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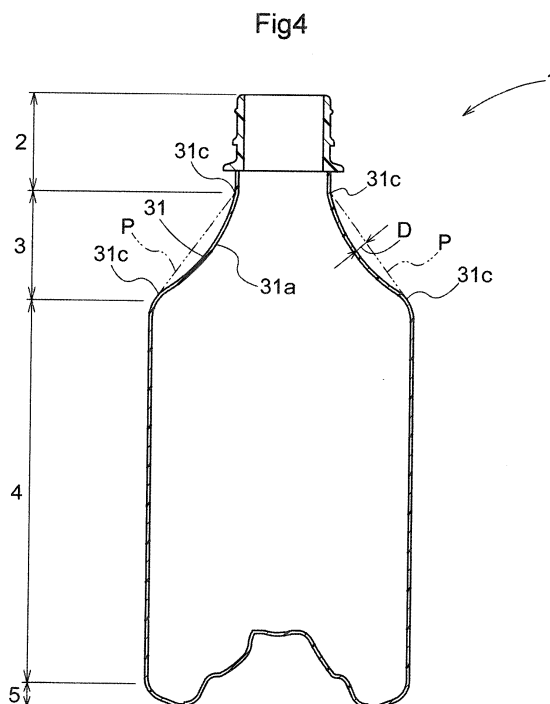
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(54) **PLASTIC BOTTLE**

(57) An increased pressure absorbing effect in the shoulder portion is to be enhanced. In a plastic bottle (1) having a spout portion (2), a shoulder portion (3) whose diameter progressively increases from the spout portion (2) toward a bottom face and a body portion (4) continuous with the shoulder portion (3), in the shoulder portion (3), there is provided at least one panel (31) which is receded toward the inner side. A bottom face (31a) of the panel (31) is formed as a curved face which is convex toward the inner side. A depth (D) from a plane (P) extending through upper and lower opposed ends (31c) of the panel (31) to a deepest portion of the bottom face (31a) of the panel (31) ranges from 1 mm to 7 mm.



Description

Technical Field

[0001] The present invention relates to a plastic bottle including a spout portion, a shoulder portion whose diameter progressively increases from the spout portion toward a bottom face, and a body portion continuous with the shoulder portion.

Background Art

[0002] In recent years, as plastic bottles for charging beverage therein, there have been employed not only plastic bottles that are displayed under a cooled state or at a room temperature, but also plastic bottles for heating that are displayed under a heated state. The plastic bottles for heating are sometimes used in such a manner that the bottles are charged with beverage at the room temperature and heated at the time of displaying. In such case, due to change of temperature by heating at the time of displaying, the inside pressure of the bottle rises from that at the time of charging.

[0003] In addressing to the above, Japanese Unexamined Patent Application No. 2016-132500 publication document (Patent Document 1) discloses a bottle having pressure absorbing panels in its shoulder portion and its body portion. With this bottle, thanks to the panels in the shoulder portion and the body portion, a rise of the inside pressure due to heating at the time of charging can be effectively absorbed.

Prior Art Document

[0004] Patent Document 1: JP2016-132500A

SUMMARY OF THE INVENTION

Problem to be Solved by Invention

[0005] However, with the bottle of Patent Document 1 identified above, it is necessary to provide the panels over the entire body portion. This presents a trouble when the design of the bottle portion is to be changed by e.g. providing the body portion with an ornament. For this reason, if the design of the body portion is to be changed, it is necessary to have an increased pressure inside the bottle absorbed in some portion other than the body portion.

[0006] In view of the above, there is a need for realizing a plastic bottle that enhances an increased pressure absorbing effect in its shoulder portion.

SOLUTION

[0007] A plastic bottle according to the present invention comprises:

a spout portion;

a shoulder portion whose diameter progressively increases from the spout portion toward a bottom face; and

a body portion continuous with the shoulder portion; wherein in the shoulder portion, there is provided at least one panel which is receded toward the inner side;

a bottom face of the panel is formed as a curved face which is convex toward the inner side; and

a depth from a plane extending through upper and lower opposed ends of the panel to a deepest portion of the bottom face of the panel ranges from 1 mm to 7 mm.

