 and the gas tank 1, a bond or adhesive is not disposed. While fixing between the container main body 2 and the gas tank 1 is performed by threading engagement by the mouth portion 4, in this embodiment, it is also possible to form projections for fixing on the gas tank 1 and to form means for engaging with the projections in the container body 2.

On the outer periphery of the inner cylindrical portion 6, a threaded groove 8 of greater pitch than that of the thread formed in the mouth portion 4 of the gas tank 1. The threaded groove 8 is engaged with a threaded groove 9 formed on the inner periphery of the cap 3. As shown in Figs. 1(a) and (b), engagement of the container body 2 and the cap 3 is established so that substantially uniform gap is defined between the inner end surface of the cap 3 and the end surface of the inner cylindrical portion 6 and between the end edge portion of the cap and the step portion of the container body 2 to permit further tightening.

At substantially center portion of the cap 3, a tip end hole 10 extending therethrough is formed. On the back surface side of the tip end hole 10, a recessed portion 3a buried with a needle piece 11 is formed. As shown in detail in Fig. 2, the needle piece 11 is constituted of a cylindrical main body 11a to be fitted in the recessed portion 3a, a needle 11c (needle member) projecting backwardly from the main body 11a, and a nozzle 11b projecting frontwardly. A through aperture 11d is formed in the axial direction in the needle 11c, the main body 11a and the nozzle 11b. These tip end hole 10 and the needle piece 11 are arranged coaxially. The needle 11c is arranged in opposition with the seal plate of the gas tank 1 (in the shown embodiment, a distance between the tip end of the needle 11c and the seal plate of the gas tank 1 are set to be substantially 0).

Then, in this embodiment, when the container body 2 and the cap 3 are relatively rotated for 10° in tightening direction (direction where the container body 2 and the cap 3 are approach with each other), the needle 11c is moved in the axial direction to contact the tip end thereof to the seal plate of the gas tank 1. Pitch of the threaded grooves 8 and 9 are set to cause fracture of the seal plate as relatively rotated for 35°.

As shown in Fig. 1(a), on the front portion of the

container body 2 and the rear portion of the cap portion 3, grooves 12 and 13 parallel to axial direction of these are formed with a given interval in the circumferential direction. The grooves 12 and 13 are formed with the same pitch. A stopper (not shown) is releasably engaged over these grooves in the condition where both grooves 12 and 13 are aligned with each other. A ring is integrally attached to the stopper.

As set forth above, the compact fire-extinguisher is produced as follow. At first, in a condition where the container body 2 is divided into two, the gas tank 1 is introduced from the front side opening, and the mouth portion 4 is fixed by threading engagement with the inner threaded portion 7 of the inner cylindrical portion 6 of the container body 2. Thereafter, the container body 2 divided into two are integrally assembled. Next, the cap 3 buried with the needle piece 11 is threadingly engaged with the container body 2. The threading engagement is established for permitting further tightening as set forth above. With such simple operation, the compact fire-extinguisher can be completed.

In order to establish threading engagement with permitting further tightening, it is considered to preliminarily provide marking on the container body 2 and the cap 3 and to stop thread tightening when two markings are matched. On the other hand, it is also possible to stop thread tightening when grooves formed on the container body 2 and the cap 3 are aligned. By releasably engaging the stopper over both grooves in the condition where the grooves are matched, unexpected relative rotation of both cylindrical members in normal condition can be successfully prevented. Upon use, it is preferred to integrate the ring with the stopper so that the stopper may be easily released. Needless to say, it is preferred to provide a marking for the rotating position to stop thread tightening when a plurality of grooves are to be formed.

The compact fire-extinguisher completed, is loaded in the automotive vehicle, for example. Since the stopper is provided between the container body 2 and the cap 3, unexpected relative rotation in the normal condition can be successfully prevented. On the other hand, since grooves 12 and 13 are formed on both members 2 and 3 are formed, it may provide good appearance.

Here, discussion will be given with respect to occurrence of fire in the engine. At first, the container body 2 and the cap 3 are gripped by respective hands. Since both members 2 and 3 are formed of plastic which is difficult to be charged, it may not be caused to generate static electricity to be released from the hand. In this condition, only by directing the tip end hole 10 of the cap toward the engine and causing relative rotation of the container body 2 and the cap 3, the needle 11c pierces the seal plate of the gas tank to jet the gas from the tip end hole 10 of the cap 3 through the through aperture of the needle piece 11 (the needle 11c, the main body 11a and the nozzle 11b). Therefore, the jetted gas is certainly directed to the target.

