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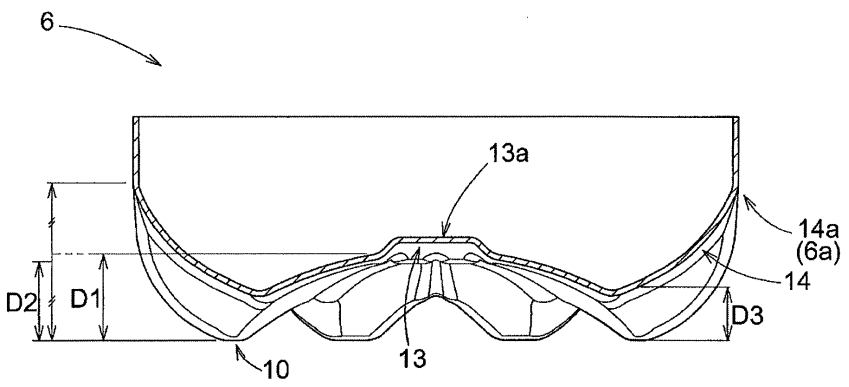
(54) **ASEPTIC FILLING BOTTLE**

(57) Provided is an aseptic filling bottle that can suppress buckling of its bottom portion even at the time of refrigerated storage. A bottom portion (6) of the aseptic filling bottle includes a grounding portion (10) to be placed in contact with a surface on which the bottle is put, a central portion that projects to an inner side of the bottle as its extends radially inwards from the grounding portion (10), a dome portion (13) which projects to more inner side of the bottle than the central portion, and a receded groove portion (14) that extends radially from the dome portion (13). A bottom inner side projection height (D1) of the central portion at a dome portion side circumferential edge thereof is set greater than a half (D2) of a height from the grounding portion (10) to a border between the body portion and the bottom portion (6). The receded groove portion (14), at a position corresponding to the radial center position of the grounding portion (10), has a depth (D3) ranging from 5.0 mm to 10.0 mm.

Fig.3



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Description

TECHNICAL FIELD

[0001] The present invention relates to a bottle for aseptic filling having a spout (mouth) portion, a shoulder portion, a body portion and a bottom portion.

BACKGROUND ART

[0002] As a method of filling a plastic bottle with liquid, there is an aseptic (germfree) filling method which fills a bottle with liquid under an aseptic condition. With this aseptic filling method, it is possible to avoid exposure of the plastic bottle to a high temperature. Thus, a plastic bottle filled by such aseptic filling method (to be referred to as "aseptic filling bottle" hereinafter) can have low heat resistance, and can be formed as a thin and lightweight bottle.

[0003] However, when a bottle is formed thin and lightweight, there arises a problem of corresponding reduction in its strength. Thus, in a case where its inside is filled with carbonated beverage for instance, rise of inner pressure occurs due to outgassing of carbonate inside, which may cause reversal (buckling) of the bottom portion. With occurrence of such buckling, the bottle can no longer stand on its own, thus making its distribution impossible. To cope with problem, Japanese Unexamined Patent Application No. 2012-140156 Publication Document (Patent Document 1) proposed a bottle that can suppress occurrence of bottom portion buckling by provision, at the center of the bottom portion, of a dome-shaped receded portion receded to the inner side.

BACKGROUND ART DOCUMENT

PATENT DOCUMENT

[0004] Patent Document 1: Japanese Unexamined Patent Application No. 2012-140156 Publication Document

SUMMARY OF THE INVENTION

PROBLEM TO BE SOLVED BY INVENTION

[0005] A plastic bottle filled with contents may not only be stored at a room temperature or in refrigeration, but also may be stored at an elevated temperature or stored under refrigeration, with heating or freezing of its contents. However, in the case of such heated storage or refrigerated storage, expansion occurs in the contents due to heating/refrigerating, which can cause buckling of the bottom portion. Moreover, in the case of adoption of such arrangement as proposed by Patent Document 1, there was another problem of difficulty of weight reduction.

