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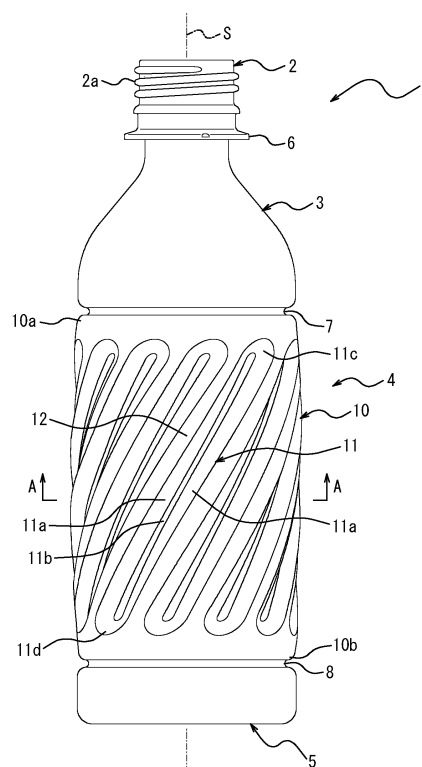
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(54) **CONTAINER MADE FROM SYNTHETIC RESIN**

(57) Provided is a synthetic resin container (1) in a bottle shape including a mouth (2) as a dispensing spout for a content medium, a trunk (4) extending contiguous to the mouth (2) via a shoulder (3), and a bottom (5) closing a lower end of the trunk (4), in which: the trunk (4) is provided with a reduced pressure absorbing portion (10) having a plurality of reduced pressure absorbing recesses (11) arranged side by side in the circumferential direction, and the reduced pressure absorbing portion (10) is formed in a barrel shape having an intermediate part diameter (R2) at an intermediate part in the vertical direction larger than an end diameter (R1) at either one of ends (10a, 10b) in the vertical direction.

FIG. 1



Description**TECHNICAL FIELD**

[0001] The present disclosure relates to a bottle-shaped synthetic resin container including a mouth serving as a dispensing spout for a content medium, a trunk extending contiguous to the mouth via a shoulder, and a bottom closing a lower end of the trunk. In particular, the present disclosure relates to a synthetic resin container including the trunk provided with reduced pressure absorbing recesses.

BACKGROUND

[0002] Due to their lightweightness and handleability, excellent stability for preservation of the content media, and inexpensive cost, bottle-shaped synthetic resin containers, typical examples of which are oriented polypropylene (OPP) bottles and poly-ethylene terephthalate (PET) bottles, are used in various applications, such as beverages, foods, and cosmetics.

[0003] Such a synthetic resin container is known to include the trunk provided with reduced pressure absorbing recesses such as reduced pressure absorbing walls (reduced pressure absorbing panels) or reduced pressure absorbing grooves to cope with so-called hot filling, in which the content medium, such as a beverage, including a juice beverage and tea, and a seasoning, including soy sauce, vinegar, and dressing, is filled at a high-temperature heated state. After the content medium is hot-filled, the mouth is closed with a cap. Then, as the content medium is cooled, the inside of the container is placed under reduced pressure, possibly causing the trunk to be deformed significantly. To address the above problem, the trunk is provided with the reduced pressure absorbing recesses, so that the reduced pressure inside the container may be absorbed through deformation of the reduced pressure absorbing recesses, thereby preventing significant deformation of the entire trunk.

[0004] For example, Patent Literature 1 describes a synthetic resin container including a trunk provided with panel-shaped reduced pressure absorbing recesses extending in the vertical direction. The described synthetic resin container prevents deterioration in rigidity otherwise caused by a reduction in thickness of the container while absorbing the reduced pressure inside the container through deformation of the reduced pressure absorbing recesses, to thereby maintain the appearance and shape of the container in a favorable state even in a situation where the container is hot-filled with the content medium.

CITATION LIST**Patent Literature**

[0005] PTL 1: JP2004-323100A

SUMMARY**(Technical Problem)**

[0006] However, even in the existing synthetic resin container described above, once reduced pressure due to hot filling reaches a certain level, the deformation of reduced pressure absorbing recesses cannot fully absorb the reduced pressure anymore. As a result, the trunk is significantly deformed to be out of shape, leading to a problem that the appearance and shape of the container can no longer be maintained in a favorable state.

