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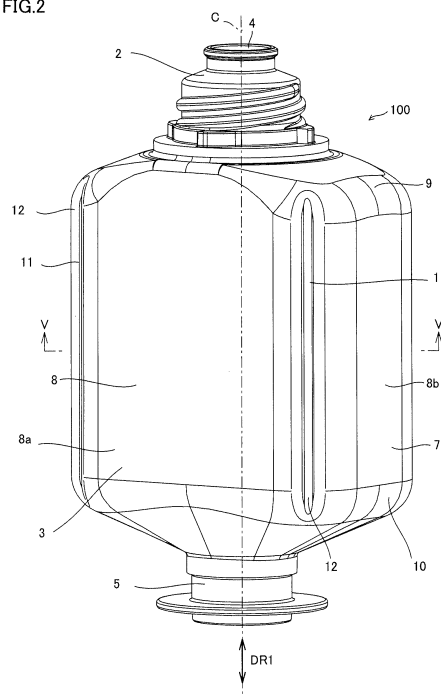
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(54) **CONTAINER**

(57) A container includes a film portion (4) at one end thereof. The container includes a liquid outlet port at the other end on an opposite side of the one end. A liquid is discharged through the liquid outlet port. The container further includes a box-shaped portion (3). A direction in which a straight line passing through each of a center position of the film portion (4) and a center position of the liquid drug outlet port extends is defined as a first direction (DR1). The box-shaped portion (3) has a cross section that is orthogonal to the first direction (DR1) and formed in an approximately rectangular shape. In at least one of corner portions (11) of the approximately rectangular shape, the box-shaped portion (3) is provided with a groove (12) extending in parallel to the first direction (DR1).

FIG.2



Description

TECHNICAL FIELD

5 [0001] The present invention relates to a container.

BACKGROUND ART

10 [0002] In medical institutions such as a hospital, a dry drug contained in a drug container such as a vial is dissolved in distilled water, a physiological saline solution, a dextrose solution, or other solutions to prepare a pharmaceutical drug in a liquid state, which is used for drip injection and the like.

[0003] In order to allow an easy and simple preparation of such a pharmaceutical drug in a liquid state, there is a proposed medical container configured such that a drug container containing a dry drug is coupled in series to an infusion solution container containing a solution so as to allow communication between the inside spaces of these two containers during use (for example, see WO2013/175970 (PTL 1)).

CITATION LIST

PATENT LITERATURE

20 [0004] PTL 1: WO2013/175970

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005] When an infusion solution container is deformed in a twisted manner during discharge of a liquid inside the infusion solution container, the liquid may remain inside the infusion solution container. Furthermore, deformation of the infusion solution container by expansion and the like may occur also during sterilization.

30 [0006] An object of the present invention is to provide a container for which the amount of its deformation can be limited.

SOLUTION TO PROBLEM

35 [0007] A container of the present invention includes a film portion at one end thereof. The film portion is provided with a hole. The container includes a liquid outlet port at the other end on an opposite side of the one end, a liquid being discharged through the liquid outlet port. The container further includes a box-shaped portion. A direction in which a straight line passing through each of a center position of the film portion and a center position of the liquid outlet port extends is defined as a first direction. The box-shaped portion has a cross section that is orthogonal to the first direction and formed in an approximately rectangular shape. A groove extending in parallel to the first direction is provided in at least one of corner portions of the approximately rectangular shape of the box-shaped portion.

40 [0008] According to the above-described container, the rigidity of the container is enhanced by the groove formed in at least one of the corner portions of the approximately rectangular shape. Thus, the amount of deformation of the container can be limited when a liquid is discharged.

[0009] In the above-described container, the box-shaped portion has a ridge portion in at least one of the corner portions of the approximately rectangular shape. The ridge portion extends in parallel to the first direction and protrudes toward an inside of the box-shaped portion. Since the ridge portion further enhances the rigidity of the container, the amount of deformation of the container can be limited.

45 [0010] In the above-described container, the box-shaped portion has a wall surface portion extending in the first direction. The groove extends over both ends of the wall surface portion in the first direction. By the groove extending in a wide range, the rigidity of the container is further enhanced, so that the amount of deformation can be limited.

50 [0011] In the above-described container, the groove is formed in each of the corner portions of the approximately rectangular shape. As the number of grooves increases, the rigidity of the container is further enhanced, so that the amount of deformation of the container can be limited.

55 [0012] In the above-described container, the box-shaped portion has a wall thickness less than a depth of the groove. Even in the case of a container having a thin wall, the rigidity of the container is enhanced by the groove, so that the amount of deformation of the container can be limited.

ADVANTAGEOUS EFFECTS OF INVENTION

[0013] According to the present invention, a container for which the amount of its deformation can be limited can be implemented.

BRIEF DESCRIPTION OF DRAWINGS

[0014]

Fig. 1 is a perspective view showing the schematic configuration of a medical container.

Fig. 2 is a diagram showing the schematic configuration of an infusion solution container as seen in a side view.

Fig. 3 is a perspective view of the infusion solution container as seen from above.

Fig. 4 is a perspective view of the infusion solution container as seen from below.

Fig. 5 is a cross-sectional view of the infusion solution container taken along a line V-V shown in Fig. 2.

Fig. 6 is an enlarged view of an area in the vicinity of a corner portion shown in Fig. 5.

Fig. 7 is a cross-sectional view of the infusion solution container taken along a line VII-VII shown in Fig. 3.

Fig. 8 is a cross-sectional view of the medical container before a drug container and the infusion solution container are in communication with each other.

Fig. 9 is a cross-sectional view of the medical container taken along a line IX-IX shown in Fig. 1.

DESCRIPTION OF EMBODIMENTS

[0015] In the following, embodiments of the present invention will be described with reference to the accompanying drawings. In the accompanying drawings, the same or corresponding components are designated by the same reference characters, and the description thereof will not be repeated.

[0016] First, the following is an explanation about a medical container 1 including an infusion solution container 100 to which the concept of the present invention is applicable.