[0006] Therefore, there is a need for an aseptic filling bottle that can suppress buckling of its bottom portion even at the time of heated storage or refrigerated storage.

SOLUTION

[0007] An aseptic filling bottle relating to the present invention, the aseptic filling bottle including a spout portion, a shoulder portion, a body portion and a bottom portion;

wherein the bottom portion includes a grounding portion to be placed in contact with a surface on which the bottle is put, a central portion that projects to an inner side of the bottle as its extends radially inwards from the grounding portion, a dome portion which projects to more inner side of the bottle than the central portion, and a receded groove portion that extends radially from the dome portion;

wherein a bottom inner side projection height of the central portion at a dome portion side circumferential edge thereof is set greater than a half of a height from the grounding portion to a border between the body portion and the bottom portion; and

wherein the receded groove portion, at a position corresponding to the radial center position of the grounding portion, has a depth ranging from 5.0 mm to 10.0 mm.

[0008] Based on a finding made by the present inventors, by not forming the center of the central portion alone in the form of a dome projecting to the bottle inner side, but by configuring the central portion entirely, with keeping the dome shape at its center, from the dome portion side circumferential edge to the grounding portion to project to the bottle inner side as it extends to the radial inner side, the strength of the bottle bottom portion can be further increased. According to a further finding made by the present inventors, when the maximum projection height of the central portion, namely, its projection height to the bottle inner side at the dome portion side circumferential edge, is set greater than a half of the height of the bottom portion, the effect of strength increase can be further enhanced.

[0009] In addition, with the above-described configuration, according to the arrangements devised by the present inventors, i.e. the arrangement of forming the central portion to project to the bottle inner side as it extends radially inwards from the grounding portion and the further arrangement of setting the projection height to the bottle inner side at the dome portion side circumferential edge greater than a half of the height of the bottom portion (i.e. the height to the border between the body portion and the bottom portion), the strength of the bottom portion can be enhanced effectively. With this, the buckling of the bottom portion at the time of refrigerated storage can be effectively suppressed.

[0010] Moreover, the receded groove portion formed radially from the central portion provides further reinforcement of the bottom portion, and since the receded groove portion has a depth ranging from 5.0 mm to 10.0 mm at a position corresponding to the radial center po-

sition of the grounding portion, the strength of the bottom portion can be even more enhanced. In addition, with this depth setting, buckling of the bottom portion can be suppressed also even when the bottle is heated.

[0011] Next, preferred embodiments of the aseptic filling bottle relating to the present invention will be explained. It is understood, however, that the range of the present invention is not limited by the preferred embodiments described below.

[0012] According to one preferred embodiment, the central portion is formed arcuate.

[0013] With this arrangement, by forming arcuate the central portion to be projected to the bottle inner side, compared with an arrangement of forming the central portion linear from the grounding portion to the dome portion circumferential edge, pressure applied to the central portion can be made uniform, so that the strength of the bottom portion can be increased even more effectively. With this, the buckling of the bottom portion at the time of refrigerated storage can be suppressed even more effectively.

[0014] According to a further preferred embodiment, the receded groove portion extends from the dome portion to a circumferential edge on more radial outer side than the grounding portion.

[0015] With this arrangement, as the receded groove portion for reinforcing the strength of the bottom portion is caused to extend long from the dome portion to the circumferential edge, the strength of the bottom portion can be even more increased.

[0016] According to a further preferred embodiment, in the body portion, there is formed at least one receded rib which extends around a circumferential face of the body portion.

[0017] With the above-described arrangement, volumetric expansion of contents at the time of refrigerated storage can be absorbed to a certain extent by the receded rib provided in the body portion. Thus, the force applied to the appropriate portion due to the volumetric expansion can be reduced, so that the buckling of the bottom portion at the time of refrigerated storage can be suppressed effectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

Fig. 1 is a front view of an aseptic filling bottle,
Fig. 2 is a bottom view of a bottom portion of the aseptic filling bottle,
Fig. 3 shows a III-III section in Fig. 2, and
Fig. 4 shows a IV-IV section in Fig. 2.

