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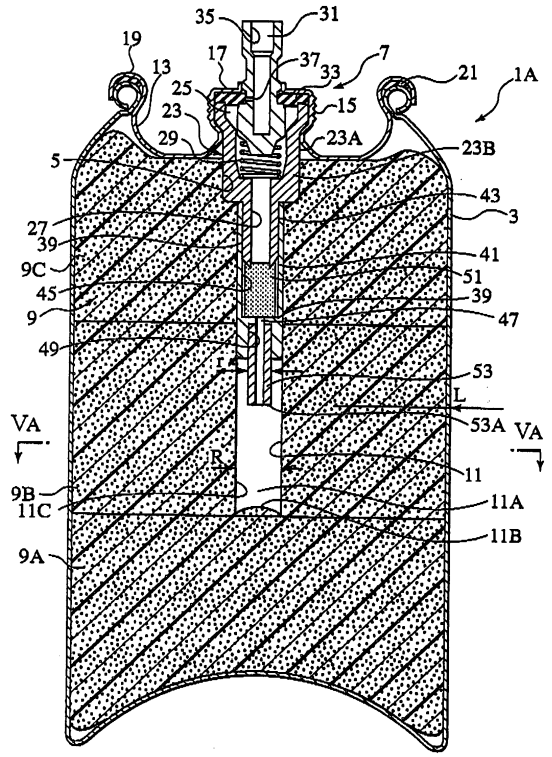
(54) GAS CYLINDER

(57) A gas container 1 is disclosed including a pressure-proof container 3, accommodating a foam body 9 sharing more than 80% of an inner capacity of the container 3, and a valve 7 provided on a top of the pressure-proof container 3 for ejecting liquefied gas from the pressure-proof container 3. The foam body 9 is internally formed with a continuous hole 11 in communication with the valve 7 and the continuous hole 11 internally has a tube 53. The tube 53 has a distal end 53A that is located at a position L nearly half a filled-up volume of the pressure-proof container 3, and the tube has a distal end 53A that is disposed in a space portion 11A formed inside the continuous hole 11 in a non-contact state.

FIG.1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a gas container including a pressure-proof container filled with liquefied gas.

BACKGROUND ART

[0002] In the related art, it has been a common practice for gas containers of this type to be designed for use in fixed orientations such as, for instance, an upstanding or lateral state.

[0003] One example of such gas containers of the related art includes one that accommodates therein an absorbent soaked with liquefied gas. With the gas container of such a structure, polyurethane foam (absorbent), foamed and resinified inside the container, is filled in the container up to a level in the close proximity to a shoulder portion of the container and a cap, having a valve support cylinder protruding from a bottom surface and fixedly attached, is fixed to the container by caulking while the valve support cylinder of the cap protrudes into a space formed between polyurethane foam and the cap (see first related art: Japanese Utility Model Application Publication No. 4-136397).

[0004] Further, a gas container of another type includes a gas torch liquefied container for supplying gas via a nozzle to a gas torch body. With such a gas container, the gas torch body incorporates therein a hollow float that is connected to the nozzle via a tube (see second related art: Japanese Patent Application Publication No. 4-321900).

DISCLOSURE OF THE INVENTION

[0005] However, with the gas container disclosed in the first related art described above, since the container is filled with polyurethane foam (absorbent), an issue arises in that under a circumstance where the gas container is used for long time in an upstanding state, liquefied gas is completely ejected with the resultant difficulty in spraying only evaporated gas. In addition, another issue arises in that there is a need for an ambitious equipment to fill the container with polyurethane foam (absorbent).

[0006] Further, with the gas container disclosed in the second related art described above, since a space is ensured for activating the Incorporated hollow float, it has been hard to form a container in a reduced size. In addition, another issue also has arisen with the occurrence in which when the remnant of liquefied gas becomes less in volume, the float does not adequately operate to cause liquefied gas to be ejected.

[0007] The present invention has been completed with a view to addressing the above issues and has an object to provide a gas container that can eject evaporated gas without causing ejection of liquefied gas even when used in any orientation and provide a gas container in which no clogging takes place.

[0008] To achieve the above objects, a gas container comprising a pressure-proof container, a foam body, accommodated in the pressure-proof container and absorbing liquid fuel, which is provided with a continuous hole defining a space for evaporating the liquid fuel, a tube provided with a bore extending from one end of the tube to the other end thereof for guiding the evaporated fuel, and a valve mounted on the pressure-proof container at an upper portion thereof and formed with a guide bore connected to the bore of the tube for guiding the evaporated fuel to an ejecting portion for ejection from the pressure-proof container, wherein the tube has a distal end protruding from the valve to a position that reaches a position substantially half a volume filled up in the pressure-proof container and the distal end of the tube is located at a position distanced from a bottom surface and an inner wall of the continuous hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 is a front cross-sectional view of a gas container of a first embodiment according to the present invention.