[0017] Fig. 1 is a perspective view showing the schematic configuration of a medical container 1. Medical container 1 includes a coupling member 300 and an infusion solution container 100. Coupling member 300 is attached to infusion solution container 100. Coupling member 300 couples a drug container 500 containing a dry drug to infusion solution container 100. Coupling member 300 is coupled to the upper portion of infusion solution container 100. In this case, the direction indicated by a double-headed arrow in Fig. 1 is defined as an up-down direction. In the up-down direction, the direction at which coupling member 300 is located with respect to infusion solution container 100 is defined as an upward direction while the direction opposite to the upward direction is defined as a downward direction. Infusion solution container 100 contains a solution. As a solution, distilled water, a physiological saline solution, a glucose solution, and the like are generally used, but the solution is not limited thereto. Infusion solution container 100 has a lower portion provided with a liquid drug outlet portion 5, and a cover member 200 is attached therebelow.

[0018] Infusion solution container 100 is generally formed using a pressure-deformable bottle made of a relatively soft synthetic resin such as polyethylene, polypropylene and polyester.

[0019] Fig. 2 is a diagram showing the schematic configuration of infusion solution container 100 as seen in a side view. Fig. 3 is a perspective view of infusion solution container 100 as seen from above. Fig. 4 is a perspective view of infusion solution container 100 as seen from below. Infusion solution container 100 includes an attachment portion 2 configured to attach coupling member 300, a box-shaped portion 3 having an approximately rectangular box shape, and liquid drug outlet portion 5. Infusion solution container 100 has one end provided with attachment portion 2. This one end corresponds to an upper end. Attachment portion 2 protrudes from box-shaped portion 3 and has a thread formed thereon. Coupling member 300 for coupling drug container 500 is screwed in the thread. Attachment portion 2 has an upper surface including a film portion 4. Infusion solution container 100 includes liquid drug outlet portion 5 at the other end on the opposite side of its one end. The other end on the opposite side of one end corresponds to a lower end. Liquid drug outlet portion 5 is provided with a liquid drug outlet port 6 through which a liquid drug as a medical drug in a liquid state obtained by dissolving a dry drug in a solution is discharged. Liquid drug outlet port 6 forms a liquid outlet port through which a liquid is discharged from infusion solution container 100.

[0020] In a view seen in the up-down direction, film portion 4 has a circular shape. In a view seen in the up-down direction, liquid drug outlet port 6 has a circular shape. The straight line passing through the center of circular-shaped film portion 4 and the center of circular-shaped liquid drug outlet port 6 is shown by an alternate long and short dash line in Fig. 2 and defined as a center line C. The direction in which center line C extends is shown by the double-headed arrow in Fig. 2 and defined as a first direction DR1. Box-shaped portion 3 has a barrel portion 7, a first shoulder portion 9, and a second shoulder portion 10. Fig. 5 is a cross-sectional view of the infusion solution container taken along a line V-V shown in Fig. 2. The cross section of barrel portion 7 that is orthogonal to first direction DR1 has an approximately

rectangular shape as shown in Fig. 5. The figure shows "a" representing the length of a short side of the approximately rectangular shape and "b" representing the length of a long side of the approximately rectangular shape. First shoulder portion 9 extends from barrel portion 7 to attachment portion 2. First shoulder portion 9 is formed as a region in which the approximately rectangular cross section of box-shaped portion 3 that is orthogonal to first direction DR1 is reduced toward the upper portion of box-shaped portion 3. Second shoulder portion 10 extends from barrel portion 7 to liquid drug outlet portion 5. Second shoulder portion 10 is formed as a region in which the approximately rectangular cross section of box-shaped portion 3 that is orthogonal to first direction DR1 is reduced toward the lower portion of box-shaped portion 3.

[0021] Barrel portion 7 has a wall surface portion 8. Wall surface portion 8 extends in first direction DR1. Wall surface portion 8 is formed of a pair of first wall surface portions 8a and a pair of second wall surface portions 8b. The cross section of barrel portion 7 that is orthogonal to first direction DR1 has the approximately rectangular shape as shown in Fig. 5. First wall surface portions 8a each are a wall surface forming the long side of the approximately rectangular cross section of barrel portion 7 that is orthogonal to first direction DR1. First wall surface portions 8a are symmetric to each other with respect to center line C in Fig. 2 as a symmetry axis. Second wall surface portions 8b each are a wall surface forming the short side of the approximately rectangular cross section of barrel portion 7 that is orthogonal to first direction DR1. Second wall surface portions 8b are symmetric to each other with respect to center line C in Fig. 2 as a symmetry axis.

[0022] Barrel portion 7 has a corner portion 11. As shown in Fig. 5, corner portion 11 corresponds to each of four corners of the approximately rectangular-shaped cross section of barrel portion 7 that is orthogonal to first direction DR1. Each corner portion 11 couples first wall surface portion 8a and second wall surface portion 8b. Corner portion 11 is recessed toward the inside of infusion solution container 100. Corner portion 11 is curved toward the center line. Corner portion 11 is curved toward the inside of infusion solution container 100. Wall surface portion 8 is curved toward the outside of infusion solution container 100. Corner portion 11 is recessed toward the inside of infusion solution container 100, thereby forming a groove 12. Groove 12 extends in first direction DR1 as shown in Fig. 2. Groove 12 extends from the end portion coupling barrel portion 7 and first shoulder portion 9 to the end portion coupling barrel portion 7 and second shoulder portion 10. Groove 12 may be formed also in wall surface portion 8.

[0023] Fig. 6 is an enlarged view of an area in the vicinity of corner portion 11 shown in Fig. 5. Corner portion 11 has a thickness defined as a wall thickness t . The dashed line in Fig. 6 is a line connecting the end portion of corner portion 11 that leads to first wall surface portion 8a and the end portion of corner portion 11 that leads to second wall surface portion 8b. The distance from the dashed line to the deepest portion of corner portion 11 is defined as a groove depth d . Groove depth d is defined to extend along a line orthogonal to the dashed line. The dimensions of infusion solution container 100 are set such that the relation between wall thickness t and groove depth d is established as $t < d$. The dimensions of infusion solution container 100 are set such that the wall thickness of box-shaped portion 3 is less than groove depth d .