[0008] With the above-described configuration, by providing a panel having a curved face which is formed convex toward the inner side, the panel is allowed to move by a large amount toward the outer side at the time of rise of pressure inside the bottle, so that the increased pressure absorption effect in the shoulder portion can be effectively enhanced. Further, as the depth ranges from 1 mm to 7 mm, this also can effectively enhance the increased pressure absorption effect in the shoulder portion. Namely, if the depth were smaller than 1 mm, the resultant increased pressure absorption amount would be insufficient. Conversely, if the depth were greater than 7 mm, this would make movement of the panel difficult, thus making the increased pressure absorption difficult.

[0009] Next, some preferred embodiments of the plastic bottle relating to the present invention will be explained. It is noted however that these preferred embodiments are not to limit the scope of the present invention in any way.

[0010] According to one preferred embodiment, a pillar portion is provided between lateral sides of the adjacent panels.

[0011] With the above arrangement, with provision of the pillar portion, it becomes possible to prevent movements of adjacent panels from interfering with the respective panels each other.

[0012] According to a further preferred embodiment, in the shoulder portion, there are provided three or more of the panels.

[0013] With the above arrangement, with provision of three or more panels, each panel needs not to be too large, so that the movements of the panels at the time of pressure increase are facilitated.

[0014] According to a further preferred embodiment, a border between the pillar portion and the panel is formed arcuate. And, also preferably, the panel is connected to the body portion and a border between the body portion and the panel is formed arcuate.

[0015] With the above arrangement, as the border between the pillar portion and the panel and the border between the body portion and the panel are formed arcuate, this facilitates the movement of the panel toward the outer side at the time of pressure increase, in comparison with

a case of forming these borders angular.

[0016] According to one preferred embodiment, the panel is formed triangular or trapezoidal.

[0017] With the above arrangement, as the panel is formed triangular or trapezoidal, the panel can be provided over a large area on the shoulder portion. Moreover, in comparison with a square-shaped panel, the above arrangement facilitates the panel movement and allows increase of the panel area also.

[0018] According to one preferred embodiment, the circumferential face of the body portion is formed as a flat smooth face without unevenness.

[0019] According to the plastic bottle relating to the present invention, pressure increase can be effectively absorbed by the shoulder portion, so the body portion can be formed as a flat smooth face having no "panel", so that the aesthetic effect can be increased.

[0020] According to one preferred embodiment, the plastic bottle is a bottle to be heated.

[0021] According to the plastic bottle relating to the present invention, pressure increase can be effectively absorbed by the shoulder portion. Thus, even if this bottle is designed as a plastic bottle for heating, disadvantageous effect due to increase of the inside pressure of the bottle can be effectively avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

- Fig. 1 is a front view of a plastic bottle,
 Fig. 2 is a plan view of the plastic bottle,
 Fig. 3 is a section view taken along III-III in Fig. 1, and
 Fig. 4 is a section view taken along IV-IV in Fig. 2.

EMBODIMENT

[0023] Next, an embodiment of a plastic bottle relating to the present invention will be explained with reference to the accompanying drawings. A plastic bottle 1 relating to this embodiment, as shown in Fig. 1, includes a spout portion 2 as a spout or outlet for pouring liquid, a shoulder portion 3 formed continuous with the spout portion 2 and having a diameter which progressively increases toward the bottom face, a cylindrical body portion 4 continuous with the shoulder portion 3, and a bottom portion 5 constituting the bottom of the plastic bottle 1. And, this plastic bottle 1 relating to the instant embodiment is designed for heating (to be heated) and is characterized by panels 31 provided in the shoulder portion 3. Next, the arrangement of the shoulder portion 3 will be discussed in details.