[0007] The present disclosure has been conceived of in light of the above problem, and the present disclosure is to provide a synthetic resin container that effectively absorbs reduced pressure generated inside the container due to hot filling to stably maintain the appearance and shape of the trunk in a favorable state.

(Solution to Problem)

[0008] The disclosed synthetic resin container includes a mouth as a dispensing spout for a content medium, a trunk extending contiguous to the mouth via a shoulder, and a bottom closing a lower end of the trunk, in which the trunk is provided with a plurality of reduced pressure absorbing recesses arranged side by side in the circumferential direction, and the reduced pressure absorbing portion is formed in a barrel shape larger in diameter at an intermediate part in the vertical direction than at both ends in the vertical direction.

[0009] In the disclosed synthetic resin container configured as described above, the plurality of the reduced pressure absorbing recesses may each preferably be formed as a groove extending in the vertical direction while twisting in the circumferential direction about the axis of the reduced pressure absorbing portion.

[0010] In the disclosed synthetic resin container configured as described above, the plurality of the reduced pressure absorbing recesses may each preferably be larger in circumferential width at an intermediate part in the longitudinal direction than at the both ends in the longitudinal direction.

(Advantageous Effect)

[0011] According to the present disclosure, even in a situation where the pressure inside the container is decreased when the content medium at a high temperature is cooled after being filled into the container, not only the reduced pressure absorbing recesses deform but also the reduced pressure absorbing portion is deformed such that the intermediate part in the vertical direction is reduced in diameter, to thereby effectively absorb the reduced pressure. Accordingly, the appearance and shape of the container can be maintained in a favorable state.

[0012] As described above, the disclosed synthetic resin container is capable of effectively absorbing re-

duced pressure generated within the hot-filled container, so as to stably maintain the appearance and shape of the trunk in a favorable state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the accompanying drawings:

FIG. 1 is a front view illustrating the disclosed synthetic resin container according to one embodiment; FIG. 2 is a sectional view taken along the line A-A of FIG. 1; and

FIG. 3 is an explanatory view schematically illustrating the reduced pressure absorbing portion of FIG. 1 being in a barrel shape.

DETAILED DESCRIPTION

[0014] The present disclosure will be described in more detail below by illustration with reference to the drawings.

[0015] As illustrated in FIG. 1, the disclosed synthetic resin container 1 according to one embodiment contains, for example, a beverage, including a juice beverage and tea, or a liquid seasoning, including soy sauce, vinegar, and dressing, as the content medium. The synthetic resin container 1 is configured to cope with hot filling, in which the content medium is filled in a high temperature state where the content medium has been heated to a predetermined temperature. Here, the vertical direction of the synthetic resin container 1 corresponds to the upper and lower direction in FIG. 1.

[0016] The synthetic resin container 1 is formed in a bottle shape, which includes a mouth 2 as a dispensing spout for the content medium, a shoulder 3, which has a head-cut conical cylinder shape extending contiguous to a lower end of the mouth 2, a trunk 4, which has a substantially cylindrical shape extending contiguous to the mouth 2 via the shoulder 3, and a bottom 5, which closes a lower end of the trunk 4. Reference numeral S in FIG. 1 denotes the axis (central axis) common to the mouth 2, the shoulder 3, the trunk 4, and the bottom 5.

[0017] The synthetic resin container 1 may be formed as a so-called PET bottle, which is formed, for example, by biaxial stretch blow molding a polyethylene terephthalate preform. The synthetic resin container 1 may also be formed by biaxial stretch blow molding a preform made of any type of thermoplastic synthetic resin, such as oriented polypropylene (OPP), other than polyethylene terephthalate. Furthermore, the method of producing the synthetic resin container 1 is not limited to biaxial stretch blow molding of a preform and may be any of a variety of production methods, such as extrusion blow molding of a resin material.

[0018] The mouth 2 has an outer circumferential surface provided with a male screw 2a. After the content medium is hot-filled, the mouth 2 may be closed with a cap, which is not illustrated, screw-connected to the male screw 2a. Alternatively, an annular protrusion may be

provided, instead of the male screw 2a, on the outer circumferential surface of the mouth 2 and a cap may be fitted onto the annular protrusion so as to plug the mouth 2 by undercut fitting. Here, a neck ring 6 is provided between the mouth 2 and the shoulder 3.