FIG. 2 is a partially enlarged cross-sectional view showing a valve, a connecting pipe and a tube shown in FIG. 1.

FIGS. 3A and 3B are cross-sectional views showing other embodiments of the valve, the connecting pipe and the tube for use in the gas container according to the present invention.

FIG. 4 is a front cross-sectional view of a gas container of a second embodiment according to the present invention.

FIG. 5A is a cross-sectional view of the gas container taken on line VA-VA shown in FIG. 1.

FIG. 5B is a cross-sectional view of the gas container taken on line VB-VB shown in FIG. 4.

BEST MODES FOR CARRYING OUT THE INVENTION

[0010] Now, various embodiments according to the present invention are described in detail with reference to the accompanying drawings.

First Embodiment

[0011] Referring to FIG. 1, a gas container 1A includes an aerosol pressure-proof container 3 such as, for instance, a cylindrically shaped pressure-proof container. The aerosol pressure-proof container 3 has an upper portion formed with a spout portion 5 that accommodates therein an ejection valve 7 for vaporizing liquefied gas, filled in the aerosol pressure-proof container 3, as evap-

orated gas for jetting. For liquefied gas, use is made of liquefied gas with a pressure higher than 0.2 MPa at normal temperatures. More particularly, liquefied gas may include liquefied petroleum gas containing major components such as propane and butane, dimethyl ether and propane gas or the like. However, gas available to be applied to the present invention is not limited to these gases.

[0012] A foam body 9 is accommodated inside the aerosol pressure-proof container 3 and soaked with liquefied gas at all times. The foam body 9 is divided into three parts and form elements 9A, 9B, 9C, formed in dimensions substantially equal to each other in structures from respective bottom walls, are stacked and received in the pressure-proof container 3. The form elements 9A, 9B, 9C share more than 90% space of an effective inner volume of the aerosol pressure-proof container 3. Further, the foam body 9 may generally include urethane foam or melamine foam. However, the foam body may be made of another material provided such material absorbs liquefied gas well.

[0013] As shown in FIG. 1, the form elements 9B, 9C have substantially axially center portions formed with a continuous hole 11 that vertically extends through the form elements 9B, 9C. In addition, the continuous hole 11 has an upper area held in communication with the spout portion 5 of the aerosol pressure-proof container 3.

[0014] As shown in FIG. 2, the valve 7 includes a mountain cup 13. The mountain cup 13 has an outer periphery folded to form a cylindrical axial portion 17, formed with a connecting screw portion 15, and a protrusion 19 concentric with the axial portion 17, with a gasket 21 being attached to a downwardly oriented ring-shaped recess of the protrusion 19. The axial portion 17 of the mountain cup 13 receives therein a mount tube 23. The mount tube 23 includes an upper main body 23A and a lower main body 23B integrally formed with the upper main body 23A on a lower end thereof so as to protrude from the mountain cup 13. The upper main body 23A internally has an open space 25, and the lower main body 23B is formed with a bore portion 27. In addition, the bore portion 27 and the open space 25 communicate each other.

[0015] The open space 25 of the upper main body 23A incorporates therein a stem 31 via a spring 29, and the upper main body 23A has an upper surface on which a gasket 33 is provided. The gasket 33 is fitted to a part of the stem 31. The stem 31 is formed with a vertically extending gas outlet port 35. The gas outlet port 35 is formed with an orifice 37.

[0016] The lower main body 23B has an upper portion whose outer periphery is formed with an external thread 39. A connecting pipe 41, extending in a vertical direction, has an upper portion whose inner periphery formed with an internal thread 43 in screw engagement with the external thread 39. The connecting pipe 39 has a sectional area, formed at a substantially central area in a vertical direction, which is formed with an insertion hole 45. The insertion hole 45 has a lower area formed with an aperture 47 in communication with the insertion hole 45. The connecting pipe 41 is formed with an insertion bore 49 with a diameter greater than that of the aperture 47 in communication with the aperture 47.

[0017] A filter 51 is inserted to the insertion hole 45 formed in the connecting pipe 41. The filter 51 is made of porous material with a function to remove foreign bodies. Moreover, a tube 53, having the substantially same diameter as that of the insertion bore 49 formed in the connecting pipe 41, is strongly fitted to the insertion bore 49. In addition, the insertion bore 49 and the tube 53 may be fixed to each other by means of screws.

[0018] As shown in FIG 1, the tube 53 has a length that is set so as to allow a distal end portion (lower end portion) 53A of the tube 53 in the continuous hole 11 to reach a position L at which liquefied gas is filled by an amount equivalent to a half volume of the pressure-proof container 3. In addition, the length of the tube 53 is set not to reach an open space portion 11A formed in the continuous hole 11. In other words, the length of the tube 53 is set such that the distal end 53A is located at a position spaced from the lowermost portion 11B and an inner wall 11C of the continuous hole 11.