MODES OF EMBODYING THE INVENTION

[0019] Embodiments of an aseptic filling bottle relating to the present invention will be explained with reference to the drawings. An aseptic filling bottle 1 relating to this embodiment includes a spout (mouth) portion 2, a shoulder portion 4, a body portion 5 and a bottom portion 6. The bottom portion 6 includes a grounding portion 10 that comes into contact with a surface on which the bottle is put, a central portion 12 that progressively projects to the inner side of the bottle main body as it extends from the grounding portion 10 to the center of the bottom portion 6, a dome portion 13 that projects more to the bottle inner side than the central portion 12, and a receded groove portion 14 that extends radially from the dome portion 13. The central portion 12 is configured such that a bottle inner side projection height D1 of this central portion 12 at a dome portion side circumferential edge 12a thereof is set greater than a half D2 of a height measured from the grounding portion 10 to the border between the body portion 5 and the bottom portion 6. Moreover, the receded groove portion 14, at a position corresponding to the radial center position of the grounding portion 10, has a depth D3 ranging from 5.0 mm to 10.0 mm. With these arrangements, buckling of the bottom portion at the time of refrigerated storage can be effectively suppressed. Next, the aseptic filling bottle relating to this embodiment will be explained in details.

[0020] The aseptic filling bottle 1 relating to this embodiment (to be referred to simply as "bottle 1" hereinafter), as shown in Fig. 1, includes the spout portion 2 as a spout or a mouse for dispensing liquid and a bottle main body portion 3 to be filled with the liquid. The bottle main body portion 3 includes the shoulder portion 4, the body portion 5 and the bottom portion 6. The shoulder portion 4 is a portion whose diameter increases progressively toward a bottom face direction continuous with the spout portion 2 and has a shape formed of combination of polygonal panels of various shapes. The body portion 5 is a cylindrical portion continuous with the shoulder portion 4. The bottom portion 6 is a portion in the bottle main body portion 3, where the circumferential face of the bottle main body portion 3 has its diameter progressively decreasing toward the bottom face. Namely, in the instant embodiment, the position of the border between the body portion 5 and the bottom portion 6 is a position in the height direction where the diameter of the bottle main body portion 3 begins to decrease toward the bottom face.

[0021] Here, the bottle 1 relating to the instant embodiment is a bottle for use in an aseptic (germfree) filling method for filling liquid inside a bottle under an aseptic condition. The aseptic filling method allows avoiding exposure of a plastic bottle to a high temperature. So, the heat resistance performance of the bottle 1 can be low and this bottle is formed as a thin and lightweight bottle. The bottle 1 can be molded integrally, e.g. by the biaxial stretch blow molding method with using a thermoplastic resin such as polyethylene, polypropylene, polyethylene terephthalate, etc. as a principal material.

[0022] The bottle 1 relating to this embodiment, as will be described below, is configured to withstand filled contents expansion when the filled (charged) liquid is frozen.

Thus, as contents to be filled in the bottle 1, e.g. non-carbonated beverage such as mineral water, tea, soft drink, or juice, which may be stored under a refrigerated state are particularly preferred. However, the bottle may be used suitably also with a carbonated drink (beverage) or a food article such as sauce.

[0023] The body portion 5 is of a straight body type and in this body portion 5, there are formed a plurality of receded ribs 7 that extend around its circumferential face. Each receded rib 7 has a shape receded or concave to the inner side in the radial direction (the direction toward a center axis X of the bottle 1 and along its horizontal direction) and the width and the depth of each receded rib 7 are formed approximately constant over the entire circumference. These receded ribs 7 function not only as reinforcing ribs for reinforcing the lateral face strength of the bottle 1, but also as portions extendible in the vertical upper direction of the bottle 1 for absorbing possible volumetric expansion of the contents liquid at the time of refrigerated storage.

