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(72) Inventors:
• **KIRA Go**
Tokyo 135-8631 (JP)
• **AKANUMA Yasuhiko**
Tokyo 135-8631 (JP)

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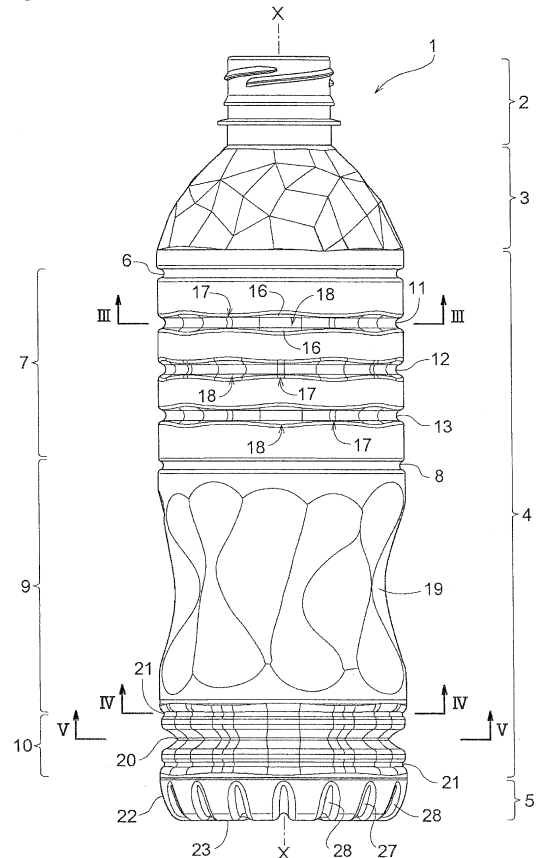
(74) Representative: **Vossius & Partner**
Siebertstrasse 4
81675 München (DE)

(71) Applicant: **Suntory Holdings Limited**
Osaka-shi, Osaka 530-8203 (JP)

(54) **RESIN CONTAINER**

(57) A resin container includes a neck section 2 to which a cap can be detachably attached, a shoulder section 3 formed continuously from the neck section 2, a body section 4 formed continuously from the shoulder section 3, and a bottom section 5 formed continuously from the body section 4 and located at the lowermost portion. The container further includes, at the lower end portion of the body section 4, a bellows-like cushioning section 10 that is elastically deformable in the vertical direction.

【Fig. 1】



Description

TECHNICAL FIELD

[0001] The present invention relates to a resin container including a neck section to which a cap can be detachably attached, a shoulder section formed continuously from the neck section, a body section formed continuously from the shoulder section, and a bottom section formed continuously from the body section and located at the lowermost portion.

BACKGROUND ART

[0002] A resin container represented by a PET bottle is suitable for mass production for its readiness of molding. The resin container has other advantageous properties such as a certain degree of mechanical strength and being of light-weight. Thus, the resin container is used in a wide range of fields as a container to be charged with various kinds of liquid or the like. In recent years in particular, a great number of them are being used as containers for beverages such as tea, mineral water or the like and are used not only for sale at stores but for sale at vending machines.

[0003] In recent years, with ever increasing awareness of environmental problems, there has been an active effort going on for weight reduction of resin bottles. However, with reduction in the thickness of the bottle as a result of weight reduction, there occurs general reduction in its strength, so that the container becomes unable to effectively withstand shocks or load applied thereto at the time of its commercial distribution. Further, there occurs also a problem of increased difficulty of hand holding thereof by a consumer.

[0004] As a conventional resin container devised in an attempt to solve such problems as above, there is one known from Patent Document 1 identified below for example. In this, at a plurality of vertical portions of the body section, there are formed a plurality of grooves that extend along the entire circumference of the body section, in an attempt to ensure strength for the resin container (see Patent Document 1).

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0005] Patent Document 1: Japanese Unexamined Patent Application Publication No. 2009-154959

SUMMARY OF THE INVENTION

OBJECT TO BE ACHIEVED BY INVENTION

[0006] With the conventional resin containers; however, sufficient strength cannot always be ensured for a shock or a load which is applied along the vertical direc-

tion. For instance, when a plurality of commercial products comprised of the resin containers filled with beverage or the like are stacked one after another vertically, collapse can sometimes occur in the lower-placed products under the load applied from the products stacked thereon.

Therefore, the object of the present invention is to provide a resin container that can effectively withstand a shock or a load applied upwardly or downwardly of the container and that allows weight reduction thereof as well.

MEANS FOR ACHIEVING THE OBJECT

[0007] According to a first characterizing feature of a resin container of the present invention, the resin container includes a neck section to which a cap can be detachably attached, a shoulder section formed continuously from the neck section, a body section formed continuously from the shoulder section and a bottom section formed continuously from the body section and located at the lowermost portion, wherein the container further includes, downwardly of the vertical center of the body section, a cushioning section elastically deformable in the vertical direction and having a groove that extends along the entire circumference thereof with a width progressively increased radially outward.