[0019] In addition, as shown in FIG. 2, the tube 53 has a bore 53B with a diameter substantially equal to a diameter of the aperture 47 and the bore 53B communicates with the aperture 47. Moreover, the tube 53 has an outer diameter r that is approximately 1/2 of an inner diameter R of the continuous hole 11.

[0020] As set forth above, liquefied gas is charged to the aerosol pressure-proof container 3 to the position L equivalent to a substantially half volume of a full charge volume thereof and soaked to the foam body 9. As the stem 31 is depressed downward from one status, shown in FIG. 2 in left half area thereof, to another status, shown in FIG. 2 in right half area thereof, against a biasing force of the spring 29, the gasket 33 is pressed downward and dislocated from the stem 31, causing the orifice 37 to be brought into communication with the open space portion 25.

[0021] As a result, liquefied gas is evaporated in the open space portion 11A formed in the continuous hole 11. Evaporated gas flows from the distal end portion (lower end portion) 53A and passes through the bore 53B and the aperture 47 into the bore portion 27, the open space portion 25 and the orifice 37, from which evaporated gas is ejected to the outside via the gas outlet port 35.

[0022] The distal end 53A of the tube 53 is set to be aligned with the position L that is substantially half of a fully charged level of the aerosol pressure-proof container 3 to enable evaporated gas, generated from liquefied gas soaked into the foam body 9, to pass through the open space 11A formed in the continuous hole 11 to eject only evaporated gas from the distal end 53A of the tube 53. In addition, even if the aerosol pressure-proof container 3 is used under an inverted state or under a laydown state, that is, even if operated under any orienta-

tion, evaporated gas, generated from liquefied gas, is caused to surely pass through the open space 11A formed in the continuous hole 11 to enable only evaporated gas to be ejected from the distal end 53A of the tube 53. That is, no liquefied gas ejects from the gas outlet port 35 as experienced in the related art and only evaporated gas can be ejected.

[0023] Further, since the bore portion 27 of the valve 7 and the bore 53B of the tube 53 are connected to each other by means of the connecting pipe 41 located inside the filter 51, impurities such as dusts or the like can be removed, thereby preventing clogging of an area through which evaporated gas is guided.

[0024] Since the tube 53 is formed to have the outer diameter r that is nearly half of the inner diameter R of the continuous hole 11, liquefied gas surely passes through the open space 11A formed in the continuous hole 11 to allow only evaporated gas to eject from the distal end 53A of the tube 53.

[0025] Since the foam body 9 is divided into a plurality of, for instance, form units 9A, 9B, 9C, the form body 9 can be easily inserted to the aerosol pressure-proof container 3 in a simple fashion.

Second Embodiment

[0026] While the first embodiment has been shown with reference to a case where the foam body 9 comprises the form units 9A, 9B, 9C, the number of foam units is not particularly limited to three. In general, the greater the number of form units, the larger will be the amount of liquefied gas to be contained. But, it becomes hard to insert respective foam units into the aerosol pressure-proof container 3 and allow centers of the respective foam units to be aligned with respect to each other for inserting the tube into a given position.

[0027] In the following second embodiment, description is made of a gas container 1B that can be available to insert more number of foam units into the aerosol pressure-proof container 3 while having the advantages of the first embodiment mentioned above. Also, the component parts bearing the same reference numerals as those of FIGS. 3A to 5 refer to the same component parts that have been described above with reference to the first embodiment and, hence, redundant description of the same is herein omitted.

[0028] FIGS. 3A and 3B show valves 70A, 70B for use in a pressure-proof container 30 (see FIGS. 5A and 5B) incorporating, for instance, more than four foam bodies 90 (90A, 90B, 90C, 90D) (see FIG. 5) described below. Also, in FIGS. 3A (3B), an area on a left side of a central axis indicates a status with no ejection of gas and right side area indicates another status in which gas is ejected.

[0029] With the present embodiment, in line with an increase in the number of foam bodies, a length of a tube 530A (530B), formed with a through-bore 560A for guiding evaporated gas to the stem 31, is longer than that of the tube 53 of the first embodiment. Further, with a valve 70B of a modified form shown in FIG. 3B. a tube 530B has a distal end to which an adapter 540 is mounted. The adapter 540 is internally formed with a through-bore 542 with substantially the same diameter as that of a through-bore 560B for guiding gas. When mounting the adapter 540 onto the tube 530B, the through-bores 560B and 542 have centers aligned with each other in position. Furthermore, the adapter 540 has an insertion end face chamfered to be easily inserted to a continuous hole 110 formed in absorbents 90B, 90C, 90D. Also, even under a situation where no adapter 540 is used, the distal end 531 of the tube 530A may be chamfered.