[0024] Incidentally, as such receded ribs 7, it will suffice to provide at least one at any position of the body portion 5. Preferably, two or more such ribs 7 will be formed in the body portion 5. More preferably, at least one will be formed at a lower part of the body portion and a plurality will be formed at an upper part of the body portion. Incidentally, if at least one is formed at the body portion lower part and the body portion upper part respectively, this will allow smooth and easy extension in the vertical upper direction of the bottle 1 for absorbing the volumetric expansion of the contents liquid at the time of refrigerated storage. So, the bottle 1 can stand straight on its own without tilting and also no deformation or break of the bottle will occur, either. Further, as shown in Fig. 1, advantageously, the receded rib 7 may be formed to be receded/concave to the radially inner side and along the entire circumference.

[0025] As shown in Figs. 1 through 4, the bottom portion 6 has an annular grounding portion 10 to be placed on (in contact with) a surface on which the bottle is put such as a desk surface and includes also a circumferential edge portion 11 which is a portion on the radially outer side of the grounding portion 10, a central portion 12 that is a radially inner side portion relative to the grounding portion 10 and a dome portion 13 that is provided at the central portion 12 and that projects to more bottle inner side than the central portion 12. The central portion 12 has such a shape that projects to the inner side (the upper side in Fig. 1) of the bottle 1 as it extends to radially inner side from the grounding portion 10 and is formed arcuate from the grounding portion 10 to the dome portion 13. Further, as shown in Fig. 3, the central portion 12 is configured such that the bottle inner side projection height D1 of this central portion 12 at the dome portion side circumferential edge 12a thereof is set greater than the half D2 of the height measured from the grounding portion 10 to the border 6a between the body portion 5 and the bottom portion 6. Moreover, the dome portion 13 is provided in a trapezoidal shape as seen in its vertical section.

[0026] In the bottom portion 6, there are formed a plurality (eight in this embodiment) of the receded groove portions 14 extending from the dome portion 13 to the circumferential edge portion 11 equidistantly in a radial pattern. With these receded groove portions 14, the strength of the bottom portion 6 is increased. With the provision of these receded groove portions 14, the circumferential edge portion 11 and the central portion 12 are divided into a plurality (eight in the present embodiment) in the circumferential direction (the direction around the center axis X of the bottle 1). As shown in Fig. 4, an end portion 14a of each receded groove portion 14 on the side of the circumferential edge portion 11 extends to the border 6a between the body portion 5 and the bottom portion 6. Further, preferably, the receded groove portion 14 is configured such that the receded groove portion 14, at a position corresponding to the radial center position of the grounding portion 10, has the depth D3 ranging from 5.0 mm to 10.0 mm (6.6 mm in this embodiment). If it exceeds 10.0 mm, the depth will be excessive to invite impairment of the outer appearance of the bottle 1 or to invite need for design change of some other portion.

[0027] As described above, in the bottle 1, the arrangement of not only forming the dome portion 13 at the center of the bottom portion 6, but also configuring the entire central portion 12 from the dome portion 13 to the grounding portion 10 to project to the bottle inner side as extending to the radially inner side, the arrangement of setting the projection height at the dome portion side circumferential edge 13a greater than the half of the height of the bottom portion 6, and the arrangement of forming arcuate from the grounding portion 10 to the dome portion side circumferential edge 13a together serve to effectively increase the strength of the bottom portion 6. Moreover, the strength of the bottom portion 6 is further increased by the receded groove portions 14 that extend from the dome portion 13 to the circumferential edge portion 11. With this, there is ensured strength sufficient to effectively suppress buckling of the bottom portion 6 due to volumetric expansion of the contents at time of refrigerated storage.

