

DESCRIPTION

TITLE OF THE INVENTION

5 **RESIN MADE CONTAINER**

TECHNICAL FIELD

[0001]

10 This invention relates to a resin made container such as a PET bottle.

BACKGROUND ART

[0002]

15 As conventional resin made containers, there is known, from e.g. Patent Document 1, a PET bottle having a constricted portion and a plurality of annular grooves, which are provided in a body portion of the bottle. With this PET bottle, even if a certain shock or load is applied thereto from the vertical direction during e.g. conveyance, such shock or load will be absorbed by elastic deformation occurring in the constricted
20 portion or the annular grooves, so buckling deformation will not occur easily.

BACKGROUND ART DOCUMENT

PATENT DOCUMENT

25 [0003]

 Patent Document 1: Japanese Unexamined Patent Application Publication No. 2008-13180

SUMMARY OF THE INVENTION

30 **PROBLEM TO BE SOLVED BY INVENTION**

[0004]

 However, with the conventional PET bottle, with provision of the constricted portion or the plurality of annular grooves, their uneven appearance can impair the aesthetic feature. Thus, there remains room
35 for improvement. Accordingly, an object of the invention is to improve the buckling resistance of a resin made container without impairing its

aesthetic feature.

SOLUTION

[0005]

5 For accomplishing the above-noted object, according to a first characterizing feature of a resin made container relating to the present invention, the resin made container includes a spout portion to/from which a cap can be attached/detached, a shoulder portion continuous with the spout portion, a body portion continuous with the shoulder
10 portion and a bottom portion continuous with the body portion and disposed at a lowermost portion of the bottle;

 wherein at a lateral wall lower end of the bottom portion, there is formed a step which is receded to the inner side along a circumferential direction.

[0006]

 According to a further characterizing feature of the resin made bottle of the invention, the step has a vertical cross sectional shape which is formed of a first curved portion which protrudes to the outer side of the container, a second curved portion which protrudes to the
20 inner side of the container, and a third curved portion which protrudes to the outer side of the container, the first through third curved portions being formed continuous in this order from the upper side.

[0007]

 According to a still further characterizing feature of the resin
25 made container of the invention, the second curved portion has a curvature radius smaller than a curvature radius of the first curved portion.

[0008]

 According to a still further characterizing feature of the resin
30 made container of the invention, the curvature radii respectively of the first curved portion, the second curved portion and the third curved portion are all smaller than or equal to 5 mm.

[0009]

 According to a still further characterizing feature of the resin
35 made container of the invention, the step has a height smaller than or equal to 4 mm.

[0010]

According to a still further characterizing feature of the resin made container of the present invention, a diameter decrease ratio of a maximum outer diameter of a bottom face of the bottom portion relative to a maximum outer diameter of the lateral wall of the bottom portion ranges from 60% to 90%.

[0011]

According to a still further characterizing feature of the resin made container of the invention, a bottom wall of the bottle portion has a recessed portion which is recessed to the inner side of the container.

EFFECT OF THE INVENTION

[0012]

With the inventive feature of a step recessed to the inner side along a circumferential direction being formed at a lateral wall lower end of the bottom portion, this step functions like a spring, thus improving the buckling resistance of the container. Therefore, as there is no need to provide a constricted portion or a plurality of annular grooves conventionally provided, the aesthetic feature of the container is not impaired and also the buckling deformation will occur less unlikely.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a perspective view of a resin made container,
Fig. 2 is a side view of the resin made container,
Fig. 3 is a vertical sectional view of the resin made container taken along a line III-III in Fig. 2,
Fig. 4 is an enlarged view of a depressurization absorbing portion,
Fig. 5 is a vertical sectional view of a bottom portion of the resin made container, and
Fig. 6 is an enlarged view showing vicinity of a connecting portion between a shoulder portion and a body portion of a resin made container according to a further embodiment.

MODES OF EMBODYING THE INVENTION

[0014]

[Embodiment]

Next, as a preferred embodiment of a resin made container relating to the present invention, there will be explained a plastic bottle
5 1 to be charged with liquid such as beverage, with reference to the accompanying drawings.

[0015]

Firstly, various kinds of terms to be used in this detailed description will be defined as follows.