[0030] As shown in Fig. 4, further, like the first embodiment, even with the present embodiment, the tube 530B (530A) has a length determined such that an adapter distal end 541 of the tube 530B (or a distal end 531 of the tube 530A) reaches a position L2, prevailing when liquefied gas is charged to the pressure-proof container 30, which corresponds to a volume equivalent to a half the volume of the pressure-proof container 30. In addition, the length of the tube 530B (530.A) is set not to reach an open space 110A formed in the continuous tube 41. In other words, the length of the tube 530B (530A) is set to assume a position distanced from the lowermost portion 110B of the continuous hole 110 and an inner wall 110C of the continuous hole 110.

[0031] FIGS. 5A and 5B are cross-sectional views showing the absorbent 9 to be used in the first embodiment and the absorbent 90 for use in the second embodiment for comparison. As will be understood from FIGS. 4A and 4B, the absorbent 90 has a diameter R10 that is set to be smaller than a diameter R1 of the absorbent 9. Moreover, the absorbent 90 has an inner diameter R20 that is set to be larger than an inner diameter R2 of the absorbent 9. That is, the relational expressions are satisfied as $R1 > P10$ and $R2 < R20$.

[0032] Upon forming the absorbent 90 to satisfy the above relational expressions, work can be done to easily insert the absorbent 90 to the pressure-proof container 30 and even in a case where use is made of the tube 530A (530B) longer than that of the related art shown in FIGS. 3A and 3B, the tube 530A (530B) can easily penetrate through the continuous hole 110. As set forth above, further, in a case where the adapter 540 is provided, the continuous hole 110 of the absorbent 90 can be further easily inserted.

[0033] In addition, even the present embodiment has the same advantageous effects as those of the first embodiment except for matters set forth above.

[0034] Moreover, the present invention is not limited to the embodiments of the present invention and can be implemented in other modes by making suitable alterations. Accordingly, by appropriately altering a length of the tube, more than five absorbents (form elements) may be employed.

INDUSTRIAL APPLICABILITY

[0035] As will be understood from the various embodiments set forth above, the distal end of the tube is set to reach the position equivalent to the volume nearly half the volume filled up to a capacity of the pressure-proof container to allow evaporated gas, resulting from liquefied gas soaked through the form elements at all times, to pass through the open space formed in the continuous hole such that only evaporated gas can inject from the distal end of the tube. Even under a circumstance where the pressure-proof container takes an inverted state or is caused to lay down, that is, even when the pressure-proof container is manipulated in any orientation, evaporated gas resulting from liquefied gas can reliably pass through the open space formed in the continuous hole upon which only evaporated gas can be ejected from the distal end of the tube. That is, only evaporated gas can be ejected without causing liquefied gas to eject from the outlet port as experienced in the related art.

[0036] Further, since the connecting pipe having an inside incorporating the filter is coupled between the valve and the tube, an action of the filter allows impurities such as dusts to be removed thereby avoiding the occurrence of clogging at all times.

[0037] Furthermore, since the outer diameter of the tube is formed in a dimension to be nearly half of the inner diameter of the continuous hole, liquefied gas is ensured to pass through the open space formed in the continuous hole at all times to enable only evaporated gas to be injected from the distal end of the tube.

[0038] Moreover, since the foam body is divided into a plurality of foam elements, the foam body can be filled into the pressure-proof container in an easy and simple fashion.

[0039] In addition, providing the chamfered adapter to the distal end of the tube enables the valve to be more easily mounted to the valve.

Claims

1. A gas container comprising:

a pressure-proof container;
a foam body, accommodated in the pressure-proof container and absorbing liquid fuel, which is provided with a continuous hole defining a space for evaporating the liquid fuel;
a tube formed with a bore extending from one end of the tube to the other end thereof for guiding the evaporated fuel; and
a valve mounted on the pressure-proof container at an upper portion thereof and formed with a guide bore connected to the bore of the tube for guiding the evaporated fuel to an ejecting portion for ejection from the pressure-proof container;

wherein the tube has a distal end protruding from the valve to a position that reaches a position substantially half a volume filled up in the pressure-proof container and the distal end of the tube is located at a position distanced from a bottom surface and an inner wall of the continuous hole.

2. The gas container according to claim 1, wherein:

the foam body accommodated in the pressure-proof container has a capacity corresponding to at least 80% of a capacity of the pressure-proof container.

3. The gas container according to claim 1, wherein:

the guide bore of the valve and the bore of the tube are connected to each other via a connecting pipe internally equipped with a filter.

4. The gas container according to claim 1, wherein:

the tube has an outer diameter nearly half of an inner diameter of the continuous hole.

5. The gas container according to claim 1, wherein:

the foam body comprises at least two foam elements with the same diameter.

6. The gas container according to claim 1, wherein:

the tube has a chamfered distal end.

7. The gas container according to claim 1, wherein:

the tube has a distal end provided with an adapter, having a through-bore in communication with the bore of the tube, which covers a part of a distal end area of the tube.

8. The gas container according to claim 7, wherein:

the adapter has a chamfered distal end.