[0024] Fig. 7 is a cross-sectional view of infusion solution container 100 taken along a line VII-VII shown in Fig. 3. The cross section of infusion solution container 100 in Fig. 7 extends through center line C. Box-shaped portion 3 has a ridge portion 13 in corner portion 11 of its approximately rectangular shape. Ridge portion 13 extends in parallel to first direction DR1 and protrudes toward the inside of box-shaped portion 3. As shown in Fig. 5, corner portion 11 is recessed toward the inside of infusion solution container 100, thereby forming ridge portion 13. Ridge portion 13 may also be formed in portions other than corner portion 11.

[0025] Film portion 4 is provided with a communication hole 14 through which drug container 500 and infusion solution container 100 are in communication with each other in the state where drug container 500 and infusion solution container 100 are coupled through coupling member 300. Fig. 8 is a cross-sectional view of medical container 1 before drug container 500 and infusion solution container 100 are in communication with each other. Also, Fig. 8 shows the same cross section as that of medical container 1 shown in Fig. 9 (described later) in the state before communication hole 14 is formed in film portion 4. Fig. 8 shows the state where drug container 500 is fixed to coupling member 300. In the state in Fig. 8, no communication hole 14 is formed in film portion 4.

[0026] Fig. 9 is a cross-sectional view of the medical container taken along a line IX-IX shown in Fig. 1. Fig. 9 is a cross-sectional view after communication between drug container 500 and infusion solution container 100 is established. Drug container 500 is pushed into infusion solution container 100 through coupling member 300, to thereby cause a first puncture needle 356b to penetrate through film portion 4, so that communication hole 14 allowing communication between drug container 500 and infusion solution container 100 is formed in infusion solution container 100. This allows communication between the internal space of drug container 500 and the internal space of infusion solution container 100. The dry drug contained in drug container 500 is mixed with the solution contained in infusion solution container 100 to obtain a mixture, which is then discharged through liquid drug outlet port 6 as the liquid drug.

[0027] The following is a summarized explanation about the configuration and the functions and effects of medical container 1 and infusion solution container 100 used in medical container 1 in an embodiment. The configuration in the embodiment will be designated by reference characters, which are however given merely by way of example.

[0028] Medical container 1 in the present embodiment includes infusion solution container 100 and coupling member

300 as shown in Fig. 1. Infusion solution container 100 has the upper end provided with film portion 4. Infusion solution container 100 has the lower end provided with liquid drug outlet port 6. Infusion solution container 100 further includes box-shaped portion 3. The direction in which the straight line passing through each of the center of film portion 4 and the center of liquid drug outlet port 6 extends is defined as first direction DR1. Box-shaped portion 3 has the cross section that is orthogonal to first direction DR1 and formed in an approximately rectangular shape. In corner portion 11 of the approximately rectangular cross section, box-shaped portion 3 is provided with groove 12 that extends in parallel to first direction DR1. Thereby, the rigidity of infusion solution container 100 is enhanced. Accordingly, the amount of deformation of infusion solution container 100 can be limited when the liquid is discharged. Thereby, the liquid is less likely to remain inside infusion solution container 100, so that the last drop of the liquid contained in infusion solution container 100 can be used, thereby leading to excellent economic efficiency. Furthermore, the rigidity of infusion solution container 100 is enhanced. Accordingly, when infusion solution container 100 is subjected to a sterilization treatment at a high temperature with high-pressure steam, deformation of infusion solution container 100 by thermal stress can be suppressed.

[0029] As shown in Fig. 7, box-shaped portion 3 has ridge portion 13 in corner portion 11 of its approximately rectangular cross section that is orthogonal to first direction DR1. Ridge portion 13 extends in parallel to first direction DR1 and protrudes toward the inside of box-shaped portion 3. Ridge portion 13 enhances the rigidity of infusion solution container 100, so that the amount of deformation of infusion solution container 100 can be limited.

[0030] As shown in Fig. 2, box-shaped portion 3 has wall surface portion 8 extending in first direction DR1. Wall surface portion 8 is formed of the pair of first wall surface portions 8a and the pair of second wall surface portions 8b. Groove 12 extends between both ends of wall surface portion 8 in the first direction. By groove 12 extending in a wide range, the rigidity of the infusion solution container is further enhanced, so that the amount of its deformation can be limited.

[0031] Groove 12 is formed in all of corner portions 11 of the approximately rectangular shape. As the number of grooves 12 increases, the rigidity of infusion solution container 100 is further enhanced, so that the amount of deformation of the infusion solution container can be limited.

[0032] As shown in Fig. 6, wall thickness t of corner portion 11 is less than groove depth d . Even in the case of infusion solution container 100 having a thin wall, the rigidity of infusion solution container 100 is enhanced by groove 12, so that the amount of deformation of infusion solution container 100 can be limited.

[0033] Infusion solution container 100 in the present embodiment is used in medical container 1 as shown in Fig. 1. Medical container 1 includes infusion solution container 100 and coupling member 300. Infusion solution container 100 has the upper end provided with film portion 4. Infusion solution container 100 has the lower end provided with liquid drug outlet port 6. Infusion solution container 100 further includes box-shaped portion 3. The direction in which the straight line passing through each of the center of film portion 4 and the center of liquid drug outlet port 6 extends is defined as first direction DR1. Box-shaped portion 3 has the cross section that is orthogonal to first direction DR1 and formed in the approximately rectangular shape. In corner portion 11 of the approximately rectangular cross section of box-shaped portion 3, groove 12 is provided to extend in parallel to first direction DR1. Thereby, the rigidity of infusion solution container 100 is enhanced. Accordingly, the amount of deformation of infusion solution container 100 can be limited when the liquid is discharged.

[0034] As a modification, each of film portion 4 and liquid drug outlet port 6 does not have to have a circular shape. When each of film portion 4 and liquid drug outlet port 6 has a shape other than a circular shape, the center of gravity of each of the shapes is defined as the center. For example, when each of film portion 4 and liquid drug outlet port 6 has a rectangular shape, the point of intersection of diagonal lines of this rectangular shape is defined as the center.

Examples

[0035] As an example of the present invention, an infusion solution container provided with no groove and an infusion solution container 100 provided with a groove 12 were prepared. The dimensions of each of the infusion solution containers were measured before and after a high pressure steam sterilization treatment (at 121 °C for 20 minutes). The measurement results are shown below.

