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Section 29

AUSTRALIA

Patents Act 1990

PATENT REQUEST : STANDARD PATENT

I/We being the person(s) identified below as the Applicant(s), request the grant of a patent to the person(s) identified below as the Nominated Person(s), for an invention described in the accompanying standard complete specification.

Full application details follow:

[71/70] Applicant(s)/Nominated Person(s):

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Address:

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[54] Invention Title:

Bottle body made of synthetic resin

[72] Name(s) of actual inventor(s):

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DIVISIONAL APPLICATION DETAILS

[62] Original Application No. 59321/94
Person by whom made: Yoshino Kogyosho Co., Ltd.

Dated this 30th day of September, 1996.

Peter H. Huntsman
(A member of the firm of DAVIES COLLISON CAVE
for and on behalf of the Applicant/s.)

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NOTICE OF ENTITLEMENT

We, Yoshino Kogyosho Co., Ltd.
of 2-6, Ojima 3-chome, Koto-ku, Tokyo 136, Japan

the applicant in respect of the accompanying patent request state the following:-

The Nominated Person is entitled to the grant of the patent because the Nominated Person derives title to the invention from the inventor(s) by assignment.

The Nominated Person is the applicant of the original application with respect to which the present application is a further complete application under S.39 of the Patents Act 1990.

DATED this 30th day of September, 1996.

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Peter H. Huntsman
a member of the firm of
DAVIES COLLISON CAVE
for and on behalf of the applicant

(DCC Ref: DM)

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(12) PATENT ABRIDGMENT (11) Document No. AU-B-67995/96
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 693721

(54) Title
BOTTLE BODY MADE OF SYNTHETIC RESIN

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(56) Prior Art Documents
AU 66797/94
AU 62970/94
AU 66797/94

(57) Claim

1. A biaxially oriented blow-molded bottle-shaped container made of synthetic resin, comprising a tubular body having a main body portion with side walls defining a generally rectangular cross-section and corner walls between adjacent side walls and having an upper end which forms a regular polygon having the same number of sides as the combined number of side walls and corner walls of the main body portion, the container further comprising a shoulder having a lower end portion connected to the upper end of the body, the lower end portion of the shoulder being in the form of a regular polygonal truncated pyramid having the same number of sides as the upper end of the body, each side of the upper end of the body being aligned with a respective one of the side walls and corner walls of the main body portion and with a respective side of the shoulder lower end portion.

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DIVISIONAL APPLICATION

NAME OF APPLICANT(S):

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Patent Attorneys
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Melbourne, 3000.

INVENTION TITLE:

Bottle body made of synthetic resin

The following statement is a full description of this invention, including the best method of performing it known to us:

The present invention relates to a biaxially oriented blow-molded bottle shaped container made of synthetic resin, for example polyethylene terephthalate (hereinafter referred to as "PET"), and is particularly concerned with such containers having a main body portion of substantially rectangular cross-section, for example square.

A biaxially oriented blow molded bottle of polyethylene terephthalate resin is excellent in various durabilities such as content resistance, chemical resistance, weather resistance, and further shock resistance and the like, and has high mechanical strength, transparency, no pollution and further gas barrier properties. Therefore, such a bottle has been used on a large scale for containing various kind of liquid.

Large PET biaxially oriented blow molded bottles tend not to have sufficient mechanical strength of its body to provide self configuration sustaining capability or buckling strength since the material of the main body portion of the bottle is thin. Particularly, a bottle having a square cylindrical body is poor in not only buckling strength but also self configuration sustaining capability. Therefore, a large depressed deformation of the body can be caused by negative pressure generated within the bottle after a liquid is sealed therein.