Since a plurality of grooves 12 and 13 are formed on the container body 2 and the cap 3, stable grip feeling can be attained upon gripping by hand and slipping upon causing relative rotation can be successfully prevented.

On the other hand, since the gas can be jetted by relative rotation for 45° of the container body 2 and the cap 3, it becomes possible to cause relative rotation without changing gripping by the hand from initially gripping the container body 2 and the cap 3. Thus, extinguishing of fire can be performed with a short period.

Since high pressure carbon dioxide is low temperature, remarkable fire-extinguishing effect can be achieved together with fire-extinguishing effect and cooling effect of non-inflammable gas, even in compact size.

Fig. 3 shows another embodiment. In this embodiment, the cap 3 is significantly extended rearwardly to slidably contact the outer peripheral surface of the container body 2 onto its inner peripheral surface. Even in this embodiment, similar effect to the former embodiment can be obtained.

Fig. 4 shows a further embodiment. In this embodiment, shape of the cap 3 is rounded at the tip end, which is applicable either for the embodiment of Figs. 1 and 2 or the embodiment of Fig. 3.

As set forth above, according to the invention of claim 1, by gripping respective of the first and second cylindrical members and causing relative rotation of both cylindrical member in the condition directing the tip end hole of the second cylindrical member toward the target, the needle member may pierce the seal plate of the gas tank to certainly jet the jetting gas.

According to the invention of claim 2, since the high pressure gas is jetted from the tip end hole of the second cylindrical hole through the through aperture of the needle member by relatively rotating both cylindrical members in the condition directing the tip end hole of the second cylindrical member toward the target, the jetting gas can be certainly directed to the target.

According to the invention of claim 3, it can be used as the fire-extinguisher. Since the high pressure gas is low temperature, remarkable extinguishing effect can be achieved together with the extinguishing action and cooling effect of the non-inflammable gas.

According to the invention of claim 4, after initially gripping both cylindrical members, relative rotation becomes possible to jet the gas without changing grip, a period required for extinguishing operation can be shortened.

According to the invention of claim 5, stable gripping feeling can be obtained and slipping upon relative rotation can be suppressed. Also, superior appearance in design can be attained. Furthermore, by the stopper, unexpected relative rotation in the normal condition can be presented.

According to the invention of claim 6, releasing of user due to action of static electricity can be prevented.

According to the invention of claim 7, the needle member can certainly pierce the seal plate of the gas tank by relative rotation of the first and second cylindrical members.

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Claims

1. A high pressure gas jetting device comprising a first cylindrical member disposed a gas tank sealingly enclosing a high pressure gas, a second cylindrical member threadingly engaged with said first cylindrical member and capable of rotation relative with the former, and a needle form member provided within said second cylindrical member and moving in an axial direction by relative rotation of said first and second cylindrical members to pierce a sealing plate of said gas tank. 10 15
2. A high pressure gas jetting device as set forth in claim 1, wherein the high pressure gas within said gas tank is jetted from said tip end hole of said second cylindrical member through a through aperture formed in the axial direction of said needle form member. 20 25
3. A high pressure gas jetting device as set forth in claim 1 or 2, wherein said high pressure gas is non-inflammable gas of carbon dioxide, nitrogen, inert gas and the like. 30
4. A high pressure gas jetting device as set forth in any one of claims 1 to 3, wherein an angle of relative rotation of said first and second cylindrical members causes said needle form member piercing said sealing plate of said gas tank within 180°. 35 40
5. A high pressure gas jetting device as set forth in any one of claims 1 to 4, wherein at least one groove parallel to a rotation axis of relative rotation is formed on the outer surface of said first and second cylindrical members, and a stopper releasably engaging over both grooves in the condition where respective grooves are aligned and thus preventing relative rotation of both cylindrical members. 45 50
6. A high pressure gas jetting device as set forth in any one of claims 1 to 5, wherein antistatic process is provided for said first and second cylindrical members. 55
7. A high pressure gas jetting device as set forth in any one of claims 1 to 6, wherein said needle form member has a truncated cone shape at the tip end.