10 As used in this detailed description, a term “vertical direction” means a direction of a center axis X-X of a plastic bottle 1 shown in Fig. 1 (to be referred to simply as “bottle 1” hereinafter). In particular, in Figs. 1-3, a term: upper side, refers to the upper end side in the drawings and a term: lower side refers to the lower end side of the drawings.

15 A term “lateral direction” or “horizontal direction” means the direction perpendicular to the center axis X-X direction.

A term “circumferential direction” means a direction along the contour of the horizontal cross sectional shape.

20 A term “radial direction” means the radial direction of a circle when the the center axis X-X is taken as the center of such circle.

A term “height” means a length along the center axis X-X direction.

A term “depth” means a length along the radial direction.

25 A term “horizontal cross sectional shape” means a cross sectional shape of the bottle 1 in a plane (horizontal cross section) perpendicular to the center axis X-X.

A term “vertical sectional shape” means a cross sectional shape of the bottle 1 in a plane (vertical cross section) along the center axis X-X.

[0016]

30 As shown in Figs. 1 through 3, the bottle 1 relating to the instant embodiment includes, from the upper side thereof, a spout portion 2 to/from which a cap can be attached/detached, a shoulder portion 3 continuous with the spout portion 2, a body portion 4 continuous with the shoulder portion 3, and a bottom portion 11 continuous with the body
35 portion 4 and located at the lowermost portion. Further, the bottle 1 relating to the instant embodiment is a cylindrical container having an

approximately circular horizontal cross section.

[0017]

5 The bottle 1 can be made of thermoplastic resin such as polyethylene, polypropylene, polyethylene terephthalate, etc. as its principal material, via a conventional molding method such as the biaxial stretching blow molding technique.

[0018]

10 The content (liquid) to be charged in the bottle 1 is not particularly limited. As examples thereof, drinks such as drinking water, tea, juice, coffee, cocoa, soft drink, alcoholic drink, milk-based drink, soup, liquid seasoning such as sauce, soy sauce, etc. can be cited. Further, the content volume of the bottle 1 is also not particularly limited. Depending on the kind of content to be charged therein, it can be appropriately set from a relatively small volume in the order of a few
15 hundreds of milliliters, to a relatively large volume in the order to a few liters. Incidentally, when the bottle 1 is used as a beverage bottle, it is desired that its content volume ranges from 500 to 550 mL.

[0019]

(Spout Portion)

20 The spout portion 2 is a part which is formed of a cylinder having an opened upper end and serves as an inlet for the content. In the outer circumferential face of the spout portion 2, male threads are formed. So that, an unillustrated cap may be adapted to be detachably fixedly threaded thereto, thus allowing repeated sealing and opening.

25 **[0020]**

(Shoulder Portion)

The shoulder portion 3 is a part which is provided with an approximately conical shape whose diameter progressively increases from its upper end to the lower side thereof. Advantageously, the
30 vertical cross sectional shape of the shoulder portion 3 may be a gentle arc which is formed to protrude to the outer side of the container (e.g. a curvature radius = 250 mm (250R)).

[0021]

(Body Portion)

35 The body portion 4 continuously decreases in its diameter from its upper end to the lower side and then continuously increases in its

diameter from a position approximately at the vertical half of the body portion 4 to be continuous with a bottom portion 11. Incidentally, the vertical cross sectional shape of the body portion 4 in the instant embodiment is constituted of continuation of two arcs having different curvature radii from each other. In the instant embodiment, the curvature radius of the arc of the approximately upper half portion of the body portion 4 is set smaller than the curvature radius of the arc of the approximately lower half portion of the body portion 4. The curvature radius of the arc of the approximately upper half portion of the body portion 4 can be e.g. 600 mm (600R) and the curvature radius of the arc of the approximately lower half portion of the body portion 4 can be 1052 mm (1052R), for instance.

[0022]

In the body portion 4, there are provided, in the form of recesses, a plurality of depressurization absorbing portions 5 by a predetermined spacing in the circumferential direction. Incidentally, the depressurization absorbing portions 5 in the instant embodiment are provided in the form of recesses distributed in both the upper half portion and the lower half portion of the body portion 4. On the upper side of each depressurization absorbing portion 5, there is formed a tapered region 6 whose diameter progressively decreases and whose depth progressively decreases toward the upper side. In the instant embodiment, the tapered regions 6 are provided at the upper half portion of the body portion 4.