In order to avoid such deformations in square-shaped PET bottles, a circumferential groove has been provided at a substantial center of the body for increasing buckling strength against depression force applied on the bottle from the outside and for increasing self configuration sustaining capability of the body against external force applied in the diametrical direction. The circumferential groove divides each flat wall of the main body portion into upper and lower parts and, in addition, each upper and lower part has been provided with a substantially central recessed portion having a depression deformable shaped panel wall as a bottom wall for taking up negative pressure generated in the bottle. This avoids any incorrect depression deformation from occurring in the body and increases self configuration sustaining capability of the flat wall portion.

The increase of mechanical configuration sustaining capability by providing the

circumferential groove and the recessed portion formed with the shaped panel wall can be obtained by forming inclined groove sidewalls of the circumferential groove and inclined groove sidewalls of the recessed portion as reinforcing rib wall pieces with respect to the diametrical direction of the body.

Therefore, hitherto, in order to provide optimum performance of the inclined groove sidewalls and recess sidewalls of the circumferential groove and the recessed portion as reinforcing rib wall pieces, the angles of the groove sidewalls and recessed sidewalls with respect to the central axis of the bottle have been set to large values.

The self configuration sustaining capability of the body of the bottle, particularly where the circumferential groove is grasped by the hand, is actively reinforced by setting the angles of the groove sidewalls and recessed sidewalls at large values, but when more than certain pressure is applied to the body of the bottle at the time of handling the bottle or at the time of casing and transporting bottles, the portion of the flat wall between the groove sidewalls and the recessed sidewalls is sharply bent and/or depressedly deformed, and the deformed portion may not return to the original configuration even if the pressure is removed. Thus, the bent and/or depressed deformation may become a permanent deformation and cause such a problem that commercial value of the bottle is lost.

The above-described conventional negative pressure taking up recessed portion is constructed by forming the shaped panel wall as its bottom wall into a shape which is easily deformable by negative pressure, and absorbing negative pressure generated in the bottle by large depressed deformation at the central portion of the shaped panel wall, so that the negative pressure deformation of this shaped panel wall is visually apparent and reduces the external appearance and style of the bottle.

Moreover, a shaped panel wall occupying a large surface area at each flat wall of the body is liable to deform, so that when grasping the bottle by the hand, the deformed panel wall with which finger tips come into contact is easily deformed, and the bottle becomes unstable

to handle by hand.

Furthermore, as described above, the shaped panel wall may occupy a large surface area of each flat wall of the body, but the wall structure of this shaped panel wall is mainly of a deformable flat structure, so that its external appearance becomes simple which tends to make the external appearance of the bottle dull.

As stated above, the shaped panel wall is molded in a flat wall portion of the body of the PET large square bottle, so that it is extremely difficult to print a commercial name or a company name or to stick and display a label, and hence, the commercial name or the company name is displayed with the aid of a shrunk label made of a heat-shrinkable sheet.

Since this shrunk label is originally a flat sheet, it is easy to print pattern and display and to form into a cylindrical body, and it is further advantageous to strongly attach to the bottle by simple but secure heat treatment. However, because of the consistent shrink deformation characteristics of the heat-shrinkable sheet, the portions overlying the flat walls of the square bottle have large shrinkage as compared with the portions overlying the corner portions. As a result, the end of a shrunk label wrapped around the bottle may wrinkle and reduce the external appearance and style of the bottle.

Furthermore, when a shoulder portion of the bottle also has a square cross-section but smaller than the body, there is generated a large difference of extension between the ridge lines or corner portions and the flat wall portions of the shoulder. This can result in incorrect thermal deformation at the shoulder portion.

The excellent transparency of PET bottles is advantageous for increasing the clear effect of goods within such a bottle.

However, as compared with a glass bottle exhibiting the same excellent transparency, the PET bottle is simply clear and does not exhibit any crystal effect due to deflection of transmitted

light, so as to be poor in visual change.

One of the big reasons why a crystal effect is low in the PET bottle having excellent transparency is considered because the PET bottle is biaxially oriented blow-molded so that it has a thin cross-section and transmitted light cannot sufficiently be deflected.