FIG.1

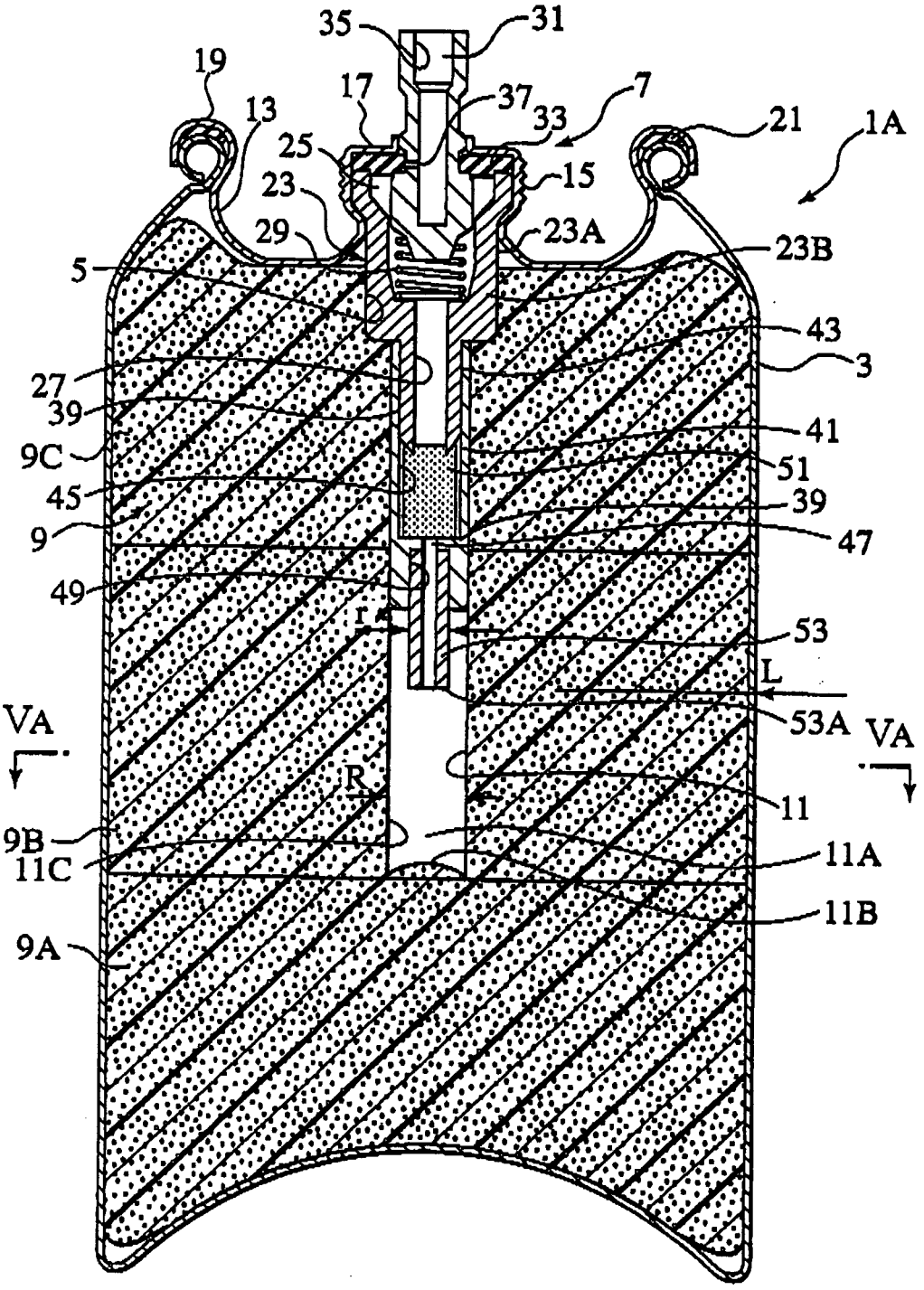
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FIG.2