[0023]

As shown in Fig. 4, the depressurization absorbing portion 5 is comprised of a tapered region 6, a constant region 7 having a constant width having a lateral width equal to the maximum lateral width of the tapered region 6 and an enlarged region 8 having a width which progressively increases from the constant region 7, with the tapered region 6, the constant region 7 and the enlarged region 8 being continuous with each other from the upper side in this order. Along the contour of the depressurization absorbing portion 5, there is formed a groove 9 having a V-shaped cross section, and this groove 9, at the upper end of the depressurization absorbing portion 5, is continuous with the lateral face of the body portion 4.

[0024]

Incidentally, though not shown, the above-described depressurization absorbing portion 5 may be vertically inverted. In such case, the tapered region 6, the constant region 7 and the enlarged region 8 will be formed continuous with each other from the lower side in this order; and the groove 9, at the lower end of the depressurization absorbing portion 5, will be formed continuous with the lateral face of the body portion 4. Further, the tapered region 6 will be provided at the lower half portion of the body portion 4.

[0025]

In the depressurization absorbing portion 5, there is formed a receded portion 10 which is receded to the inner side of the container. In the instant embodiment, such receded portion 10 having a rhombus square pyramid-like shape is formed over and across a part of the constant region 7 and a part of the enlarged region 8. However, the shape and the disposing position of the receded portion 10 are not limited to the above. Incidentally, in the depressurization absorbing portion 5, instead of the receded portion 10 above, a protruding portion which protrudes to the outer side of the container may be formed. In this case, similarly to the receded portion 10, such protruding portion having a rhombus square pyramid-like shape may be formed over and across a part of the constant region 7 and a part of the enlarged region 8. However, the shape and the disposing position of such protruding portion are not limited to the above.

[0026]

Incidentally, advantageously, a ratio of an area summing up the respective surface areas of the tapered region 6, the constant region 7 and the enlarged region 8 relative to the total surface area of the bottle 1 can be set to range from 30% to 45% approximately.

[0027]

(Connecting Portion between Shoulder Portion and Body Portion)

As shown in Fig. 3, the vertical cross sectional shape of a connecting portion C between the shoulder portion 3 and the body portion 4 is formed like an arc which protrudes (convex) to the outer side of the container. This connecting portion C has a curvature radius ranging from 1.5 to 5 mm (1.5R to 5R), more preferably from 1.5 to 3.5

mm (1.5R to 3.5R). The shape extending from the lower end portion of the shoulder portion 3 through the connecting portion C to the upper end portion of the body portion 4 is curved to protrude toward the lateral outer side of the container.

5 [0028]

(Connecting Portion between Body Portion and Bottom Portion)

As shown in Figs. 1-3, at the connecting portion between the body portion 4 and the bottom portion 11, there is formed a circumferential groove 20 which extends along and over the entire circumference. This
10 circumferential groove 20 acts as a reinforcing rib for enhancing reinforcement against a shock or a load applied to the lateral face of the bottle 1.

As shown in Fig. 5, in the vertical cross sectional shape of the circumferential groove 20, an edge arc 21 protruding to the outer side of the container, a bottom arc 23 protruding to the inner side of the
15 container and an edge arc 22 protruding to the outer side of the container are formed continuous with each other from the upper side in this order. Advantageously, the curvature radii of the edge arcs 21, 22 can be greater than the curvature radius of the bottom arc 23. For instance,
20 the curvature radii of the edge arcs 21, 22 can be 2 mm (2R) and the curvature radius of the bottom arc 23 can be 1.5 mm (1.5R). Further, advantageously, the depth of the circumferential groove 20 can range from 1 to 1.5 mm, for example.

[0029]

25 **(Bottom Portion)**

As shown in Fig. 5, the bottom portion 11 is comprised of a lateral wall 12 and a bottom wall 13. At the lower end of the lateral wall 12, there is formed a step 14 which is receded to the inner side along the circumferential direction.

30 The step 14 has a vertical cross sectional shape which is formed of a first curved portion 15 which protrudes to the outer side of the container, a second curved portion 16 which protrudes to the inner side of the container, and a third curved portion 17 which protrudes to the outer side of the container, the first through third curved portions 15, 16, 17
35 being formed continuous in this order from the upper side. Advantageously, the curvature radius of the second curved portion 16

can be smaller than the curvature radius of the first curved portion 15. Also advantageously, the respective curvature radii of the first curved portion 15, the second curved portion 16 and the third curved portion 17 all can be smaller than or equal to 5 mm (5R). For instance, advantageously, the curvature radius of the first curved portion 15 can be 3 mm (3R), the curvature radius of the second curved portion 16 can be 1.5 mm (1.5R), and the curvature radius of the third curved portion 17 can be 2 mm (2R). Further, advantageously, the height of the step 14 can be smaller than or equal to 4 mm.