It has therefore been proposed to make the PET bottle cross-section thicker in order to give a sufficient crystal effect, but if the PET bottle is made thick, the cost of PET material per molding in increased and, as a result, the unit price becomes high, biaxially oriented blow-molding technique becomes extremely difficult, sufficient transparency cannot be obtained without biaxially oriented deformation, and the weight of the molded goods increases.

SUMMARY OF THE INVENTION

It is an object of the invention to alleviate one or more of the aforementioned problems of biaxially oriented blow-molded bottle-shaped containers, particularly to provide such a container in which the problem of wrinkling at the upper edge of a label applied to the container is alleviated.

According to the present invention, there is provided a biaxially oriented blow-molded bottle-shaped container made of synthetic resin, comprising a tubular body having a main body portion with side walls defining a generally rectangular cross-section and corner walls between adjacent side walls and having an upper end which forms a regular polygon having the same number of sides as the combined number of side walls and corner walls of the main body portion, the container further comprising a shoulder having a lower end portion connected to the upper end of the body, the lower end portion of the shoulder being in the form of a regular polygonal truncated pyramid having the same number of sides as the upper end of the body, each side of the upper end of the body being aligned with a respective one of the side walls and corner walls of the main body portion and with a respective side of the shoulder lower end portion.

The body has un upper end portion merging the main body portion with the upper end and, preferably, the sides of the upper end portion of the body aligned with the corner walls of the main body portion comprise substantially flat walls each disposed between a respective pair of flat sides and wherein the upper end portion gradually decreases in cross-section towards the upper end with a decrease in width of each of the flat sides and an increase in width of each of the substantially flat walls to form the regular polygon at the upper end.

In a preferred embodiment, the lower end portion of the shoulder is connected to a substantially part-spherical shell portion of the shoulder through a narrow stage portion, and wherein a lower end portion of the shell portion has a plurality of inclined side walls each aligned with a respective side of the lower end portion of the shoulder. Advantageously, each inclined side wall of the lower end portion of the shell is flat and each side of the lower end portion of the shell comprises a flat wall. Advantageously, the body has a circumferential groove which is formed in a substantially central portion of the body. In a preferred embodiment, the circumferential groove is as described in AU-B-59370/90 from which this application is derived.

A shrinkable label will generally be applied to a bottle in accordance with the invention over the upper half portion of the body and the lower end portion of the shoulder, so the upper edge of the shrunk label will overlie the lower end portion of the shoulder.

When the bottle has the aforementioned substantially central circumferential groove, the opposed lower edge of the label is preferably located in the circumferential groove. Thus, the shrunk label may be applied around the bottle in such a manner that the upper edge is wound around the reduced cross-section lower end portion of the shoulder and the lower edge is also wound around the reduced cross-section of the central circumferential groove. Therefore, both the upper and lower edges are located in corresponding upper and lower portions of reduced cross-section, respectively, so that the shrunk label cannot be withdrawn from the bottle and may therefore be strongly and stably secured to the bottle.

The lower end portion of the shoulder where the upper edge portion of the shrunk label may be wound has a regular polygonal shape, with the same number of sides as the number of sides and corner portions of the main portion of the body and a smaller cross-section than that of the main portion of the body. Therefore, the upper edge portion of the shrunk label which is wound around the lower end portion of the shoulder is under a condition that the difference in shrinkage between the portions thereof overlying the respective sides of the lower end portion of the shoulder is sufficiently small that the overall shrinkage of the portion of the label overlying the lower end portion of the shoulder may be considered as uniform. Furthermore any displacement which might result from the shrinkage of the label in the vertical direction is resisted by the upper end portion of the body which has larger cross-section. Accordingly, large wrinkles in the upper edge portion of the shrunk label wound around the lower end portion of the shoulder are less likely to occur.