[0024] In the instant embodiment, as shown in Figs. 1 through 4, in the shoulder portion 3, there are total of four panels 31 receded toward the inner side, the panels 31 being arranged equidistantly and having a same shape. And, as shown in Fig. 3, a bottom face 31a of each panel 31 is formed as a curved face which is formed convex toward the bottle inner side. With this arrangement of the

bottom face 31a being formed as a curved face which is formed convex toward the bottle inner side, the panel 31 is allowed to move largely toward the outer side at the time of pressure inside the bottle. Further, the panel 31 is configured to extend perpendicular to the circumferential direction.

[0025] A depth D (see Fig. 4) from a plane P extending through upper and lower opposed ends 31c, 31c of the panel 31 to the deepest portion of the bottom face 31a of the panel 31 is arranged to range from 1 mm to 7 mm. This is because if the depth D were smaller than 1 mm, the increased pressure absorption amount would become insufficient; whereas if the depth D were greater than 7 mm, this would make the panel movement difficult and make increased pressure absorption difficult also. Incidentally, the depth D ranges from 2 mm to 6 mm more preferably and ranges from 3 mm to 5 mm even more preferably.

[0026] In the instant embodiment, between lateral sides 31b of adjacent panels 31, a pillar portion 32 is provided. With provision of such pillar portion 32, it is possible to prevent movements of the adjacent panels 31 from interfering with the respective panels each other. Further, the border between the pillar portion 32 and the panel 31 is formed arcuate. In comparison with an arrangement of the border between the pillar portion 32 and the panel 31 being formed angular, the movement of the panel 31 toward the outer side at the time of pressure increase is made easier. Moreover, the panel 31 is connected to the body portion 4 and the border between the body portion 4 and the panel 31 is formed arcuate also. With this arrangement, in comparison with an arrangement of the border between the body portion 4 and the panel 31 being formed angular, the movement of the panel 31 toward the outer side at the time of pressure increase is made easier.

[0027] In the instant embodiment, the panel 31 is formed trapezoidal. With this, the panel 31 can be provided over a large area on the shoulder portion 3, thus enhancing the increased pressure absorption effect of the shoulder portion 3. Further, in comparison with a panel having a square shape, the movement of the panel toward the outer side at time of pressure increase is facilitated and the area of the panel can be increased also.

[0028] With the plastic bottle 1 having the above-described arrangements, the increased pressure absorption effect is enhanced by the shoulder portion 3, so that increased pressure inside the bottle at the time of heating can be absorbed effectively, without providing the body portion 4 with an arrangement for increased pressure absorption. Then, in the instant embodiment, since the shoulder portion 3 absorbs increased pressure, it is possible to employ a characteristic arrangement of constituting the body portion 4 of a flat smooth face having no unevenness, so that the aesthetic effect can be enhanced.

[0029] Next, one example of the increased pressure absorption effect in the shoulder portion 3 will be ex-

plained. Comparison was made among the plastic bottle 1 relating to the instant embodiment and 500 ml bottles having the same shape as the inventive plastic bottle 1, on changes occurring in bottle shape after heating the bottles in 75 °C hot water for a predetermined period, with beverage being charged in the bottles. Specifically, such comparisons were made among bottles which are different only in the arrangements of their shoulder portions; namely, (1) a bottle having no panels in the shoulder portion, (2) a bottle having four panels in the shoulder portion and a bottom face formed as a flat face, (3) a bottle having four panels in the shoulder portion and a bottom face formed as a curved face convex toward the inner side and a 3 mm depth at the panel deepest portion, (4) a bottle arranged similarly to the bottle of (3), except in that the panel deepest portion has a depth of 4 mm, and (5) a bottle arranged similarly to the bottle of (3), except in that the panel deepest portion has a depth of 5 mm. Respecting the bottles (1) and (2), due to deformations occurring in the bottom portions of the bottles with continued heating in water, they became unable to stand on their own or could barely stand on their own, but with inclinations. Whereas, respecting the bottles (3) through (5), they did not suffer such conditions described above occurred with the bottles (1), (2), and normal self-standing states were maintained. In this way, it is understood that by providing the shoulder portion with the panel having its bottom face formed as a curved face formed convex toward the inner side, the increased pressure absorption effect in the shoulder portion was enhanced.