[Function and Effect]

[0008] With the above-described arrangement in which at the lower end portion of the body section, the container include a cushioning section elastically deformable in the vertical direction, even when a shock or a load is applied to the container along the vertical direction, as the cushioning section is elastically deformed around the groove that extends along the entire circumference thereof with a width progressively increased radially outward, thereby to absorb this load. Consequently, collapse of the container can be prevented. Further, as the cushioning section is placed lower than the vertical center of the body section, when this resin container is filled with an amount of beverage or the like, the elastic deformation occurs at a position adjacent or lower than its center of gravity, so that the shock or load can be absorbed in a more stable manner.

[0009] According to a second characterizing feature, the cushioning section is placed at the lower end of the body section.

[Function and Effect]

[0010] With the above-described arrangement, since the cushioning section is placed at the lower end of the body section, the shock or load can be absorbed in an even more stable manner. Moreover, as the cushioning section becomes less conspicuous than one provided at an upper portion, disadvantageous effect to the aesthetic performance of the resin container is smaller.

[0011] According to a third characterizing feature, the cushioning section includes one or more further grooves extending along the entire circumference thereof and provided respectively upwardly and downwardly of said groove extending with a width progressively increased radially outward.

[Function and Effect]

[0012] With the above-described arrangement, the cushioning section is provided with three or more stages (or steps or layers) of spring-like arrangements, so that the load can be absorbed even more reliably.

[0013] According to a fourth characterizing feature of the invention, the groove that extends with a width progressively increased radially outward has a depth greater than the depth of said further groove(s).

[Function and Effect]

[0014] With the above-described arrangement, the shape of the cushioning section as seen in the front view thereof exhibits a constricted shape whose diameter is most reduced in the vicinity of the groove extending with a width progressively increased radially outward. With this, stress concentration tends to occur at the groove with a width progressively increased radially outward when a load or the like is applied along the vertical direction, so that the elastic deformation can occur even more smoothly.

[0015] According to a fifth characterizing feature, the resin container further comprises a first protruding region protruding radially inward in the body section and a second protruding region protruding in a chevron-form and protruding more radially inward than the first protruding region, and the first protruding region and the second protruding region are provided in alternation along the circumferential direction, so that the resin container is provided, along the vertical direction of the body section, with a plurality of waveform recessed portions having a waveform circumferential shape in its cross sectional shape.

[Function and Effect]

[0016] With the above-described arrangement, when a plurality of waveform recessed portions having a waveform circumferential shape in its cross sectional shape are provided along the vertical direction of the body section, the arrangement provides a higher reinforcing effect than a rib having a circular cross sectional shape. Moreover, unlike a rib having a polygonal cross sectional shape, stress concentration is alleviated due to absence of any angular portions.

Therefore, with the inventive arrangement described above, even when the container is formed thin for the purpose of weight reduction, the container still can ensure sufficient strength against a shock or a load that is

applied to the lateral side of the container.

[0017] According to a sixth characterizing feature, the plurality of waveform recessed portions are disposed with a phase difference along the circumferential direction relative to each other, and at the position where the first protruding region of one waveform recessed portion is located, the second protruding region of a further waveform recessed portion disposed immediately below it is located.

[Function and Effect]

[0018] With the above-described arrangement, with the arrangement of circumferential phase difference between the plurality of waveform recessed portions, the strength of the body section as a whole can be more uniform, so that the stress concentration can be alleviated even more effectively.

20 BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

[Fig. 1] is a front view of a resin container according to the present invention,

[Fig. 2] is a perspective view of a straight body portion of the inventive resin container,

[Fig. 3] is a section view along an arrow line III-III in Fig. 1,

[Fig. 4] is a section view along an arrow line IV-IV in Fig. 1,

[Fig. 5] is a section view along an arrow line V-V in Fig. 1,

[Fig. 6] is a bottom view of a bottom section of the inventive resin container, and

[Fig. 7] is a front view showing a further embodiment of a straight body section.

MODES OF EMBODYING THE INVENTION

[0020] Next, a plastic bottle for beverage as a preferred embodiment of a resin container relating to the present invention will be described with reference to the accompanying drawings.

[Embodiments]

[0021] Firstly, various terms used in the present description will be defined as follows.

[0022] As used herein, the vertical direction means the direction of the center axis X-X of the plastic bottle 1 (to be referred to as the bottle 1 hereinafter) shown in Fig. 1. The "upper side" represents the upper side in the plane of the figure, the lower side represents the lower side of the plane of the figures, respectively. The lateral direction or horizontal direction means the direction perpendicular to the center axis X-X. The circumferential direction means the direction along the contour of the cross sec-

tional shape. The radial direction means the radial direction of the circle centering about any point on the center axis X-X. The height or width means the length or dimension along the center axis X-X direction. The depth means the length or dimension along the radial direction. The cross sectional shape means the cross sectional shape of the bottle 1 in the plane (cross sectional plane) perpendicular to the center axis X-X.