[Table 1]

	Before Sterilization	After Sterilization (No Groove)	After Sterilization (with Groove)
Short Side a [mm]	41.17	51.09 (+9.92)	46.09 (+4.92)
Long Side b [mm]	65.45	68.36 (+2.91)	67.64 (+2.19)
Groove Depth d [mm]	2.20	-	-

[0036] The short side corresponds to "a" shown in Fig. 5 while the long side corresponds to "b" shown in Fig. 5. Short

side a and long side b were measured using LS-9120M manufactured by KEYENCE CORPORATION. Infusion solution container 100 was placed on a measuring instrument while cover member 200 was placed therebelow. Then, short side a and long side b were measured in one place at a height of 70 mm in infusion solution container 100. Groove depth d was measured using STM7 manufactured by Olympus Corporation. Groove depth d was measured in each of four corners of infusion solution container 100 having an approximately rectangular box shape one by one. Table 1 shows the maximum values obtained as a result of measuring the dimensions of short side a, long side b and groove depth d in each of ten infusion solution containers. Groove depth d of the infusion solution container before a high pressure steam sterilization treatment was 2.20 [mm] in each of the infusion solution container provided with no groove and infusion solution container 100 provided with groove 12.

[0037] In the infusion solution container provided with no groove after the sterilization treatment, short side a was increased in length by 9.92 [mm] while long side b was increased in length by 2.91 [mm]. In infusion solution container 100 provided with groove 12 after the sterilization treatment, short side a was increased in length by 4.92 [mm] while long side b was increased in length by 2.19 [mm]. After the sterilization treatment, the infusion solution container provided with no groove expanded, so that each of the corner portions was deformed into a circular arc shape. On the other hand, infusion solution container 100 provided with groove 12 did not expand, so that each of corner portions 11 was not deformed into a circular arc shape. This shows that infusion solution container 100 provided with groove 12 is less likely to undergo a dimensional change, so that deformation of infusion solution container 100 provided with groove 12 can be suppressed as compared with the infusion solution container provided with no groove.

[0038] Although the embodiments of the present invention have been described as above, it should be understood that the embodiments disclosed herein are illustrative and non-restrictive in every respect. The scope of the present invention is defined by the terms of the claims, rather than the description above, and is intended to include any modifications within the meaning and scope equivalent to the terms of the claims.

REFERENCE SIGNS LIST

[0039] 1 medical container, 2 attachment portion, 3 box-shaped portion, 4 film portion, 5 liquid drug outlet portion, 6 liquid drug outlet port, 7 barrel portion, 8 wall surface portion, 8a first wall surface portion, 8b second wall surface portion, 9 first shoulder portion, 10 second shoulder portion, 11 corner portion, 12 groove, 13 ridge portion, 14 communication hole, 100 infusion solution container, 200 cover member, 300 coupling member, 356b first puncture needle, 500 drug container, C center line, DR1 first direction, a short side, b long side, d groove depth, t wall thickness.

Claims

1. A container comprising:

a film portion at one end thereof;
a liquid outlet port provided at the other end on an opposite side of the one end, a liquid being discharged through the liquid outlet port; and
a box-shaped portion having a cross section that is orthogonal to a first direction in which a straight line passing through each of a center position of the film portion and a center position of the liquid outlet port extends, the cross section having an approximately rectangular shape, wherein
a groove extending in parallel to the first direction is provided in at least one of corner portions of the approximately rectangular shape.

2. The container according to claim 1, wherein the box-shaped portion has a ridge portion in at least one of the corner portions of the approximately rectangular shape, the ridge portion extending in parallel to the first direction and protruding toward an inside of the box-shaped portion.

3. The container according to claim 1 or 2, wherein
the box-shaped portion has a wall surface portion extending in the first direction, and
the groove extends over both ends of the wall surface portion in the first direction.

4. The container according to any one of claims 1 to 3, wherein the groove is formed in each of the corner portions of the approximately rectangular shape.

5. The container according to any one of claims 1 to 4, wherein the box-shaped portion has a wall thickness less than a depth of the groove.