[0030] Incidentally, the plastic bottle 1 relating to the instant embodiment can be made by using a thermosetting resin such as polyethylene, polypropylene, polyethylene terephthalate, etc., as its main material and formed by a stretch molding technique such as the biaxial stretch blow molding technique. The capacity of the plastic bottle 1 is not particularly limited, it may range from 200 ml to 2 liters approximately, such as 280 ml, 350 ml, 500 ml which are commonly employed in the market. Also, the liquid to be charged in the plastic bottle 1 is not particularly limited, it may be drinking water, tea, juice, coffee, cocoa (chocolate), soft drink, hard (alcoholic) drink, milk-based drink, liquid food such as soup, liquid seasoning or condiment such as Worcester sauce, soy sauce, etc.

[Other Embodiments]

[0031] Lastly, other embodiments of the plastic bottle relating to the present invention will be explained. Incidentally, it is understood that arrangements disclosed in the respective following embodiments may be used in any desired combination with the other arrangements disclosed in the other embodiments as long as no contradiction results from such combination.

(1) In the foregoing embodiment, the arrangement of providing four panels 31 in the shoulder portion 3 was explained as one specific example. However,

the present invention is not limited thereto. It will suffice for this invention to provide at least one panel 31. More preferably, three or more of them may be provided.

(2) In the foregoing embodiment, the arrangement of forming the panels 31 trapezoidal was explained as one specific example. However, the present invention is not limited thereto. The panel 31 may be formed triangular. Its shape can be modified in any other manner.

(3) In the foregoing embodiment, the arrangement of no ornament being provided in the panel 31 was explained as one specific example. However, the present invention is not limited thereto. The panel 31 may be provided with predetermined letter or character or an ornament such as a graphic shape or the like.

(4) In the foregoing embodiment, the arrangement in which the border between the pillar portion 32 and the panel 31 and the border between the body portion 4 and the panel 31 are formed arcuate. However, the present invention is not limited thereto. The border between the pillar portion 32 and the panel 31 and the border between the body portion 4 and the panel 31 may be formed angular. And, the body portion 4 and the panel 31 may not be connected to each other.

(5) In the foregoing embodiment, the arrangement in which the circumferential face 4a of the body portion 4 is formed as a flat smooth face. However, the present invention is not limited thereto. The body portion 4 may be provided with a feature such as a panel, a rib, etc. or may be provided with predetermined letter or character or an ornament such as a graphic shape or the like.

(6) In the foregoing embodiment, the arrangement in which the depth D from the plane P extending through the upper and lower opposed ends 31c, 31c of the panel 31 to the deepest portion of the bottom face 31a of the panel 31 is arranged to range from 1 mm to 7 mm. However, as an example of reference, it is also conceivable to arrange such that a panel depth from the plane extending through the left and right opposed sides 31b, 31b of the panel 31 to the deepest portion of the bottom face 31a of the panel 31 ranges from 1 mm to 7 mm.

(7) Respecting the other arrangements too, it is understood that the embodiments disclosed in this detailed description are only illustrative in all respects and the scope of the present invention is not limited thereto. One skilled in the art would readily understand that various appropriate modifications are possible within the range not deviating from the essence of the present invention. Therefore, other embodiments including modifications that do not deviate from the essence of the present invention are also included in the scope of the present invention as a matter of course.

INDUSTRIAL APPLICABILITY

[0032] The present invention is applicable to a plastic bottle for heating for instance.