[0023] As shown in Fig. 1, the bottle 1 relating to the instant embodiment includes, as recited in the order from the upper side thereof, a neck section 2 to which a cap can be detachably attached, a shoulder section 3 formed continuously from the neck section 2, a body section 4 formed continuously from the shoulder section 3, and a bottom section 5 formed continuously from the body section 4 and located at the lowermost portion. These sections together form an inner space for storing an amount of beverage.

[0024] The neck section 2, the shoulder section 3, the body section 4, and the bottom section 5 are formed integrally of a thermoplastic resin such as polyethylene, polypropylene, polyethylene terephthalate, etc. as a main material thereof by a stretch molding technique such as a biaxial stretch molding technique.

[0025] After its molding, the bottle 1 will be subjected to a cleaning/sterilizing treatment and then charged or filled with an amount of beverage. As some non-limiting examples of the beverage to be charged, non-carbonated drinks such as mineral water, green tea, oolong tea, fruit juice, can be cited. However, besides these, carbonated drink or a food product such as sauce too can be charged.

(Neck Section)

[0026] The neck section 2 is opened at its upper end and functions as a "spout" for the beverage. The opening of the neck section 2 is opened/closed with an unillustrated attachable/detachable cap.

(Shoulder Section)

[0027] The shoulder section 3 includes a polygonal body having a generally circular cross sectional shape whose diameter is progressively increased toward the lower side and the lower end of the shoulder section 3 is continuous from a first recessed portion 6 of the body section 4.

(Body Section)

[0028] The body section 4 includes, as recited in the order from the upper side thereof, the first recessed portion 6, a straight body portion 7 formed continuously from the first recessed portion 6, a second recessed portion 8 formed continuously from the straight body portion 7, a constricted portion 9 formed continuously from the second recessed portion 8, and a cushioning section 10

formed continuously from the constricted portion 9.

[First and Second Recessed Portions]

[0029] The first and second recessed portions 6, 8 are grooves provided along the entire circumference of the body section 4 and function as reinforcing ribs for increasing the strength against a shock or a load that can be applied to the lateral face of the bottle 1 (this strength will be referred to briefly as the "lateral strength" hereinafter). Incidentally, the width and the depth of the respective grooves of the first and second recessed portions 6, 8 are constant along the entire circumference of the body section 4, and the width and the depth of the first recessed portion 6 are same as the width and the depth of the second recessed portion 8.

[Straight Body Portion]

[0030] The straight body portion 7 is a cylindrical portion whose cross sectional shape is of a regular circle and forms the maximum outer diameter of the bottle 1. Further, on the outer peripheral face of the straight body portion 7, there can be provided a label or the like for showing the brand of the beverage, etc. In the straight body portion 7, first through third waveform recessed portions 11, 12, 13 are provided with equal distance therebetween along the vertical direction. These first through third waveform recessed portions 11, 12, 13 are grooves provided along the entire circumference of the straight body portion 7 and have the function as reinforcing ribs for increasing the lateral strength of the bottle 1, just like the first and second recessed portions 6, 8 described above.

[First through Third Waveform Recessed Portions]

[0031] Next, the first through third waveform recessed portions 11, 12, 13 will be described in greater details. In the following discussion, as these portions are of a same construction, the construction will be described only for the first waveform recessed portion 11 and descriptions of the constructions of the second and third waveform recessed portions 12, 13 will be omitted.

[0032] As shown in Fig. 2, the first waveform recessed portion 11 includes a first protruding portion 14 protruding radially inward and a second protruding region 15 protruding in a chevron-form and protruding more radially inward than the first protruding region 14.

[0033] The first protruding region 14 and the second protruding region 15 are provided in alternation along the circumferential direction. In the instant embodiment, the first protruding region 14 and the second protruding region 15 are provided respectively at seven positions with an angular distance of about 51 degrees in the circumferential direction relative to each other.

[0034] As shown in Fig. 3, the cross sectional shape of the groove of the second protruding region 15 is a

chevron-shape which protrudes more radially inwards than the position of the first protruding region 14, so that the cross sectional shape of the first waveform recessed portion 11 as a whole exhibits a circumferential shape with waves having more conspicuous undulations.

[0035] As shown in Fig. 1 and Fig. 2, the groove of the second protruding region 15 has two chevron-shaped sloped faces 16 extending vertically, so that the groove has a width which progressively increases radially outwards. Further, the width of the groove 17 constituting the first protruding region 14 is narrower than the width of the groove 18 constituting the second protruding region 15. So, as shown in Fig. 1, the narrow groove 17 and the wide groove 18 are provided in alternation along the circumferential direction while forming waveform curves vertically.