[0019] The trunk 4 is provided with a reduced pressure absorbing portion 10. In the illustrated example, the reduced pressure absorbing portion 10 is provided over a predetermined range which is defined between an upper horizontal groove 7 and a lower horizontal groove 8 formed on the trunk 4, as being biased to the lower side of the trunk 4 in the vertical direction. The reduced pressure absorbing portion 10 is configured to deform so as to reduce the capacity of the synthetic resin container 1 in a case where the pressure inside the synthetic resin container 1 is reduced when the content medium at a high temperature is cooled after being hot-filled into the synthetic resin container 1 and the mouth 2 is closed with a cap, to thereby absorb the reduced pressure.

[0020] The upper horizontal groove 7 and the lower horizontal groove 8 are each depressed from the outer circumferential surface of the trunk 4 to the inner side of the trunk 4 and formed in an annular shape extending in the circumferential direction over the entire circumference of the trunk 4. The upper horizontal groove 7 and the lower horizontal groove 8 configured as described above may be used to define the reduced pressure absorbing portion 10 in the trunk 4, so that the trunk 4 is increased in radial direction rigidity in a part adjacent to the reduced pressure absorbing portion 10. This configuration allows for preventing deformation of the trunk 4 in a part other than the reduced pressure absorbing portion 10 due to reduced pressure while allowing the reduced pressure absorbing portion 10 to deform so as to reduce the capacity of the synthetic resin container 1 when the pressure is reduced within the synthetic resin container 1.

[0021] As illustrated in FIGS. 1 and 2, the reduced pressure absorbing portion 10 is provided with a plurality of reduced pressure absorbing recesses 11 arranged side by side in the circumferential direction. In FIGS. 1 and 2, only one of the reduced pressure absorbing recesses 11 is denoted by reference numeral for convenience; however, the reduced pressure absorbing portion 10 has a plurality of reduced pressure absorbing recesses 11 of the same shape, which are arranged at regular intervals in the circumferential direction over an entire circumference of the reduced pressure absorbing portion 10. In this embodiment, the reduced pressure absorbing portion 10 is provided with twelve of the reduced pressure absorbing recesses 11; however, the number of the reduced pressure absorbing recesses 11 may be varied as desired.

[0022] The plurality of reduced pressure absorbing recesses 11 each have a side surface 11a and a bottom surface 11b, and formed in a groove shape which is depressed toward the inside of the trunk 4. Further, the plurality of the reduced pressure absorbing recesses 11

each extend in the vertical direction while twisting in the circumferential direction about the axis (central axis) S of the trunk 4, i.e., the reduced pressure absorbing portion 10. In other words, the plurality of the reduced pressure absorbing recesses 11 are each formed in a concave rib shape extending in a direction inclined relative to the vertical direction such that one end (upper end) 11c thereof is located on the upper side than the other end (lower end) 11d thereof in the longitudinal direction and the one end 11c and the other end 11d in the longitudinal direction are displaced from each other in the circumferential direction.

[0023] Portions between the adjacent reduced pressure absorbing recesses 11 are each formed as a support portion 12, which extends as being inclined relative to the vertical direction. In FIGS. 1 and 2, only one of the support portions 12 is denoted by reference numeral for convenience; however, each portion between the adjacent reduced pressure absorbing recesses 11 is formed as the support portion 12, which makes twelve support portions 12 in total.

[0024] In this embodiment, the reduced pressure absorbing recesses 11 are each formed in a shape having a uniform circumferential width in the longitudinal direction such that the circumferential width in the intermediate part (intermediate part between the one end 11c and the other end 11d) in the longitudinal direction thereof becomes equal to the circumferential width at both ends, namely, one end 11c and the other end 11d in the longitudinal direction. Here, the circumferential width of the reduced pressure absorbing recess 11 is a circumferential distance between a point where one side surface 11a is intersecting with the support portion 12 and a point where the other side surface 11a is intersecting with the support portion 12.