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FIG. 1 (a)

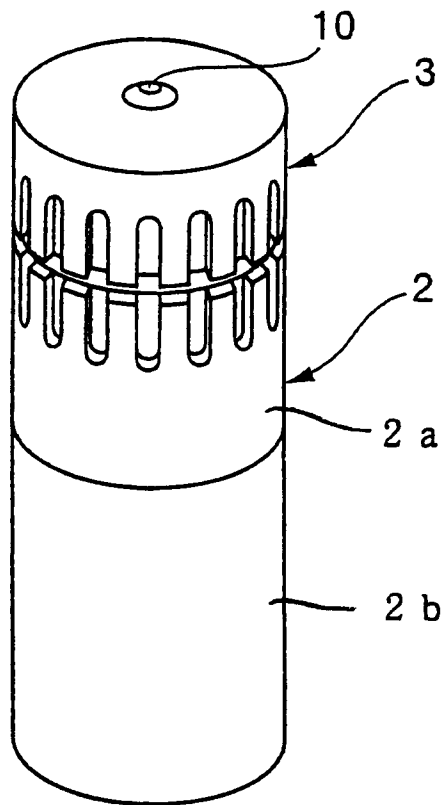


FIG. 1 (b)

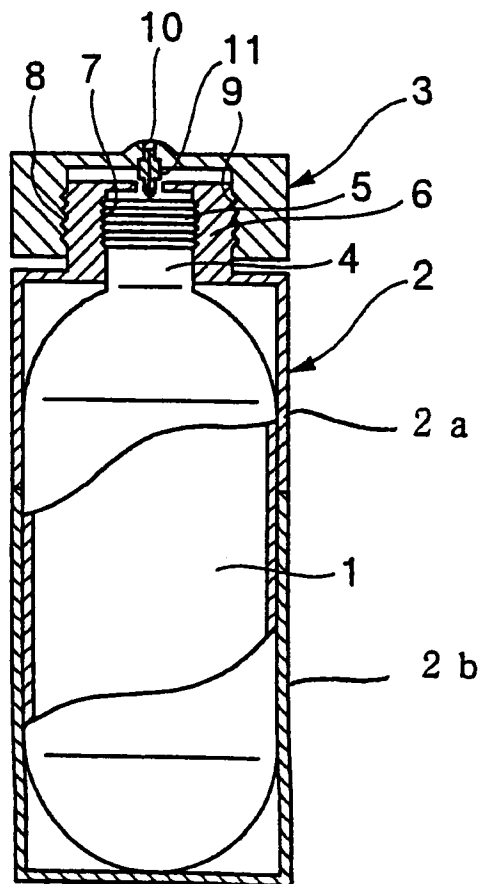


FIG. 2

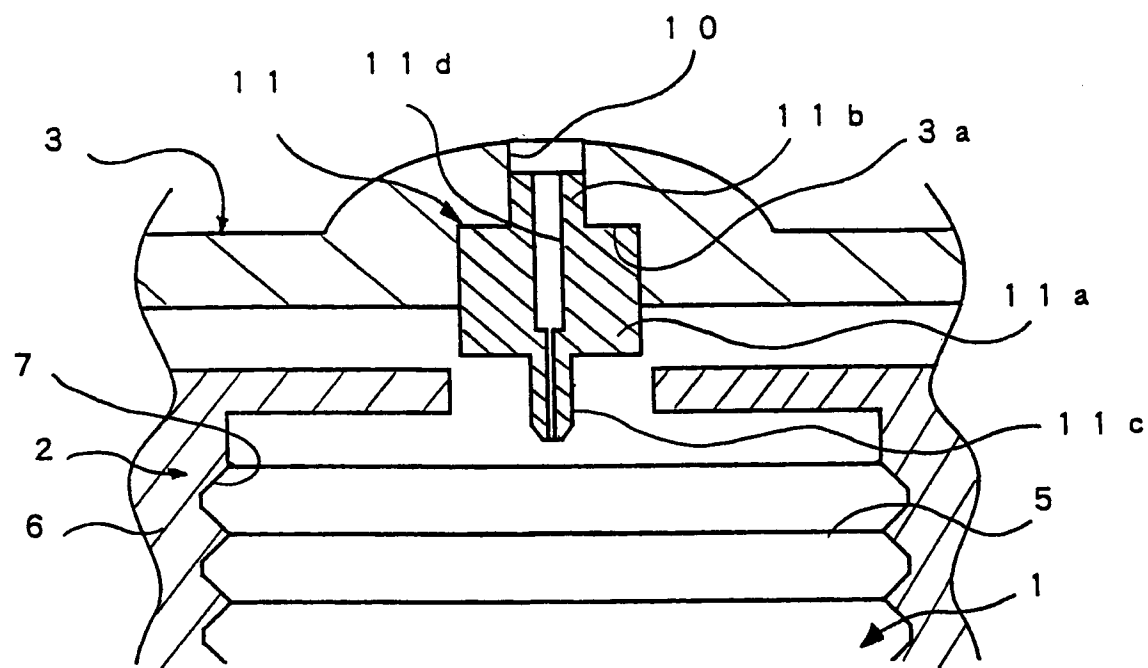


FIG. 3

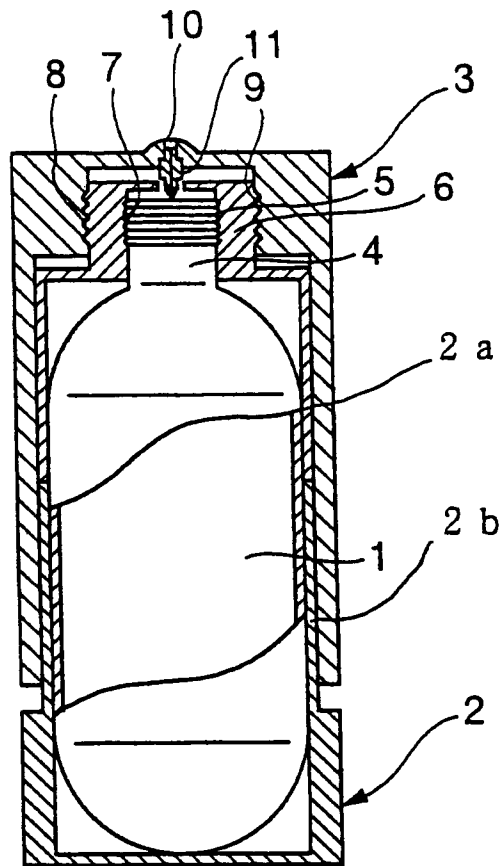
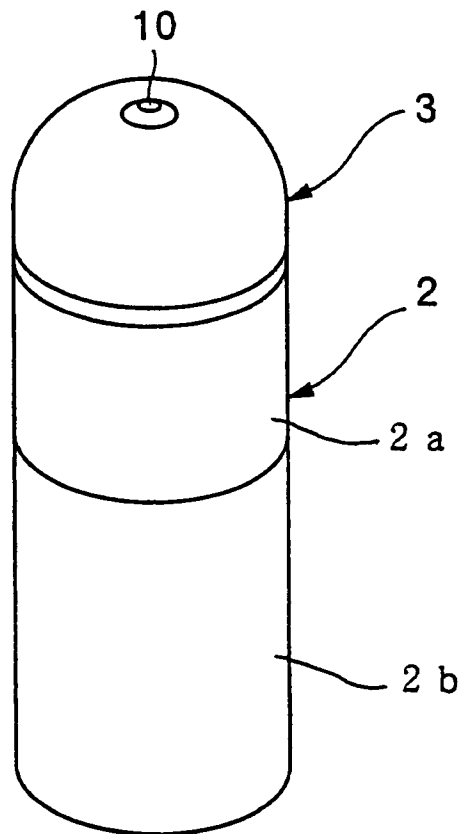


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP97/00003

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl ⁶ A62C13/74 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) Int. Cl ⁶ A62C13/62, A62C13/74 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926 - 1996 Kokai Jitsuyo Shinan Koho 1971 - 1996 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.
PA	JP, 8-252338, A (Nirai K.K.), October 1, 1996 (01. 10. 96), Page 2, right column, line 11 to page 4, left column, line 22; Fig. 1 (Family: none)	1 - 7
A	JP, 50-85198, A (Miyata Industry Co., Ltd.), July 9, 1975 (09. 07. 75), Page 1, left column, line 34; Fig. 2 (Family: none)	1 - 7
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "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 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search March 25, 1997 (25. 03. 97)		Date of mailing of the international search report April 8, 1997 (08. 04. 97)
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