FIG.1

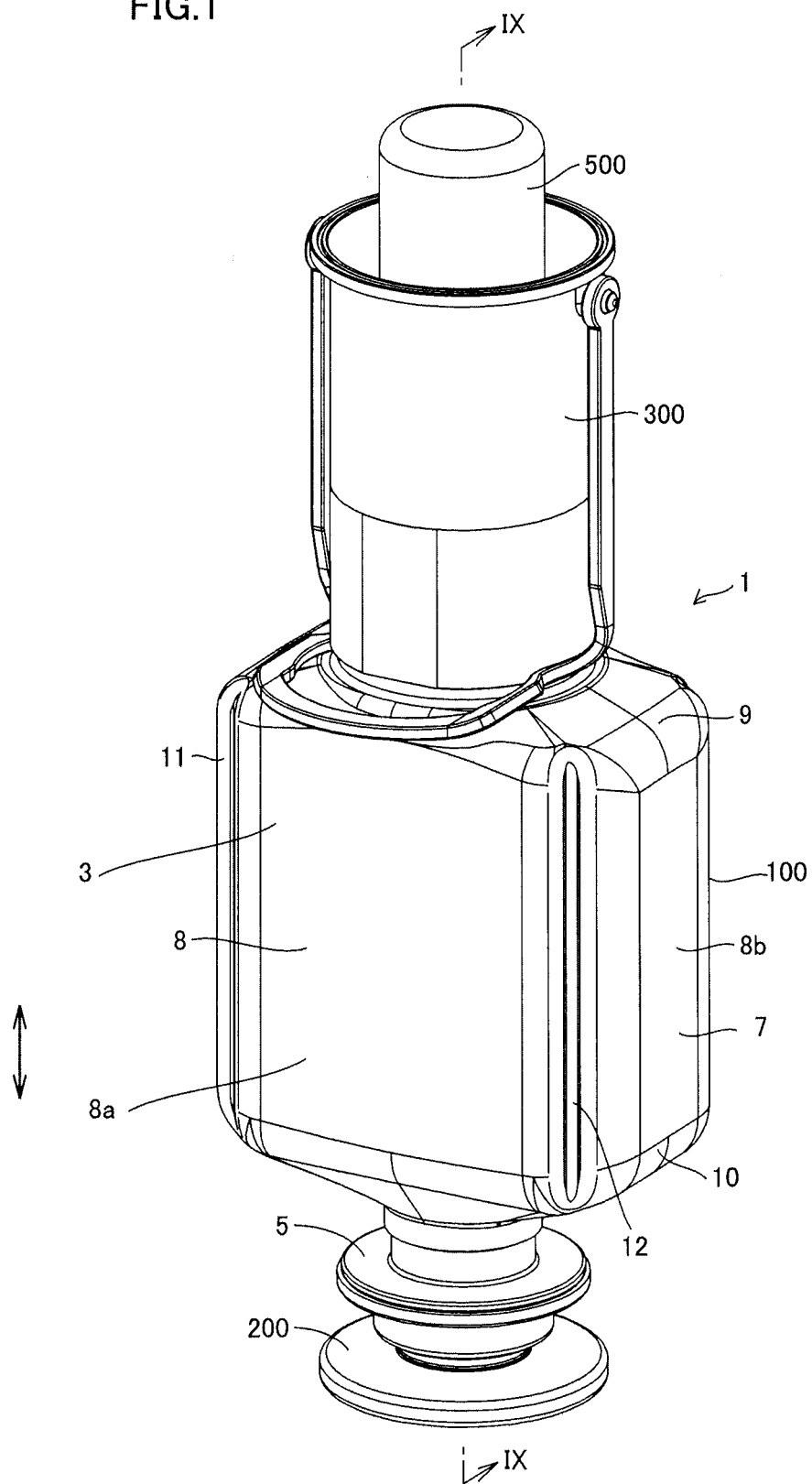


FIG.2

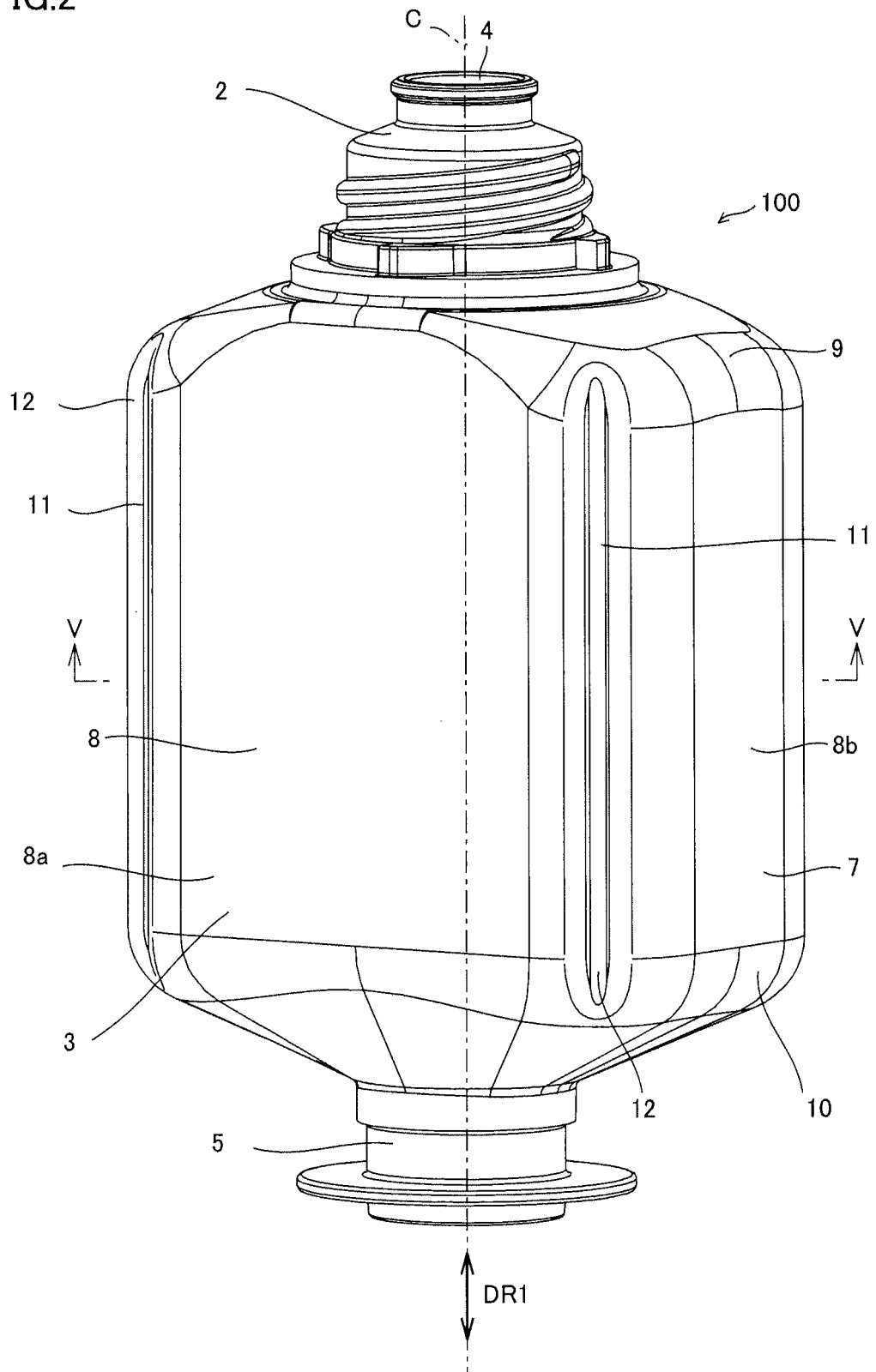