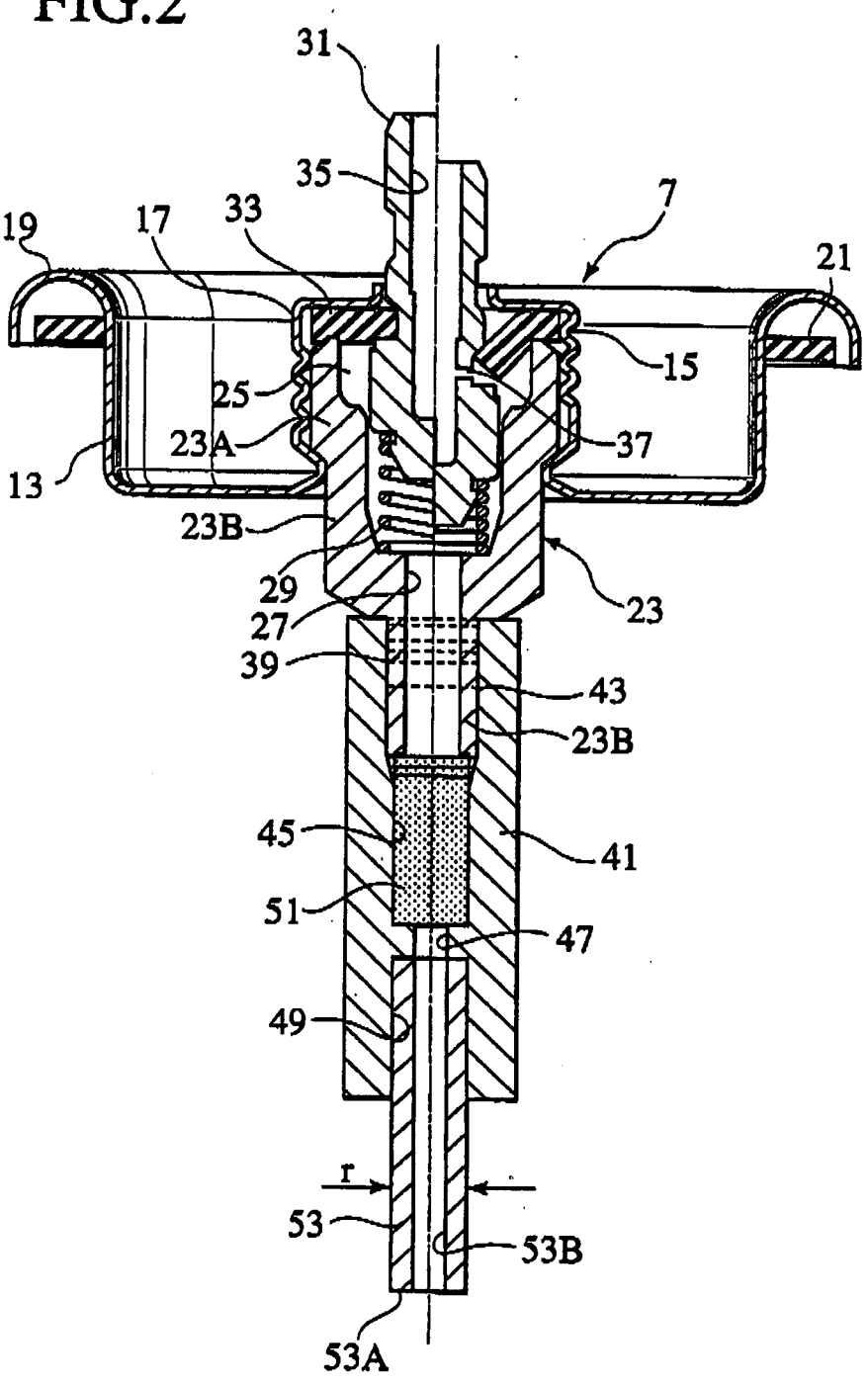
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FIG.3A