[0036] As shown in Fig. 2, the first through third waveform recessed portions 11, 12, 13 are disposed with a phase difference relative to each other in the circumferential direction. For instance, at the position where the first protruding region 14 of the first waveform recessed portion 11 is placed, the second protruding region 15 of the second waveform recessed portion 12 downwardly thereof is placed and further, the first protruding region 14 of the third waveform recessed portion 13 disposed further downward is placed. Further, as shown in Fig. 1 and Fig. 2, at the position where the narrow groove 17 of the first waveform recessed portion 11 is placed, the wide groove 18 of the second waveform recessed portion 12 downward thereof is placed and also the narrow groove 17 of the third waveform recessed portion 13 further downwards is placed.

[Constructed Portion]

[0037] As shown in Fig. 1, the constricted portion 9 is a portion configured to facilitate a consumer's hand-gripping of the bottle 1. The constricted portion 9, as seen in the front view, has a shape formed as if by combining a roundish rhombus-shaped panel and a pandurate shaped panel in alternation each other. In the constricted portion 9, the diameter is progressively reduced toward its vertical center position 19.

[0038] Though not shown, the constricted portion 9 has a polygonal shape in its cross section, and the cross section at a center position 19 of the constricted portion 9 has a roundish approximately octagonal shape, which progressively approximates a circular shape as it extends vertically away from the center position 19 and which exhibits a roundish hexadecagonal shape at each of upper and low end portions.

[Cushioning Section]

[0039] As shown in Fig. 1, the cushioning section 10 comprises a bellows-like portion having, as three grooves extending the entire circumference thereof, a V-shaped recessed portion 20 whose width progressively increases

radially outward and which has a V-shaped vertical sectional shape, and two small recessed portions 21, 21 provided upwardly and downwardly of the V-shaped recessed portion 20 respectively. The cushioning section 10 has a line-symmetrical construction around the V-shaped recessed portion 20 as the axis of its line symmetry. As shown in Fig. 4, the small recessed portion 21 has a cross sectional shape which exhibits a waveform circumferential shape with undulations. Further, as shown in Fig. 5, the cross sectional shape of the V-shaped recessed portion 20 too exhibits a waveform circumferential shape with undulations.

[0040] The size of the inner diameter of the deepest portion of the V-shaped recessed portion 20 is substantially equal to the size of the inner diameter of the constricted portion 9 at the vertical center position thereof. The width of the groove of the small recessed portion 21 is smaller than the widths of any of the first first and second recessed portions 6, 8, the first through third waveform recessed portions 11, 12, 13 and the V-shaped recessed portion 20. Further, the depth of the small recessed portion 21 is smaller than the depths of any of the first first and second recessed portions 6, 8, the first through third waveform recessed portions 11, 12, 13 and the V-shaped recessed portion 20.

[0041] The cushioning section 10 comprises a three-staged (three-stepped or layered) spring-like construction having, as three grooves, the V-shaped recessed portion 20 and the two small recessed portions 21, 21, by which construction the cushioning section 10 can be elastically deformed along the vertical direction. Therefore, even when a load is applied along the vertical direction to the bottle 1, the cushioning section 10 is elastically deformed to absorb this load, whereby collapse of the bottle 1 can be avoided.

[0042] Incidentally, the cushioning section 10 in this embodiment includes the three grooves, namely, the V-shaped recessed portion 20 and the two small recessed portions 21, 21 as grooves extending along the entire circumference thereof. However, the invention is not limited thereto. For instance, the cushioning section 10 can include only one or more V-shaped recessed portion (s) 20 or can include one or more small recessed portion (s) 21 upwardly and downwardly of the V-shaped recessed portion 20 or can include a plurality of V-shaped recessed portions 20 and one or more small recessed portions 21. Further, in the instant embodiment, the cushioning section 10 is provided at the lower end portion of the body section 4. However, the invention is not limited thereto. Instead, any desired arrangement is possible as long as the cushioning section 10 is provided downwardly of the vertical center of the body section 4.

(Bottom Section)

[0043] As shown in Fig. 1, the bottom section 5 includes a peripheral wall 22 and a bottom wall 23. The peripheral wall 22 is a cylindrical portion which extends upward from

the peripheral edge of the bottom wall 23 to be opened progressively wider. As shown in Fig. 6, the bottom wall 23 has a regular circular shape and includes a ring-like contact portion 24 disposed adjacent the outer peripheral edge thereof, a conical portion 25 rising smoothly in a conical shape from the inner edge of the contact portion 24 toward the center of the circle of the conical portion 23, and an upwardly protruding circular depression 26 formed at the center of the circle of the conical portion 25. Incidentally, when the bottle 1 is placed erect on e.g. a flat desk or the like, the contact portion 24 contacts the desk or the like.