[0030]

Moreover, the vertical cross sectional shape of the step 14 is not limited to the above. Alternatively, between the first curved portion 15 and the second curved portion 16 and/or between the second curved portion 16 and the third curved portion 17, a straight portion(s) may be provided.

[0031]

The bottom wall 13 of the bottom portion 11 is comprised of a receded portion 18 which is receded to the inner side of the container and a bottom face 19 which comes into contact with a disposing surface when the bottle1 is placed vertically thereon. The vertical cross sectional shape of the receded portion 18 is a round-dome shape which is receded in the form of step. The bottom face 19 has a ring shape as seen in a plan view and is disposed in the outer circumference of the receded portion 18.

[0032]

Advantageously, a diameter decrease ratio of a maximum outer diameter T2 of the bottom face 19 relative to the maximum outer diameter T1 of the lateral wall 12 of the bottom portion 11 can range from 60% to 90%.

[0033]

[Further Embodiment]

The shape extending from the lower end portion of the shoulder portion 3 across the connecting portion C to the upper end of the body portion 4 can be a shape which has a greater degree of protrusion to the lateral outer side of the container, as shown in Fig. 6, for instance. In

this embodiment, an arc 24 protruding to the inner side of the container is formed at the upper end portion of the body portion 4 and this arc 24 is continuous with the connecting portion C. The curvature radius of the arc 24 is greater than the curvature radius of the connecting portion C and can range from 10 to 20 mm (10R to 20R), for instance.

INDUSTRIAL APPLICABILITY

[0034]

The resin made container of the present invention can be used as a container in which beverage, seasoning, etc. is charged in a sealed state.

DESCRIPTION OF SIGNS

[0035]

15	1:	bottle
	2:	spout portion
	3:	shoulder portion
	4:	body portion
	5:	depressurization absorbing portion
20	6:	tapered region
	7:	constant region
	8:	enlarged region
	9:	groove having V-shaped cross section
	10:	receded portion having rhombus square pyramid-like
25	shape	
	11:	bottom portion
	12:	lateral wall
	13:	bottom wall
	14:	step
30	15:	first curved portion
	16:	second curved portion
	17:	third curved portion
	18:	receded portion
	19:	bottom face
35	20:	circumferential groove
	21, 22:	edge arcs

	23:	bottom arc
	24:	arc relating to further embodiment
	T1:	maximum outer diameter of lateral wall of bottom portion
	T2:	maximum outer diameter of bottom face
5	C:	connecting portion between shoulder portion and body portion

CLAIMS

1. A resin made container including a spout portion to/from
which a cap can be attached/detached, a shoulder portion continuous
5 with the spout portion, a body portion continuous with the shoulder
portion and a bottom portion continuous with the body portion and
disposed at a lowermost portion of the bottle;

wherein at a lateral wall lower end of the bottom portion, there is
formed a step which is receded to the inner side along a circumferential
10 direction.

2. The resin made container of claim 1, wherein the step has
a vertical cross sectional shape which is formed of a first curved portion
which protrudes to the outer side of the container, a second curved
15 portion which protrudes to the inner side of the container, and a third
curved portion which protrudes to the outer side of the container, the
first through third curved portions being formed continuous in this order
from the upper side.

3. The resin made container of claim 2, wherein the second
20 curved portion has a curvature radius smaller than a curvature radius of
the first curved portion.

4. The resin made container of claim 2 or 3, wherein the
25 curvature radii respectively of the first curved portion, the second curved
portion and the third curved portion are all smaller than or equal to 5
mm.

5. The resin made container of any one of claims 1-4,
30 wherein the step has a height smaller than or equal to 4 mm.

6. The resin made container of any one of claims 1-5,
wherein a diameter decrease ratio of a maximum outer diameter of a
bottom face of the bottom portion relative to a maximum outer diameter
35 of the lateral wall of the bottom portion ranges from 60% to 90%.

7. The resin made container of claim 6, wherein a bottom wall of the bottle portion has a recessed portion which is recessed to the inner side of the container.