[0025] FIG. 3 is an explanatory view schematically illustrating the reduced pressure absorbing portion 10 of FIG. 1 being formed in a barrel shape.

[0026] As illustrated in FIG. 3, the reduced pressure absorbing portion 10 is formed in a barrel shape having an intermediate part diameter R2 at an intermediate part in the vertical direction between the upper end 10a and the lower end 10b and end diameters R1 at the both ends, namely, the upper end 10a and the lower end 10b in the vertical direction, the intermediate part diameter R2 being larger than each of the end diameters R1.

[0027] In this embodiment, the reduced pressure absorbing portion 10 is formed in a barrel shape having a largest diameter at the center between the upper end 10a and the lower end 10b. However, the part having the largest diameter may be shifted upward or downward relative to the center between the upper end 10a and the lower end 10b. Further, in this embodiment, the upper end 10a and the lower end 10b both have the same end diameter R1; however, the end diameters R1 may be different from each other as long as the end diameters R1 are each smaller than the diameter at the intermediate part.

[0028] FIG. 3 illustrates the barrel shape of the reduced pressure absorbing portion 10 in an exaggerated manner; the intermediate part diameter R2 may be about 62 mm to 66 mm when the end diameter R1 is about 60 mm, so as to favorably maintain the appearance after reduced pressure deformation. Here, the end diameters R1 and the intermediate part diameter R2 are not limited to be in the aforementioned numerical range to form the reduced pressure absorbing portion 10 in a barrel shape.

[0029] In the aforementioned synthetic resin container 1, when the mouth 2 is closed with a cap after hot filling and the pressure inside is reduced, the plurality of the reduced pressure absorbing recesses 11 are each deformed toward the radially inside, so as to reduce the capacity of the synthetic resin container 1, to thereby absorb the reduced pressure. Further, when the pressure inside the synthetic resin container 1 is reduced, the barrel-shaped reduced pressure absorbing portion 10 itself is also deformed, in addition to the reduced pressure absorbing recesses 11 being deformed, such that the intermediate part in the vertical direction serving as a large diameter portion of the barrel-shaped reduced pressure absorbing portion 10 is reduced in diameter, which can further reduce the capacity of the synthetic resin container 1 so as to more effectively absorb the reduced pressure. In this manner, when the pressure inside the synthetic resin container 1 is reduced due to hot filling, the synthetic resin container 1 configured as described above is capable of absorbing the reduced pressure through deformation of the barrel-shaped reduced pressure absorbing portion 10 itself, in addition to the deformation of the plurality of the reduced pressure absorbing recesses 11, to thereby more effectively absorb the reduced pressure and stably maintain the appearance and shape of the trunk 4 in a favorable state. In particular, even when the synthetic resin container 1 is reduced in wall thickness for such purposes as weight reduction, the reduced pressure can still be effectively absorbed so as to stably maintain the appearance and shape of the trunk 4 in a favorable state.

[0030] Further, in the aforementioned synthetic resin container 1, the plurality of the reduced pressure absorbing recesses 11 are each formed as a groove extending in the vertical direction while twisting in the circumferential direction about the axis S of the reduced pressure absorbing portion 10. With this configuration, when the pressure is reduced inside the synthetic resin container 1, the reduced pressure absorbing recesses 11 and the support portion 12 are subjected not only to the diameter reducing deformation but also to deformation in the twisting direction so as to further increase the inclination angle, which can further reduce the capacity of the synthetic resin container 1. In this manner, the reduced pressure inside the synthetic resin container 1 can be absorbed further effectively, to thereby further stably maintain the appearance and shape of the trunk 4 in a favorable state.

[0031] Needless to say, the present disclosure is not limited to the aforementioned embodiment, and may be

subjected to various alterations without departing from the gist thereof.

[0032] For example, the plurality of the reduced pressure absorbing recesses 11, which are each formed in a groove shape in the aforementioned example, is not particularly limited thereto, and may be formed in various shapes such as, for example, a panel shape as long as being arranged side by side in the circumferential direction on the reduced pressure absorbing portion 10.