FIG.3

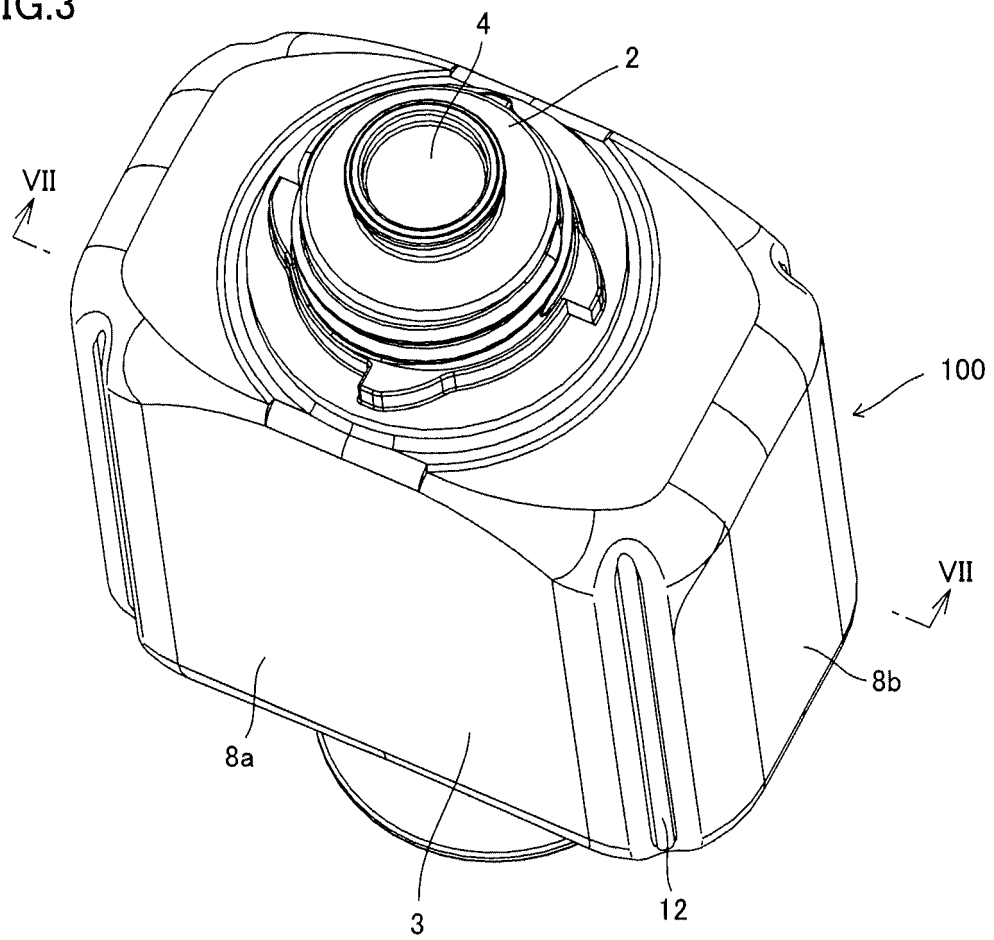
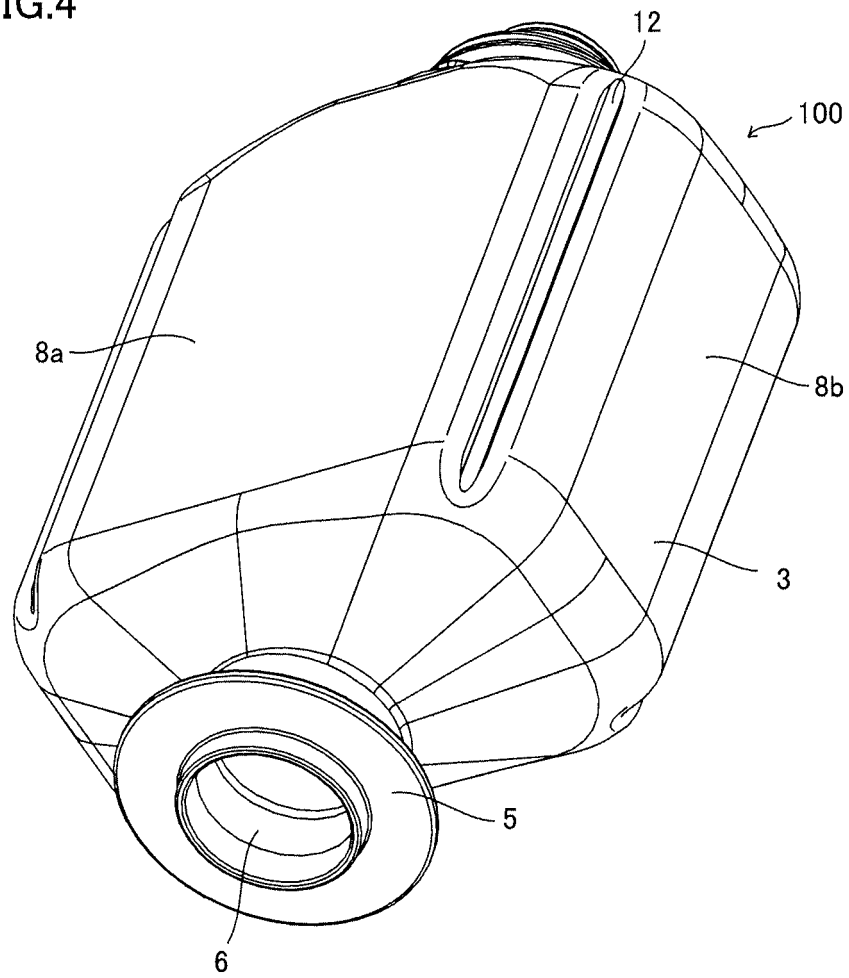