DESCRIPTION OF SIGNS

[0033]

1: plastic bottle
 2: spout portion
 3: shoulder portion
 3a: position of circumferential face
 31: panel
 31a: bottom face
 31b: lateral side
 31c: upper and lower opposed ends
 32: pillar portion
 4: body portion
 4a: circumferential face
 D: depth
 P: plane extending through upper and lower opposed ends of panel.

the panel is connected to the body portion and a border between the body portion and the panel is formed arcuate.

- 5 **6.** The plastic bottle of any one of claims 1-5, wherein the panel is formed triangular or trapezoidal.
- 7.** The plastic bottle of any one of claims 1-6, wherein the circumferential face of the body portion is formed as a flat smooth face without unevenness.
- 10 **8.** The plastic bottle of any one of claims 1-7, wherein the plastic bottle is a bottle to be heated.

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Claims

- 1.** A plastic bottle comprising:

a spout portion;
 a shoulder portion whose diameter progressively increases from the spout portion toward a bottom face; and
 a body portion continuous with the shoulder portion;
 wherein in the shoulder portion, there is provided at least one panel which is receded toward the inner side;
 a bottom face of the panel is formed as a curved face which is convex toward the inner side; and
 a depth from a plane extending through upper and lower opposed ends of the panel to a deepest portion of the bottom face of the panel ranges from 1 mm to 7 mm.

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- 2.** The plastic bottle of claim 1, wherein a pillar portion is provided between lateral sides of the adjacent panels.
- 3.** The plastic bottle of claim 1 or 2, wherein in the shoulder portion, there are provided three or more of the panels.
- 4.** The plastic bottle of any one of claims 1-3, wherein a border between the pillar portion and the panel is formed arcuate.
- 5.** The plastic bottle of any one of claims 1-4, wherein