[0033] Further, in the aforementioned embodiment, the plurality of the reduced pressure absorbing recesses 11 are each formed to have a uniform circumferential width in the longitudinal direction. However, without being particularly limited thereto, the plurality of the reduced pressure absorbing recesses 11 may each be formed, for example, to have a wider circumferential width at the intermediate part (intermediate part between the one end 11c and the other end 11d) in the longitudinal direction than the circumferential width at the both ends in the longitudinal direction, namely, the one end 11c and the other end 11d. That is, the reduced pressure absorbing portion 10 may be formed to have the widest circumferential width at the intermediate part in the vertical direction thereof. In this manner, the plurality of the reduced pressure absorbing recesses 11 may each be shaped to have a wider circumferential diameter at the intermediate part in the longitudinal direction than the circumferential width at the both ends in the longitudinal direction, such that the barrel-shaped reduced pressure absorbing portion 10 can more readily be subjected to diameter reducing deformation and the reduced pressure absorbing recesses 11 and the support portion 12 can more readily be subjected to deformation in the twisting direction, and the reduced pressure absorbing recesses 11 themselves can also readily be deformed, to thereby further effectively absorb the reduced pressure generated inside the synthetic resin container 1. Here, the height of each of the reduced pressure absorbing recesses 11 at a part where the circumferential width becomes largest may preferably be the same as the height of the reduced pressure absorbing portion 10 at a part where the diameter becomes largest (the height at a part having the intermediate part diameter R2). However, the height may be different from the height of the reduced pressure absorbing portion 10 at a portion where the diameter becomes largest.

[0034] Further, the plurality of the reduced pressure absorbing recesses 11 may each be formed to have a narrower circumferential width at the intermediate part in the longitudinal direction than the circumferential width at the both ends in the longitudinal direction. In this case, the reduced pressure absorbing recesses 11 may be curved at only one of the side surface 11a sides toward the other side surface 11a side or may be curved at both side surface 11a sides toward each other side surface 11a side, to thereby narrow the circumferential width at the intermediate part in the longitudinal direction. When the plurality of the reduced pressure absorbing recesses

11 are each formed to have a narrower circumferential width at the intermediate part in the longitudinal direction than the circumferential width at the both ends in the longitudinal direction as described above, a shrink label applied to the reduced pressure absorbing portion 10 can be suppressed from generating wrinkles along with the deformation of the reduced pressure absorbing portion 10, and thus, the shrink label can be stably applied in an easy-to-see manner. The aforementioned effect can similarly be obtained when a roll label or a tack label is attached, in place of a shrink label, to the reduced pressure absorbing portion 10. Here, the shrink label refers to a label made of a heat-shrinking film such as polystyrene (PS) and polyethylene terephthalate (PET) and formed in a tubular shape having a diameter larger than that of the trunk 4. When heated by hot air or the like in a state where the shrink label covers the outer side of the trunk 4, the shrink label shrinks and adheres to the outer circumferential surface of the trunk 4. The roll label, which is also called wrap label, is made of a resin film or the like and formed in a band shape. The roll label is wrapped around the outer circumferential surface of the reduced pressure absorbing portion 10 and overlapping parts at both ends thereof are adhered via an adhesive or the like, so as to be applied to the reduced pressure absorbing portion 10 in the state of being wrapped. The tack label, which is made of a laminate paper or synthetic paper, is bonded to the outer circumferential surface of the reduced pressure absorbing portion 10 via a tackifier or the like.

[0035] Further, in the aforementioned embodiment, the plurality of the reduced pressure absorbing recesses 11 are each formed as a groove extending in the vertical direction while twisting in the circumferential direction about the axis S of the reduced pressure absorbing portion 10. However, without being limited thereto, the plurality of the reduced pressure absorbing recesses 11 may each be formed as a groove or a panel extending straight in the vertical direction along the axis S of the reduced pressure absorbing portion 10. Even in this case, in line with forming the reduced pressure absorbing portion 10 in a barrel shape, the plurality of the reduced pressure absorbing recesses 11 may each be formed to have a wider circumferential width at the intermediate part in the longitudinal direction than the circumferential width at both ends in the longitudinal direction, or to have a uniform circumferential width in the longitudinal direction, and further to have a narrower circumferential width at the intermediate part in the longitudinal direction than the circumferential width at the both ends in the longitudinal direction.