FIG.4



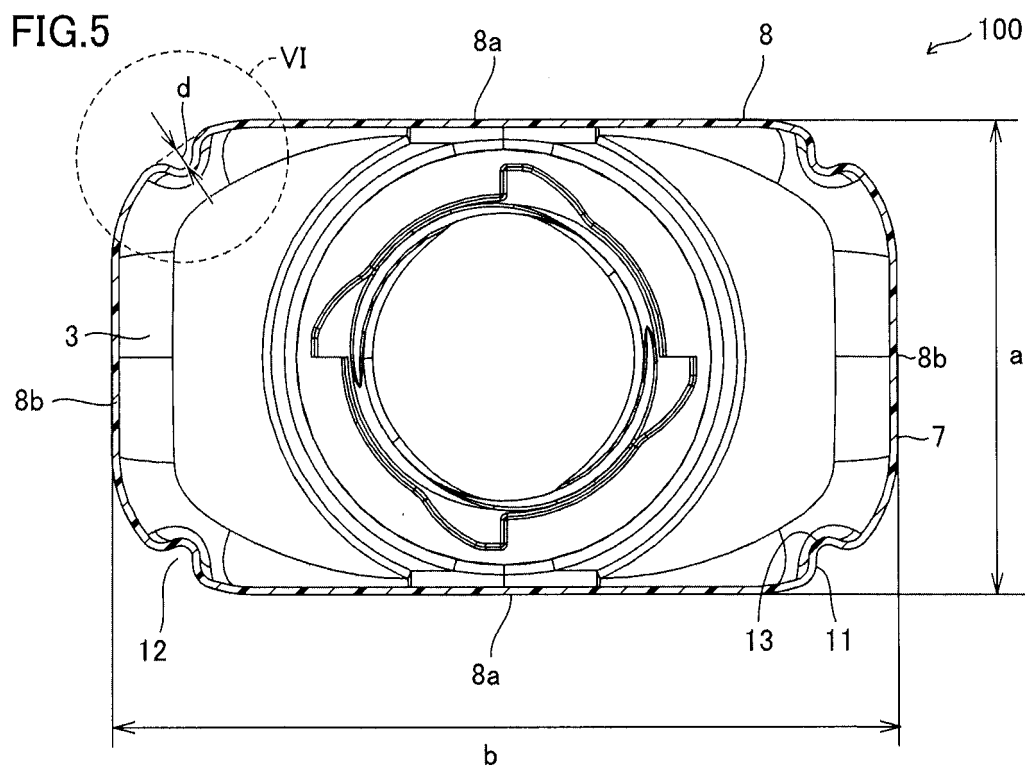


FIG.6

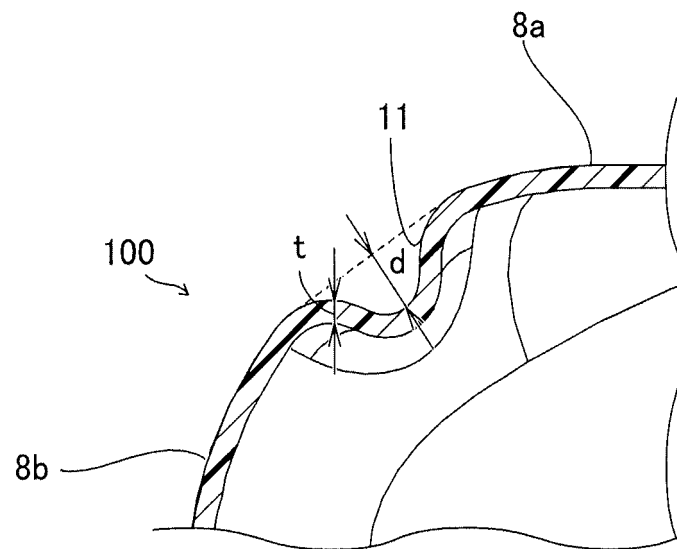


FIG.7

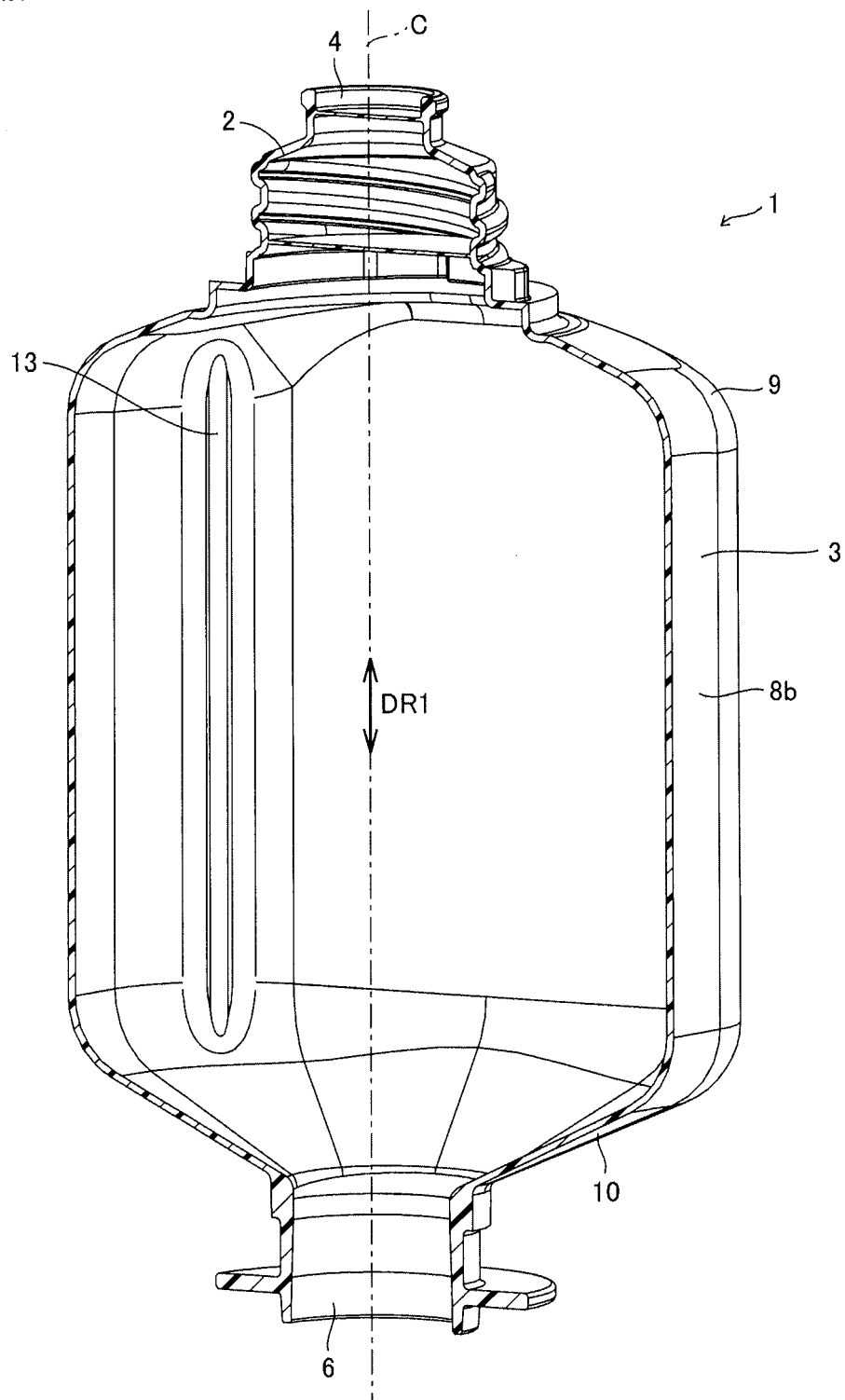


FIG.8

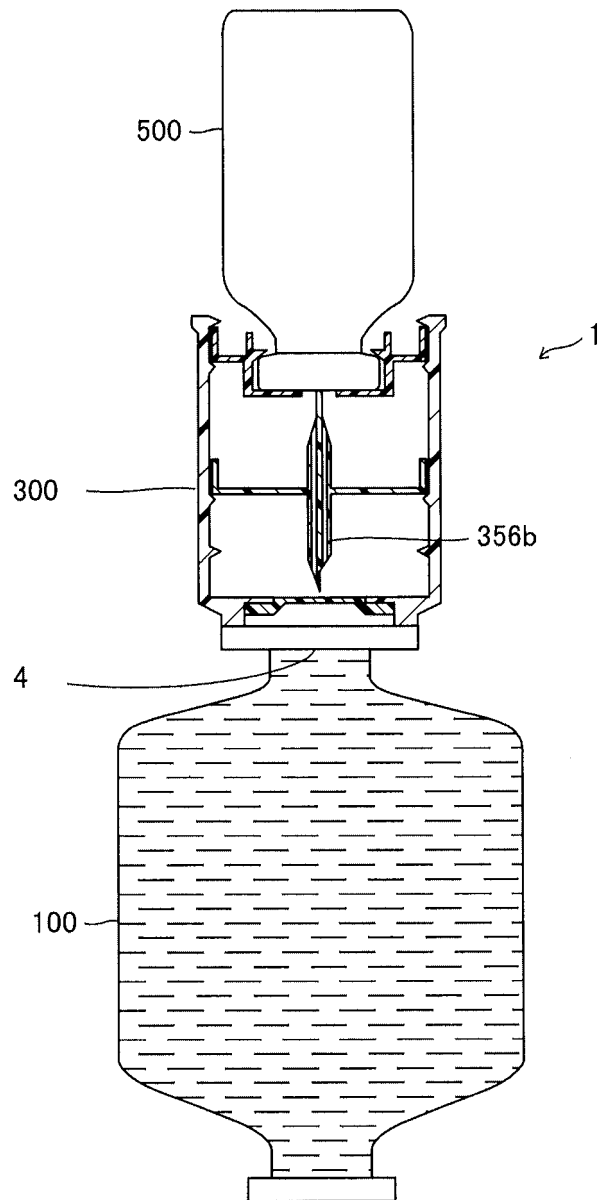
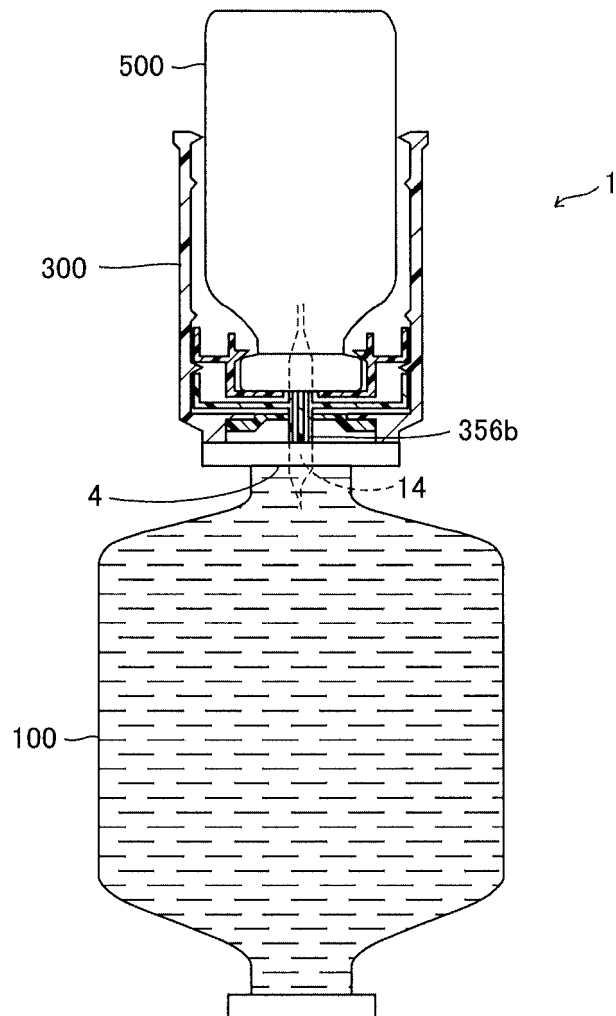


FIG.9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/033029

A. CLASSIFICATION OF SUBJECT MATTER

A61J1/05(2006.01)i, A61J3/00(2006.01)i

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)

A61J1/05, A61J3/00

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017

Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

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.
Y	JP 5-337163 A (Nissho Corp.), 21 December 1993 (21.12.1993), paragraphs [0008] to [0016]; fig. 1 to 11 (Family: none)	1-5
Y	JP 2015-163528 A (Dainippon Printing Co., Ltd.), 10 September 2015 (10.09.2015), paragraphs [0065], [0105] to [0108]; fig. 1, 4, 12 (Family: none)	1-5

☒ 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

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Date of the actual completion of the international search
10 November 2017 (10.11.17)Date of mailing of the international search report
21 November 2017 (21.11.17)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/033029

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2013/069194 A1 (Toyo Seikan Kaisha, Ltd.), 16 May 2013 (16.05.2013), paragraph [0018]; fig. 1 & US 2014/0224814 A1 paragraph [0028]; fig. 1 & CN 103930351 A	1-5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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