[0028] Table 1 below shows comparison of three-times tests of a conventional bottle and the bottle 1 relating to the present embodiment. As shown, with the conventional bottle, unlike the bottle 1 relating to the present embodiment, the depth of the portion corresponding to the depth D3 shown in Fig. 3 (the depth at the position of the receded groove portion 14 corresponding to the radial center of the grounding portion 10) is below 5 mm.

[Table 1]

	Embodiment	Conventional
filling amount (ml)	650	490
N=1	Pass	Pass

(continued)

	Embodiment	Conventional
N=2	Pass	Failure
N=3	Pass	Failure

Pass: The bottle stands stably after refrigeration.
Failure: The bottle does not stand stably after refrigeration.

[0029] As can be seen from Table 1, the bottle 1 relating to the present embodiment is more stable in the case of the large-volume bottle having a filling amount of 650 ml, this means the suppression of buckling of the bottom portion 6. In this way, it may be understood that with the bottle 1 relating to the present embodiment, strength sufficient to suppress the buckling of the bottom portion 6 due to volumetric expansion of the contents at time of refrigerated storage (and also heated storage) is ensured.

[Other Embodiments]

[0030] Lastly, other embodiments of the aseptic filling bottle relating to the present invention will be explained. Incidentally, the arrangements/configurations disclosed in the respective following embodiments can be used in any combination with the arrangements/configurations disclosed in the other embodiments unless no contradiction occurs resulting therefrom.

(1) In the foregoing embodiment, there was explained an example in which the body portion 5 is configured as a straight body type. However, the present invention is not limited thereto. For instance, the body portion 5 may be provided with a constricted portion, in addition to the straight body portion.
(2) In the foregoing embodiment, between the respective receded groove portions 14, a receded small groove portion smaller than the receded groove portion 14 may be provided additionally from the grounding portion 10 to the circumferential edge portion 11. With this, the strength of the bottom portion can be further increased.
(3) Further, regarding the other arrangements/configurations too, it is understood that the embodiments disclosed in this detailed disclosure are only illustrative in all respects thereof, and the scope of the present invention is not limited thereto. One skilled in the art could easily understand that appropriate modifications will be possible within the scope not departing from the spirit of the invention. Therefore, it is as a matter of course that other embodiments with such modifications not departing form the spirit of the invention are also included in the scope of the present invention.

INDUSTRIAL APPLICABILITY

[0031] The present invention is applicable to e.g. a plastic bottle filled with contents liquid by an aseptic filling method.

DESCRIPTION OF SIGNS

[0032]

1: aseptic filling bottle
2: spout portion
4: shoulder portion
5: body portion
6: bottom portion
7: receded rib
10: grounding portion
11: circumferential edge
12: central portion
13: dome portion
14: receded groove portion
D1: projection height of central portion at dome portion side circumferential edge to bottle inner side
D2: a half of height from grounding portion to border between body portion and bottom portion
D3: height at position in receded groove portion corresponding to radial center of grounding portion

Claims

1. An aseptic filling bottle including a spout portion, a shoulder portion, a body portion and a bottom portion;
wherein the bottom portion includes a grounding portion to be placed in contact with a surface on which the bottle is put, a central portion that projects to an inner side of the bottle as its extends radially inwards from the grounding portion, a dome portion which projects to more inner side of the bottle than the central portion, and a receded groove portion that extends radially from the dome portion;
wherein a bottom inner side projection height of the central portion at a dome portion side circumferential edge thereof is set greater than a half of a height from the grounding portion to a border between the body portion and the bottom portion; and
wherein the receded groove portion, at a position corresponding to the radial center position of the grounding portion, has a depth ranging from 5.0 mm to 10.0 mm.

2. The aseptic filling bottle of claim 1, wherein the central portion is formed arcuate.

3. The aseptic filling bottle of claim 1 or 2, wherein the receded groove portion extends from the dome portion to a circumferential edge on more radial outer

side than the grounding portion.