[0036] Further, in the aforementioned embodiment, the synthetic resin container 1 is applied for use in containing a beverage, including a juice beverage and tea, or a liquid seasoning, including soy sauce, vinegar, and dressing, as the content medium. However, without being limited thereto, the disclosed synthetic resin container 1 may also be applied for use in containing other content

media such as food or cosmetics, which are as long as hot-filled.

rection than at the both ends in the longitudinal direction.

REFERENCE SIGNS LIST

5

[0037]

1	synthetic resin container	
2	mouth	
2a	male screw	10
3	shoulder	
4	trunk	
5	bottom	
6	neck ring	
7	upper horizontal groove	15
8	lower horizontal groove	
10	reduced pressure absorbing portion	
10a	upper end	
10b	lower end	
11	reduced pressure absorbing recess	20
11a	side surface	
11b	bottom surface	
11c	one end	
11d	other end	
12	support portion	25
S	axis (central axis)	
R1	diameter at end	
R2	diameter at intermediate part	
		30

Claims

1. A synthetic resin container in a bottle shape comprising a mouth as a dispensing spout for a content medium, a trunk extending contiguous to the mouth via a shoulder, and a bottom closing a lower end of the trunk, wherein:
 - the trunk is provided with a reduced pressure absorbing portion having a plurality of reduced pressure absorbing recesses arranged side by side in the circumferential direction, and
 - the reduced pressure absorbing portion is formed in a barrel shape larger in diameter at an intermediate part in the vertical direction than at both ends in the vertical direction.
2. The synthetic resin container according to claim 1, wherein the plurality of the reduced pressure absorbing recesses are each formed as a groove extending in the vertical direction while twisting in the circumferential direction about the axis of the reduced pressure absorbing portion.
3. The synthetic resin container according to claim 2, wherein the plurality of the reduced pressure absorbing recesses each being larger in circumferential width at an intermediate part in the longitudinal di-