[0044] As shown in Fig. 6, a vertical recessed portion 27 is provided as a groove extending from the depression 26 of the bottom wall 23 to the peripheral wall 22. And, such vertical recessed portions 27 are provided at eight positions along the circumferential direction in a radially equidistant arrangement from the depression 26 of the bottom wall 23. Further, a small vertical recessed portion 28 is provided as a groove extending from the outer edge of the conical portion 25 to the peripheral wall 22. And, such small vertical recessed portions 28 are provided at eight positions along the circumferential direction in a radially equidistant arrangement to be placed between each adjacent vertical recessed portions 27.

[0045] The vertical recessed portions 27 and the small vertical recessed portions 28 serve as reinforcing ribs for enhancing the strength of the bottom section 5. Further, these vertical recessed portions 27 and small vertical recessed portions 28 provide additional function of guiding cleaning liquid at the time of cleaning of the inside of the bottle 1 after molding thereof, so that the liquid may be distributed evenly the entire bottom section 5 as it is guided along the vertical recessed portions 27 and the small vertical recessed portions 28, thus contributing to improvement of cleaning performance of the bottom section 5.

[0046] [Other Embodiments]

(1) The shapes, etc. of the respective components of the bottle 1 of the above-described embodiment are not limited to those in this embodiment, but can be changed if desired and/or needed, as long as such modifications are not to depart from the essential arrangement of the present invention.

(2) In the foregoing embodiment, the first through waveform recessed portions 11, 12, 13 are disposed horizontally as seen in the front view of the bottle 1. However, the invention is not limited thereto. Instead, for instance, as shown in Fig. 7, the first through third waveform recessed portions 11, 12, 13 may be disposed with inclinations as seen in the front view of the bottle 1.

INDUSTRIAL APPLICABILITY

[0047] The use of the resin container according to the present invention is not limited to non-carbonated bev-

erages or drinks such as water, green tea, oolong tea, fruit juice or the like, but the inventive container may be used as a container to be charged or filled with a carbonated drink or a food stuff such as sauce or the like.

DESCRIPTION OF REFERENCE MARKS

[0048]

1	bottle
2	neck section
3	shoulder section
4	body section
5	bottom section
10	cushioning section
11-13	first through third waveform recessed portions
14	first protruding region
15	second protruding region

Claims

1. A resin container comprising a neck section to which a cap can be detachably attached, a shoulder section formed continuously from the neck section, a body section formed continuously from the shoulder section and a bottom section formed continuously from the body section and located at the lowermost portion;
wherein the container further comprises, downwardly of the vertical center of the body section, a cushioning section elastically deformable in the vertical direction and having a groove that extends along the entire circumference thereof with a width progressively increased radially outward.
2. The resin container according to claim 1, wherein the cushioning section is placed at the lower end of the body section.
3. The resin container according to claim 1 or 2, wherein the cushioning section includes one or more further grooves extending along the entire circumference thereof and provided respectively upwardly and downwardly of said groove extending with a width progressively increased radially outward.
4. The resin container according to claim 3, wherein the groove that extends with a width progressively increased radially outward has a depth greater than the depth of said further groove(s).
5. The resin container according to any one of claims 1-4, wherein the resin container further comprises a first protruding region protruding radially inward in the body section and a second protruding region protruding in a chevron-form and protruding more radially inward than the first protruding region, and the

first protruding region and the second protruding region are provided in alternation along the circumferential direction, so that the resin container is provided, along the vertical direction of the body section, with a plurality of waveform recessed portions having a waveform circumferential shape in its cross sectional shape. 5

6. The resin container according to claim 5, wherein the plurality of waveform recessed portions are disposed with a phase difference along the circumferential direction relative to each other, and at the position where the first protruding region of one waveform recessed portion is located, the second protruding region of a further waveform recessed portion disposed immediately below it is located. 10 15