4. The aseptic filling bottle of any one of claims 1-3, wherein
in the body portion, there is formed at least one receded rib which extends around a circumferential face of the body portion.

Fig.1

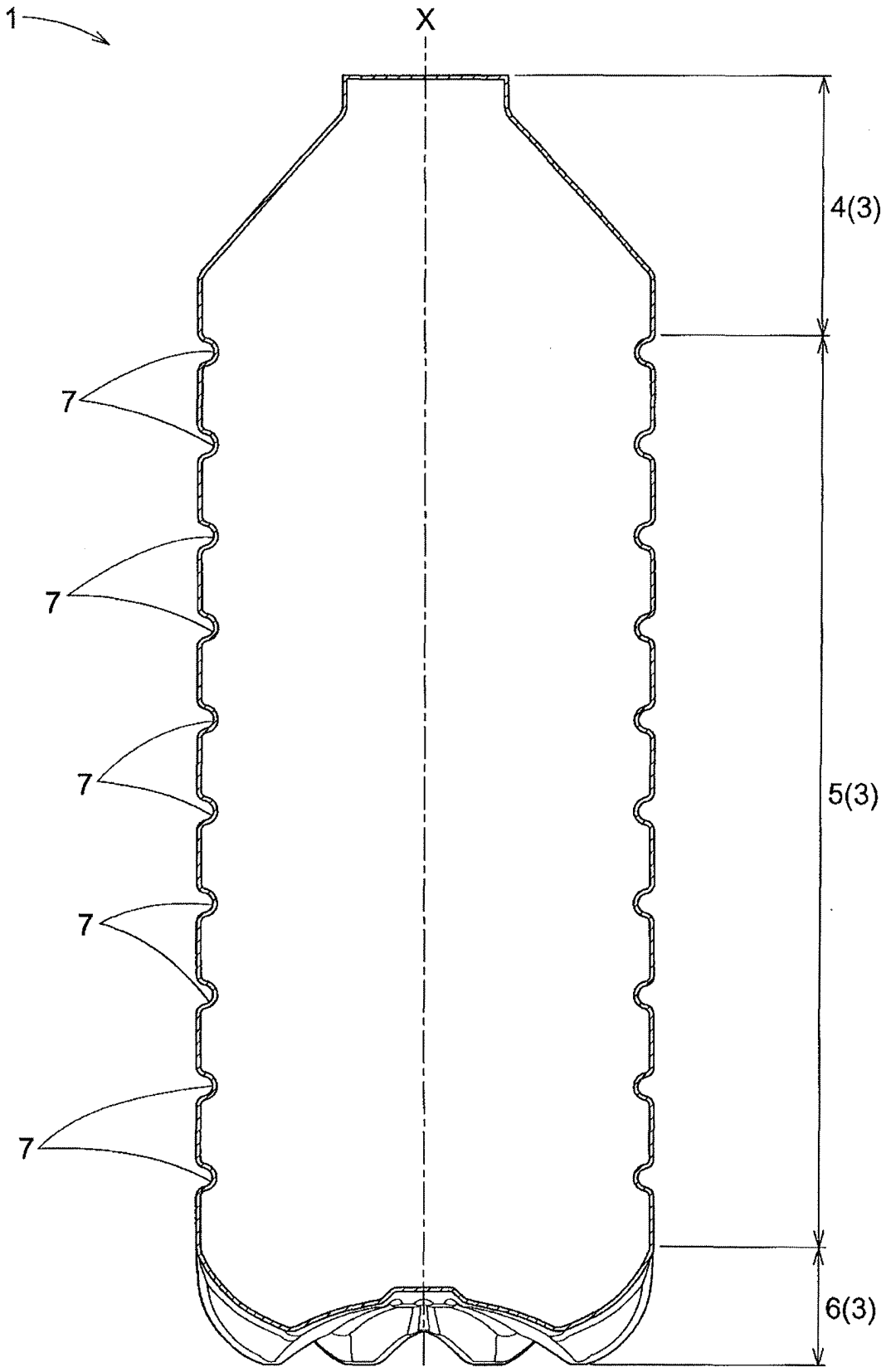


Fig.2

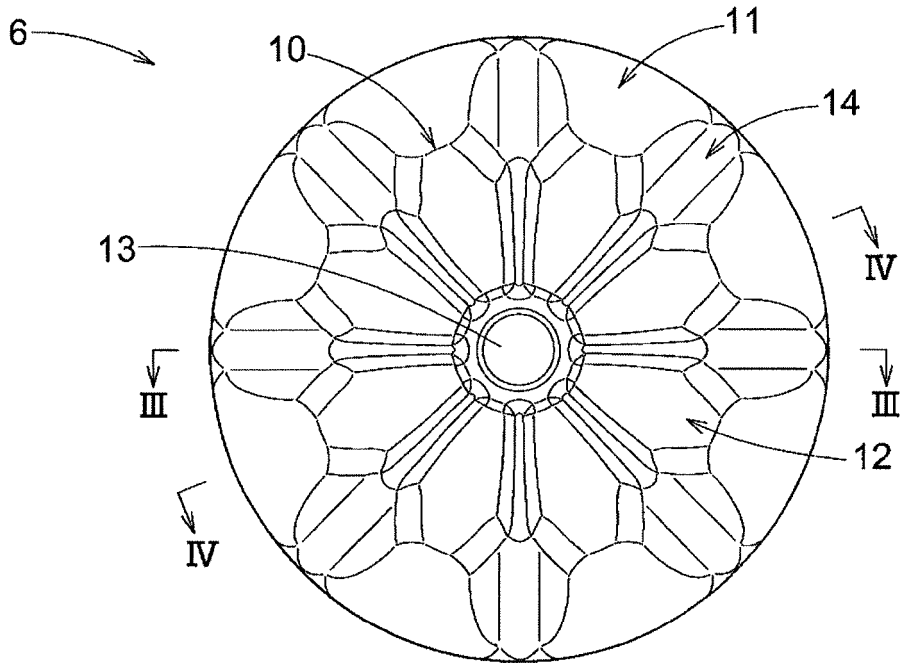


Fig.3

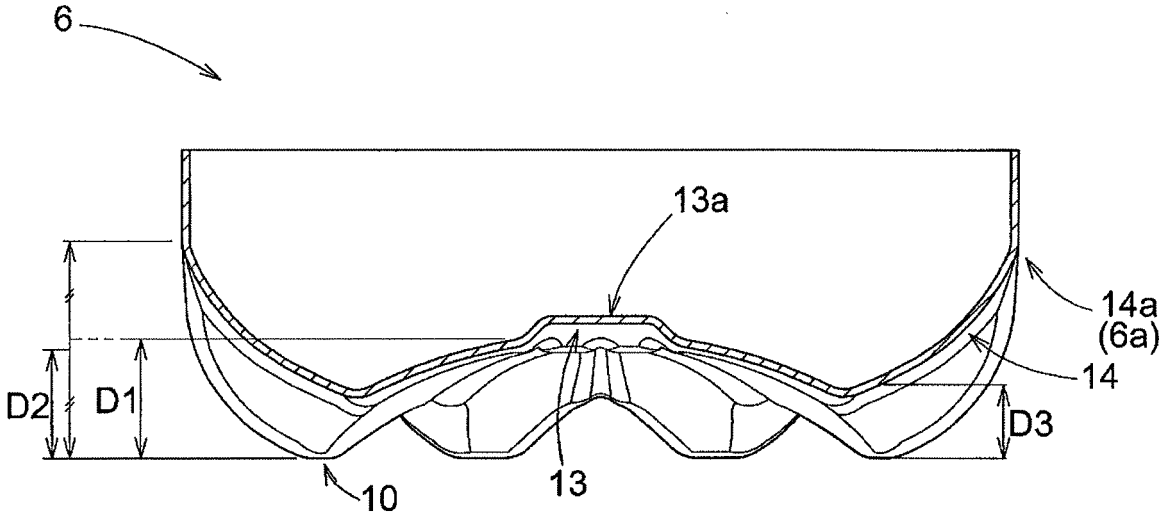
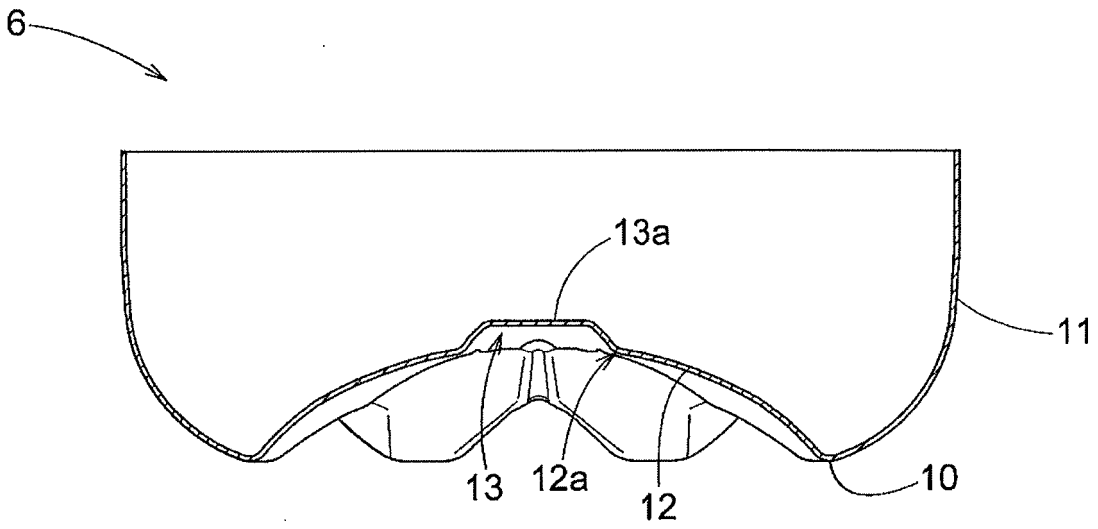


Fig.4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/008551

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. B65D1/02(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)
Int.Cl. B65D1/02