FIG. 1

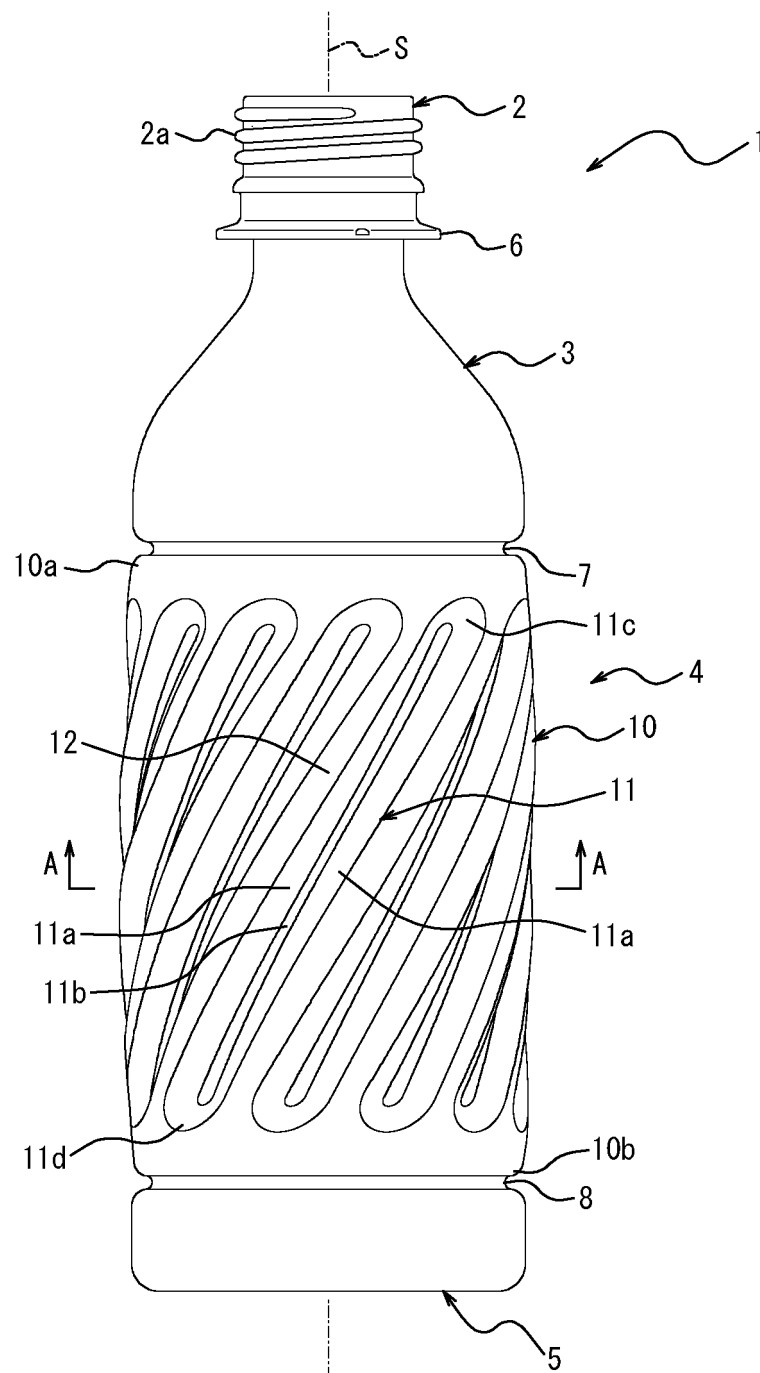


FIG. 2

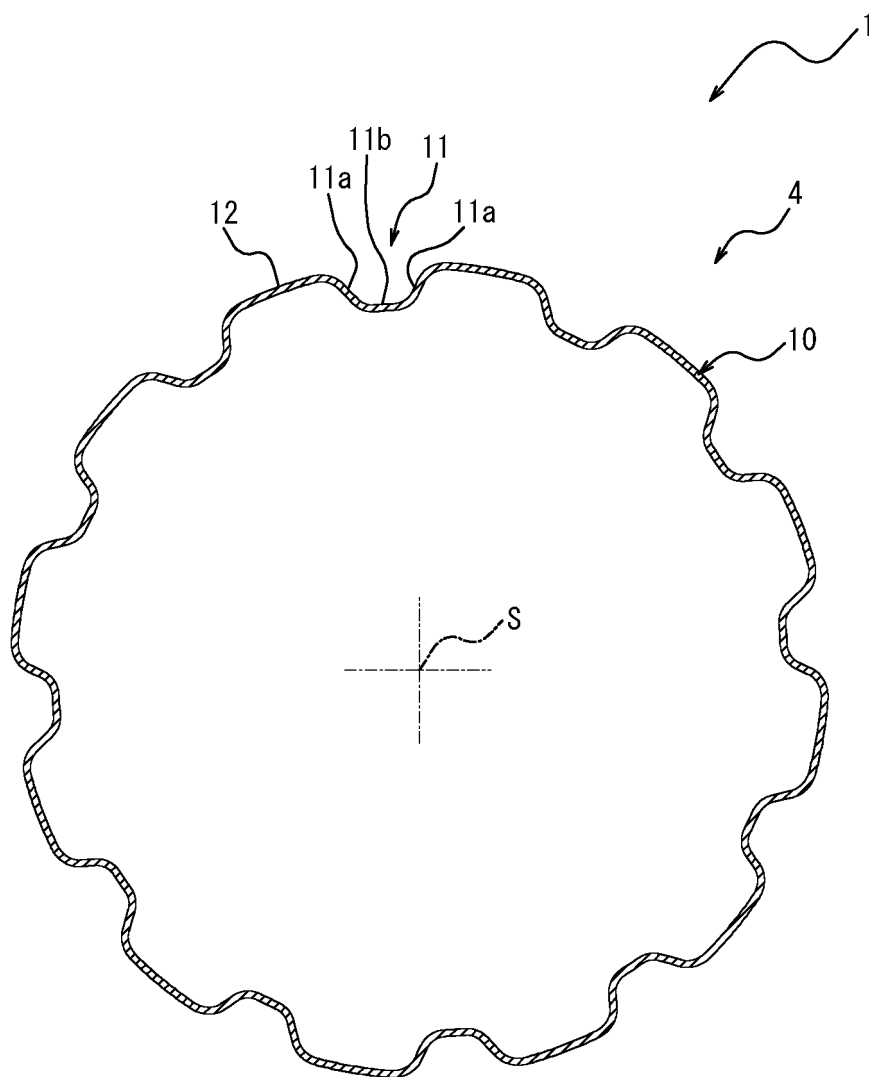
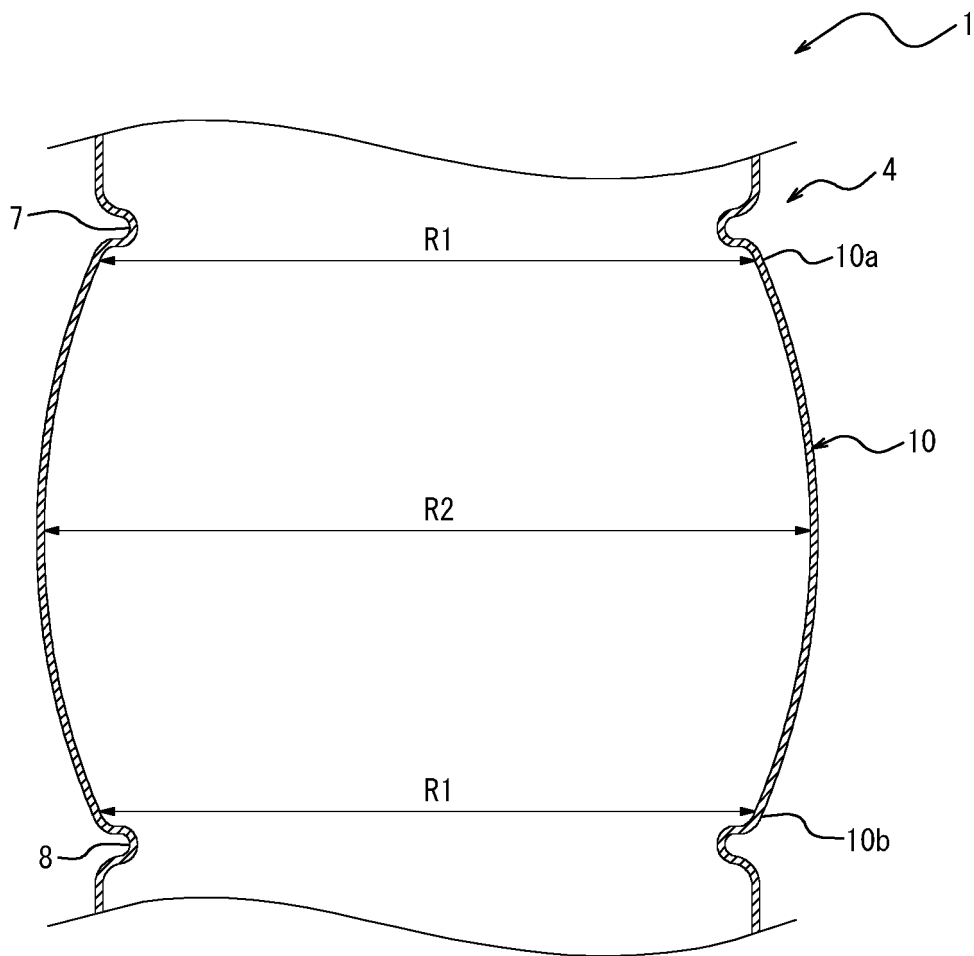


FIG. 3



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/024489

A. CLASSIFICATION OF SUBJECT MATTER

B65D1/02(2006.01)i, B65D1/44(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)

B65D1/02, B65D1/44

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 2010-247834 A (Toyo Seikan Kaisha, Ltd.), 04 November 2010 (04.11.2010), paragraphs [0011] to [0015]; fig. 1 to 5 (Family: none)	1-3
Y	US 4749092 A (YOSHINO KOGYOSHO CO., LTD.), 07 June 1988 (07.06.1988), column 1, lines 15 to 36; column 2, lines 19 to 33; fig. 1 to 3 & GB 2066766 A & WO 1981/000390 A1 & EP 33745 A1	1-3

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

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Date of the actual completion of the international search
20 July 2017 (20.07.17)Date of mailing of the international search report
01 August 2017 (01.08.17)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

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Telephone No.

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004323100 A [0005]