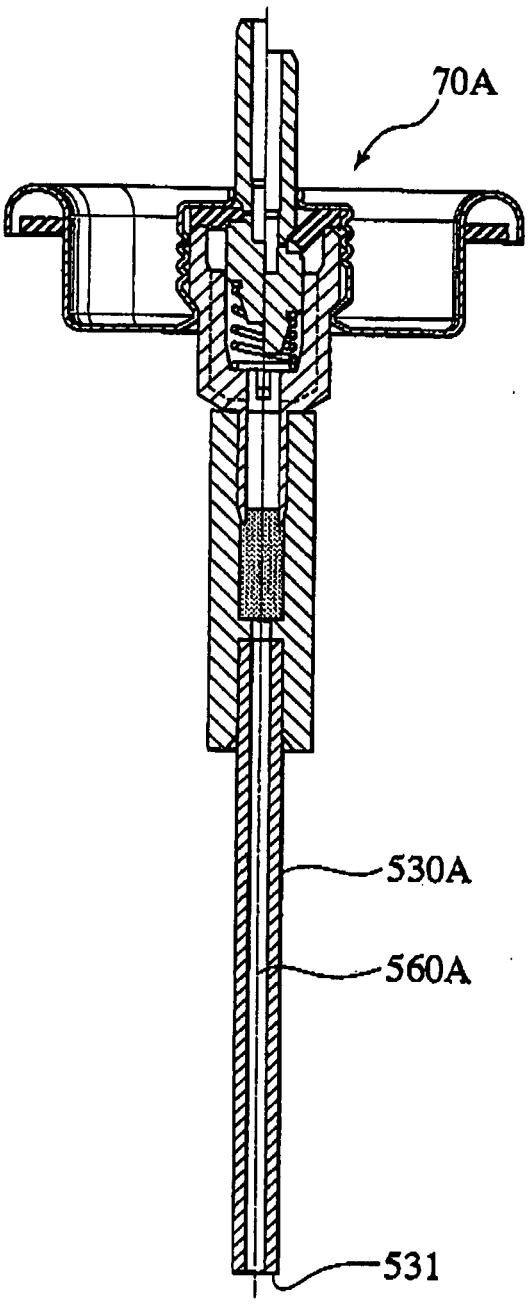


FIG.3B

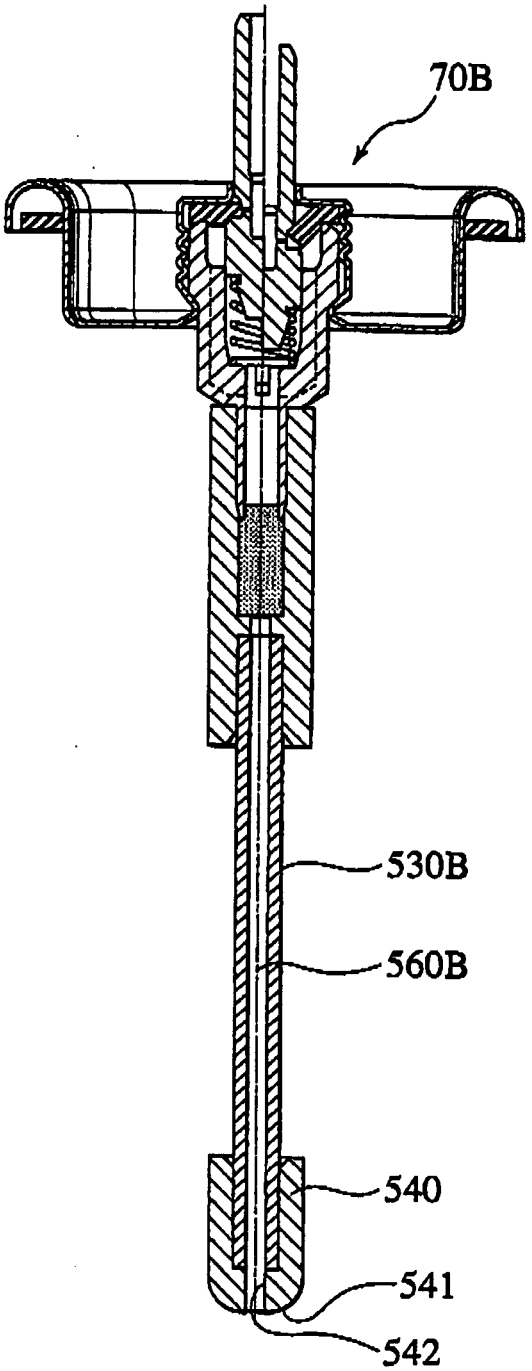
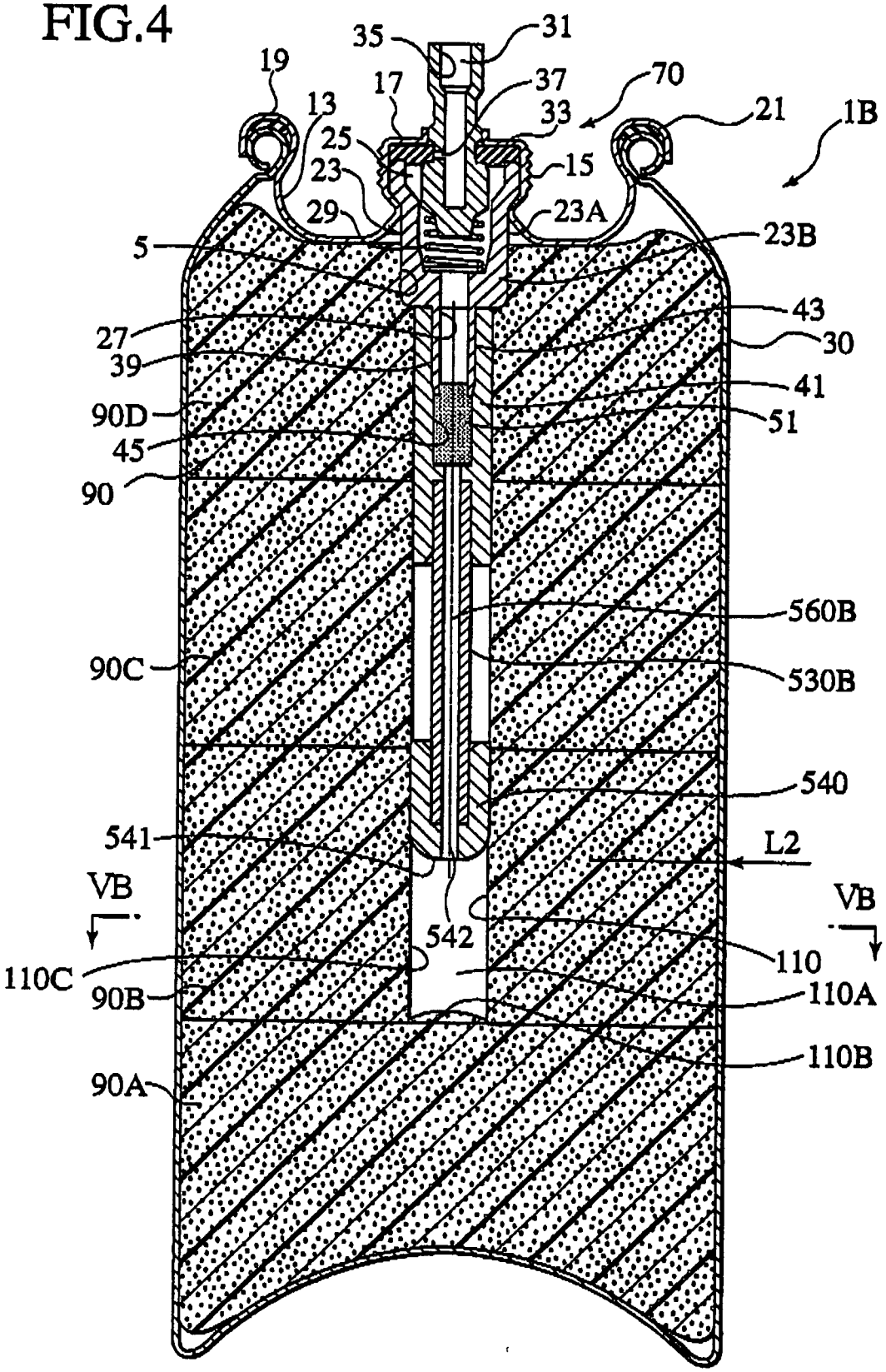