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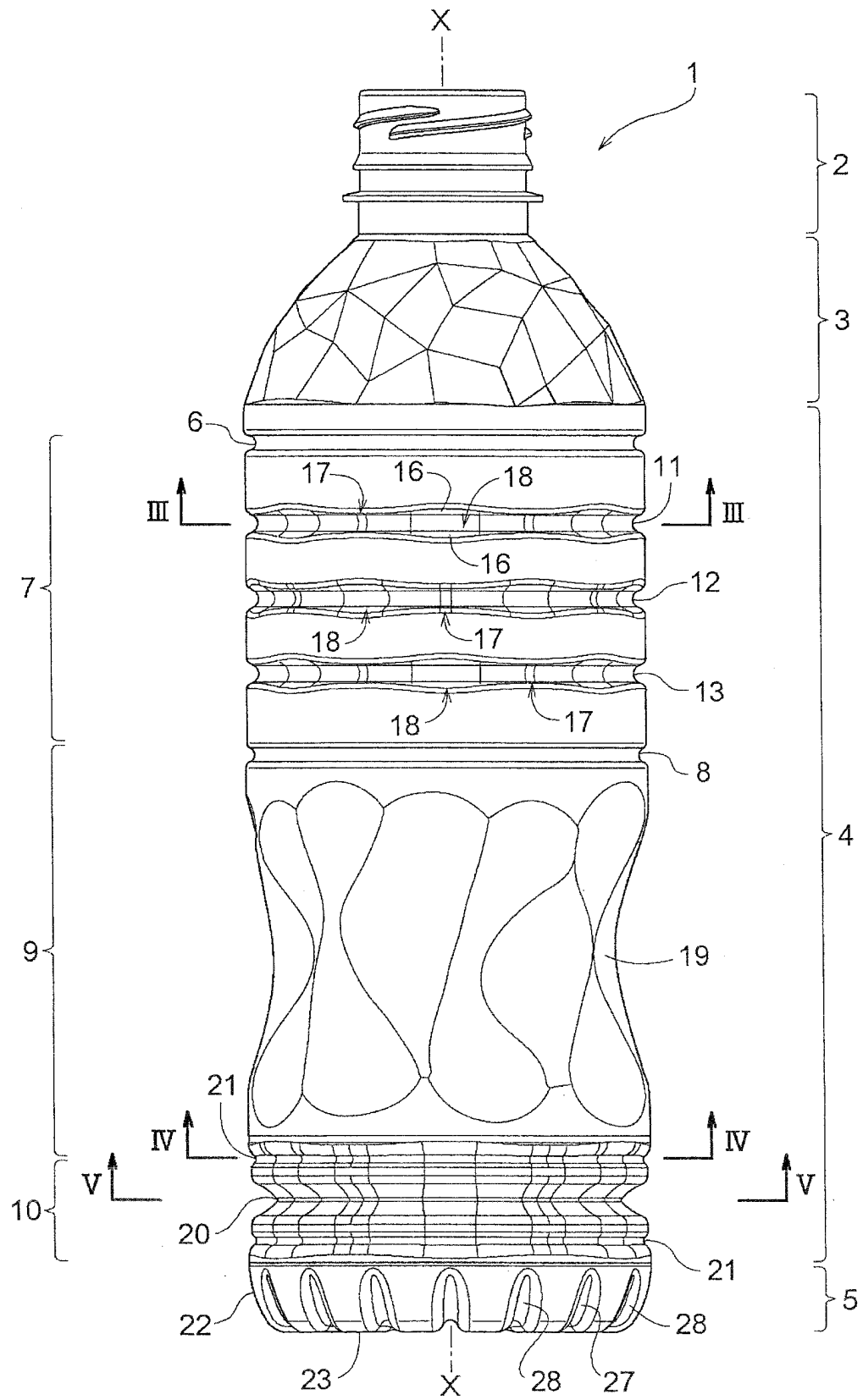
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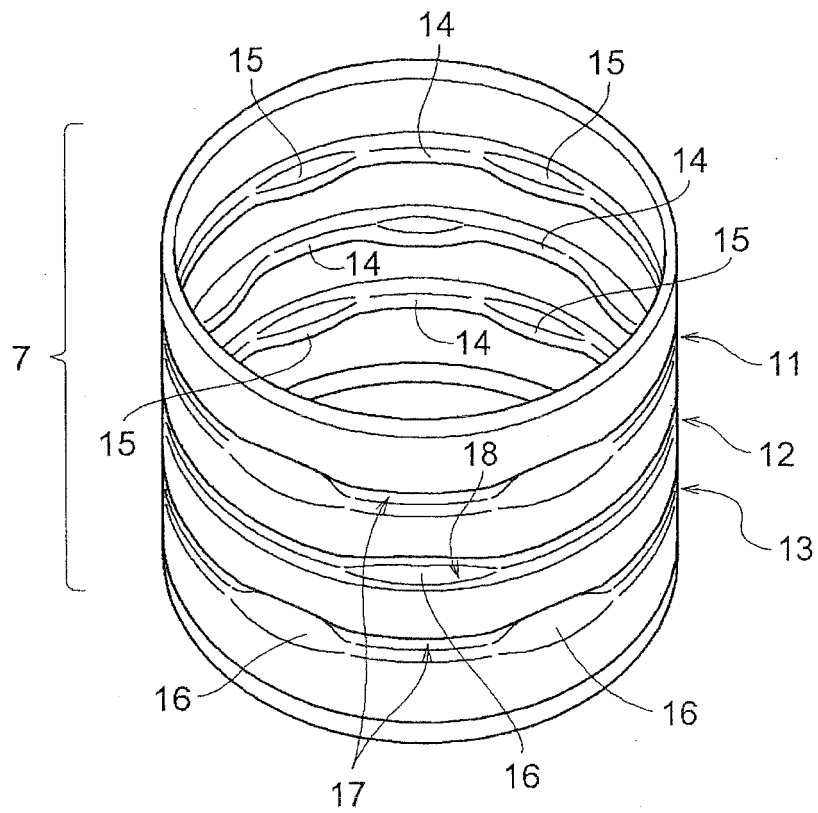
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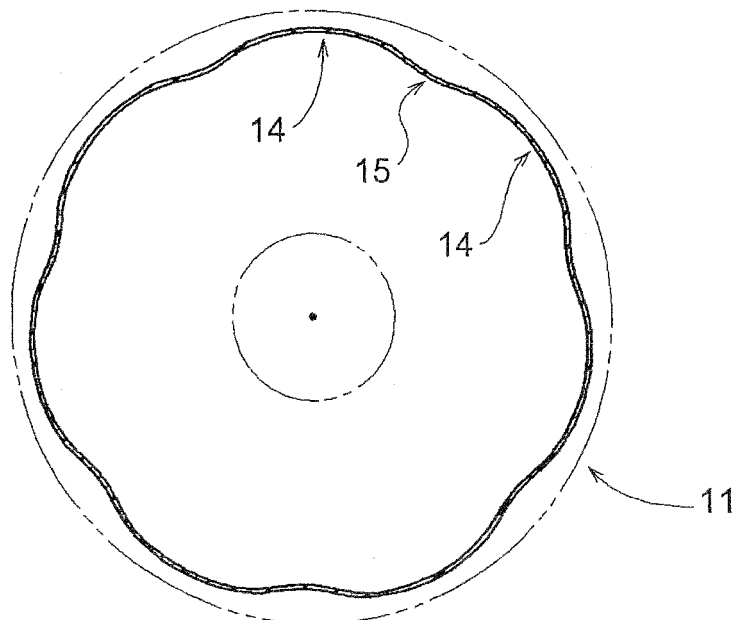
【Fig. 1】