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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	US 2016/0144992 A1 (SIDEL PARTICIPATIONS) 26 May 2016, paragraphs [0003]-[0014], [0029]-[0056], fig. 1-4 & WO 2014/207331 A1 & FR 3007392 A1 & CN 105339274 A	1-4
Y	JP 2012-140156 A (DAI NIPPON PRINTING CO., LTD.) 26 July 2012, paragraphs [0003]-[0032], fig. 1, 4, 5 & WO 2012/029665 A1 & CN 103118950 A	1-4

☒ 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 09.04.2018	Date of mailing of the international search report 24.04.2018
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/008551

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-114214 A (KAO CORPORATION) 16 April 2002, paragraphs [0002], [0003], [0008], [0009], fig. 1(a)(b) (Family: none)	1-4
Y	JP 2016-216093 A (SUNTORY HOLDINGS LTD.) 22 December 2016, paragraphs [0008]-[0039], fig. 1-4 & CN 107709175 A & EP 3299306 A1, paragraphs [0008]-[0038], fig. 1-4	1-4
X		1-4
A	JP 2011-116429 A (KIRIN BREWERY) 16 June 2011 (Family: none)	1-4
A	JP 2009-298483 A (SIDEL PARTICIPATIONS) 24 December 2009 & US 2009/0308835 A1 & EP 2133277 A1 & FR 2932458 A1 & CN 101633417 A	1-4
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2012140156 A **[0003] [0004]**