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Fig.1

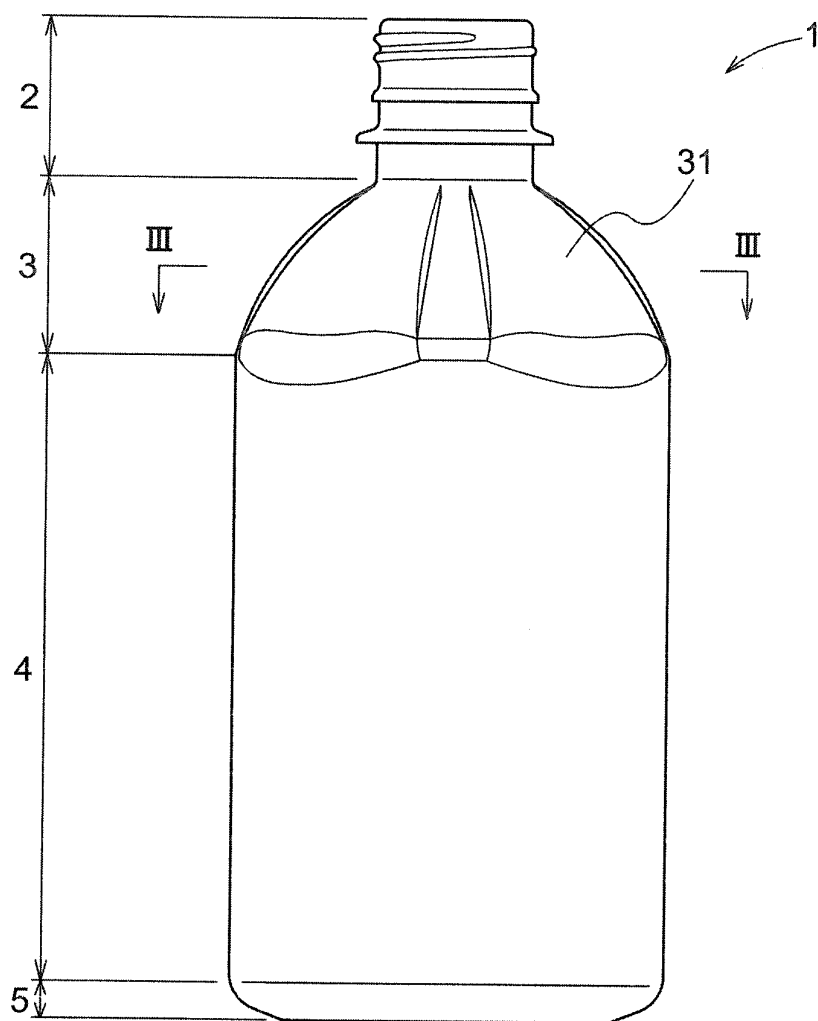


Fig.2

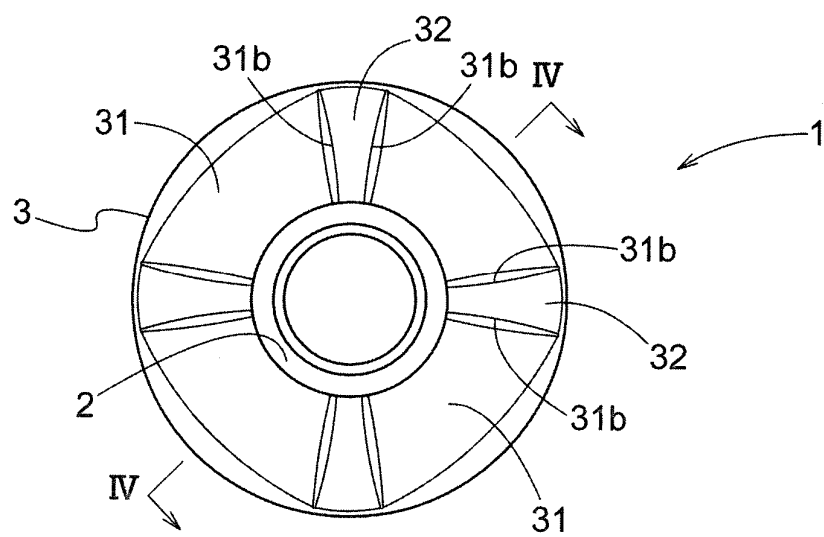


Fig.3

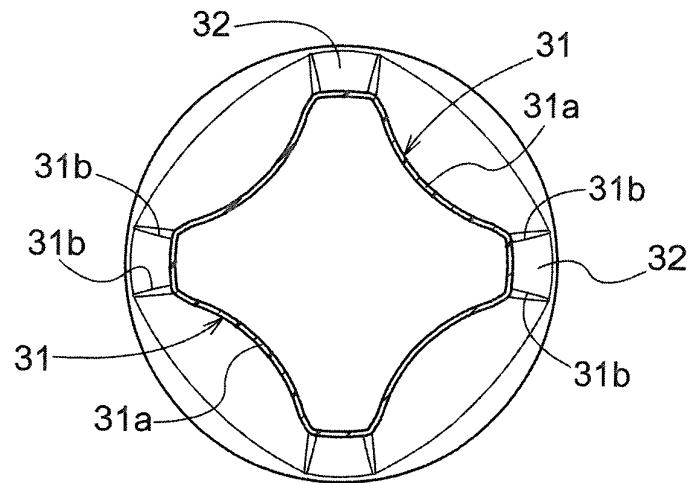
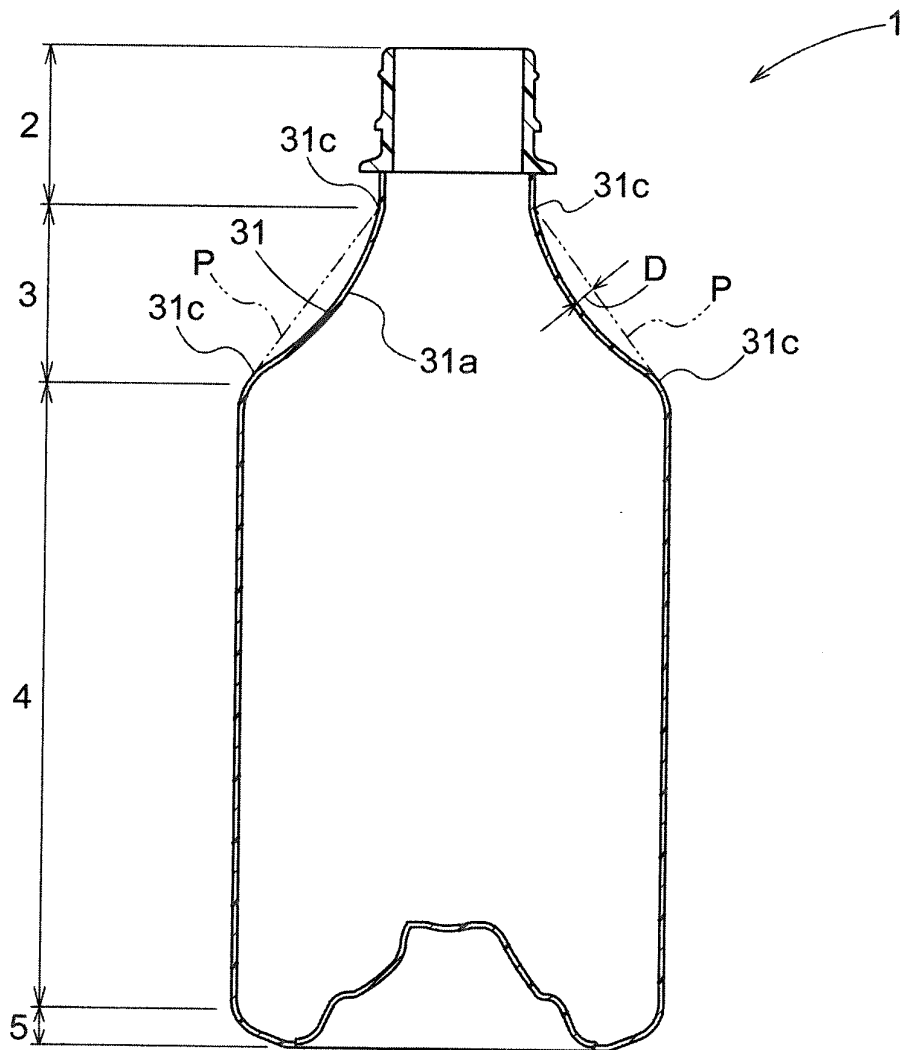


Fig4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/021754

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.
X	US 2011/0000869 A1 (BRAUN, J. A.) 06 January 2011, paragraphs [0011]-[0034], fig. 1-3 & CA 2708541 A1	1-8
X	JP 2016-132500 A (DAI NIPPON PRINTING CO., LTD.)	1, 3, 6, 8
Y	25 July 2016, paragraphs [0024]-[0080], fig. 1-6 (Family: none)	1-8
X	JP 2016-101975 A (YOSHINO KOGYOSHO CO., LTD.) 02	1-6, 8
Y	June 2016, paragraphs [0016]-[0025], fig. 1, 2 (Family: none)	4-8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search
22.06.2018Date of mailing of the international search report
03.07.2018Name 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/JP2018/021754

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 2000-79925 A (TOPPAN PRINTING CO., LTD.) 21 March 2000, paragraphs [0006]-[0014], fig. 1-3 (Family: none)	1-8
Y	JP 2014-156287 A (YOSHINO KOGYOSHO CO., LTD.) 28 August 2014, paragraphs [0015]-[0027], fig. 1-6 (Family: none)	1-8
P, X	JP 1600042 S (SUNTORY HOLDINGS LTD.) 19 March 2018, paragraph [Description of design], drawings (Family: none)	1-8

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2016132500 A [0003] [0004]