FIG.4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110B
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FIG.5A

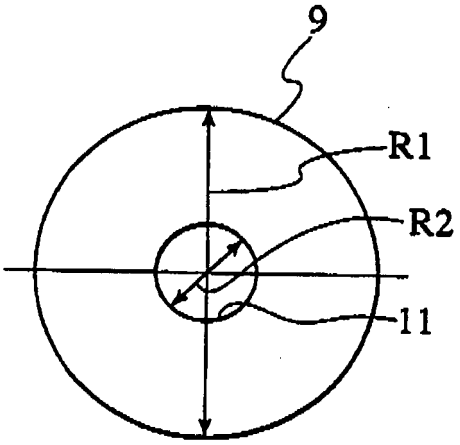
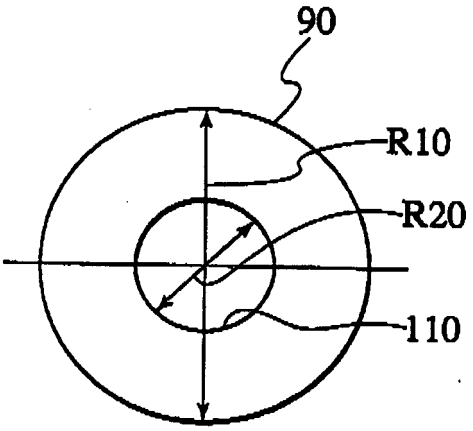


FIG.5B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/007203

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F17C11/00, 7/04

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[7] F17C1/00-13/12

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

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2004
Kokai Jitsuyo Shinan Koho	1971-2004	Jitsuyo Shinan Toroku Koho	1996-2004

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.
X	JP 62-2097 A (APPLICATION DES GAZ), 08 January, 1987 (08.01.87),	1-4,6
Y	Page 1, lower left column, lines 6 to 18; page 3, lower right column, lines 2 to 13; page 5, upper left column, line 16 to page 6, upper right column, line 7; Fig. 1 & EP 202172 A1 & FR 2580376 A1 & FR 2590651 A2 & US 4729494 A	5,7,8
Y	US 2002/0084277 A1 (Patrick L. MULLENS), 04 July, 2002 (04.07.02), Par. Nos. [0119] to [0126]; Fig. 3 & EP 1356229 A1 & WO 02/053967 A1	5

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

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
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"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 05 July, 2004 (05.07.04)	Date of mailing of the international search report 20 July, 2004 (20.07.04)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/007203

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 439980 B1 (APPLICATION DES GAZ), 15 September, 1993 (15.09.93), Column 13, line 54 to column 15, line 44; Fig. 1 & DE 69003376 T2 & FR 2657677 A1	7,8
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 123629/1985(Laid-open No. 32300/1987) (Prince Industrial Development Co., Ltd.), 26 February, 1987 (26.02.87), Page 3, line 13 to page 4, line 18; Fig. 1 (Family: none)	1,2,4,6

Form PCT/ISA/210 (continuation of second sheet) (January 2004)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4136397 U **[0003]**
- JP 4321900 A **[0004]**