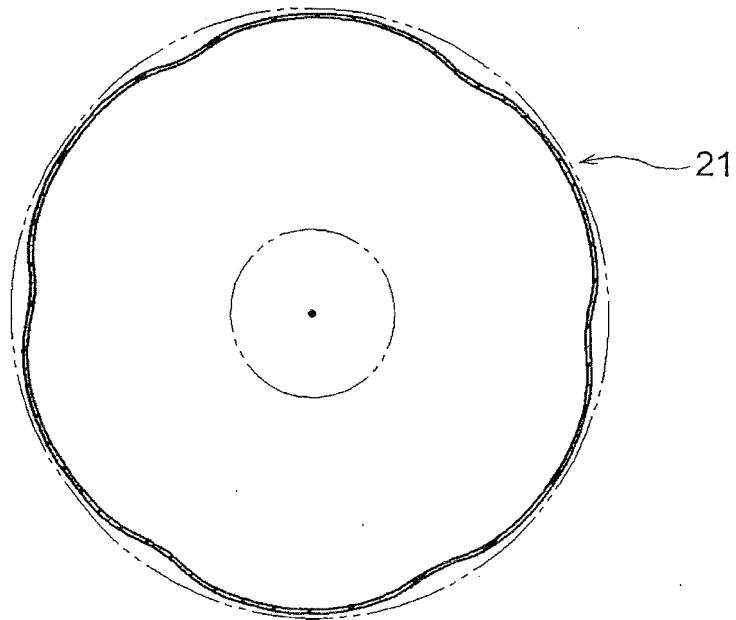
【Fig. 2】



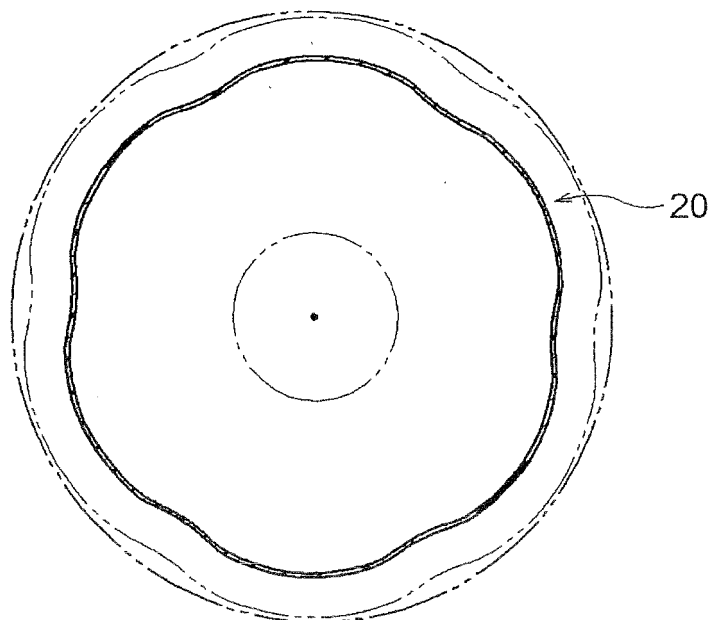
【Fig. 3】



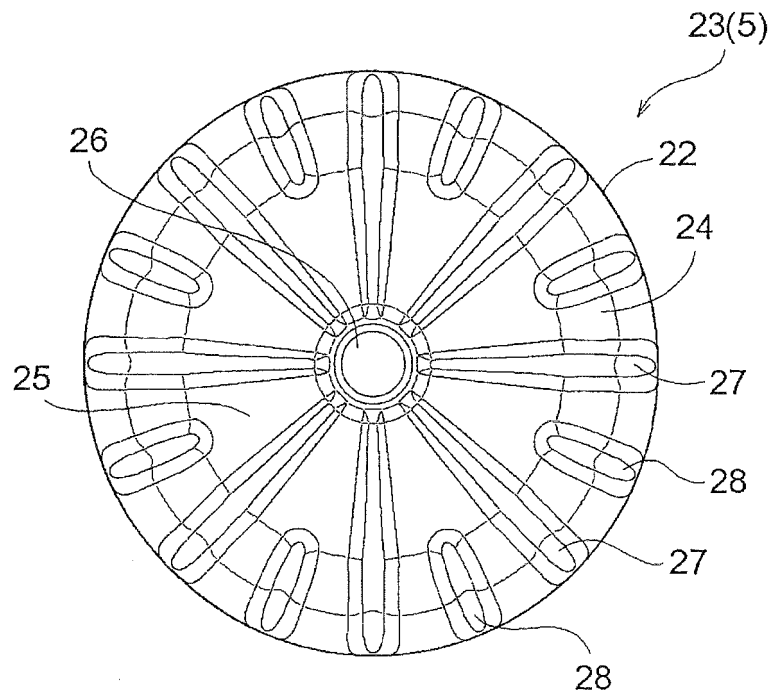
【Fig. 4】



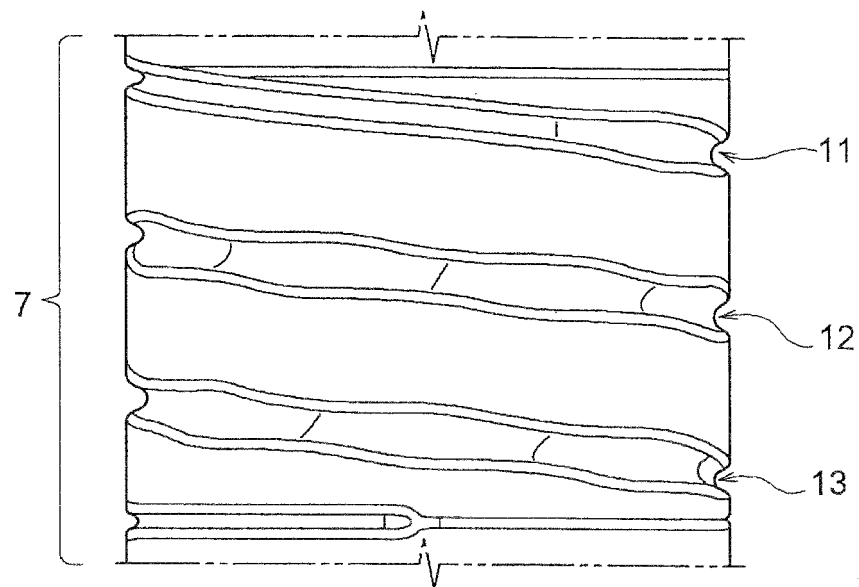
【Fig. 5】



【Fig. 6】



【Fig. 7】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/078934

A. CLASSIFICATION OF SUBJECT MATTER

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)

B65D1/02

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	1996-2012
Kokai Jitsuyo Shinan Koho	1971-2012	Toroku Jitsuyo Shinan Koho	1994-2012

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 A	JP 2005-335767 A (Yoshino Kogyosho Co., Ltd.), 08 December 2005 (08.12.2005), paragraph [0043]; fig. 1 & US 2005/0263481 A1	1-4 5, 6
Y A	JP 2005-313975 A (Yoshino Kogyosho Co., Ltd.), 10 November 2005 (10.11.2005), paragraph [0045]; fig. 2 (Family: none)	1-4 5, 6
Y A	JP 2009-154959 A (The Coca-Cola Co.), 16 July 2009 (16.07.2009), paragraphs [0018] to [0033]; fig. 7 (Family: none)	4 5, 6

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

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search
02 March, 2012 (02.03.12)Date of mailing of the international search report
13 March, 2012 (13.03.12)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2011/078934

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2010-126233 A (Yoshino Kogyosho Co., Ltd.), 10 June 2010 (10.06.2010), fig. 3 & EP 2319771 A1 & WO 2010/018835 A1	5, 6
A	JP 2000-229614 A (Lion Corp.), 22 August 2000 (22.08.2000), entire text; all drawings (Family: none)	1-4

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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