On the other hand, the lower edge portion of the shrunk label is under a condition that there may be some difference in shrinkage between portions thereof overlying the corner walls and portions thereof overlying the side walls of the main portion of the body. As a result, the lower edge portion of the shrunk label may be wrinkled. However, in the preferred embodiment, the aforementioned circumferential groove is provided substantially centrally of the main body portion and the lower edge of the shrunk label is located in the circumferential groove. Accordingly, a portion of the shrunk label just about the lower edge portion may be initially applied to the surface of the body immediately above the circumferential groove and then prevents any displacement of the lower edge portion resulting from the shrinkage of the label in the vertical direction. Consequently, large wrinkles at the lower edge of the shrunk label are also less likely to occur.

Furthermore, since the lower end portion of the shoulder is molded with the cross-section of a regular polygon, the average length of each side of the lower end portion of the shoulder is substantially the same. Accordingly, the lower end portion of the shoulder can be uniformly molded with substantially uniform circumferential elongation. Since the lower end portion of the shoulder is uniformly elongated in the circumferential direction during blow

molding, even if thermal deformation occurs in the shoulder portion due to insufficient elongation, the thermal deformation uniformly occurs in the circumferential direction and therefore irregular deformation does not appear in the external appearance of the shoulder portion due to the thermal deformation.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, an embodiment of a biaxially oriented blow molded bottle according to the present invention will be described, by way of example only, with reference to the drawings.

Fig. 1 is a front view illustrating the bottle;

Fig. 2 is a cross sectional view taken on line II-II of Fig. 1;

Fig. 3 is an enlarged vertical sectional view of a portion enclosed by a circle in Fig. 1;

Fig. 4 is a cross sectional view of a body of the bottle shown in Fig. 1;

Fig. 5 is a partial enlarged cross sectional view of a flat wall of the bottle shown in Fig. 1;

Fig. 6 is a partial enlarged vertical sectional view illustrating a rib on a modified panel wall;

Fig. 7 is a plan view of the bottle shown in Fig. 1;

Fig. 8 is a cross sectional view taken on line III-III of Fig. 1;

Fig. 9 is an enlarged front view of the bottom portion of the bottle shown in Fig. 1;

Fig. 10 is a bottom plan view of the bottle shown in Fig. 1;

Fig. 11 is a sectional view of a wall taken on line IV-IV of Fig. 9; and

Fig. 12 is an enlarged detail of a protruded ridge-line portion shown in the sectional view of Fig. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the embodiment shown in the drawings, a bottle 1 has a tubular body 2 having a substantially square cross-section. The body has four ridge-line walls 13 at corners thereof, respectively, each of which is formed by an arched wall having a radius of curvature of a length of a half of a diagonal line. The body has also a central circumferential groove 3 which is formed at a central position slightly higher than a half level of the whole height to divide each of four flat wall 6 into upper and lower half portions, respectively. The body further has a bottom having a central curved recess retracted inwardly into the bottle 1 and an upper end portion having a diameter which is gradually reduced from a shoulder 11 having a substantially part-spherical shape and has an opening 12 at the upper end thereof.

Each of the upper and lower portions of the flat wall 6 divided by the central circumferential groove 3 has a recessed portion 7 formed at the centre portion thereof. The recessed portion 7 has a shape bottom panel wall 8 at the central portion thereof and a deformed sidewall 9 at the peripheral portion of the recessed portion 7.

A portion of the sidewall 9 of the recessed portion 7 adjacent to the central circumferential groove 3 that is the upper portion of the sidewall 9 in the lower recessed portion 7 and the lower portion of the side wall in the upper recessed portion 7 are approximately straight extended along the central circumferential groove 3 so that the portions of the flat wall 6 between the central circumferential groove 3 and the recessed portions 7 can be easily bent as the whole.

The central circumferential groove 3 has a flat bottom wall 5 and corners having a large

radius of curvature in the cross section thereof as shown in Fig. 2 so that the central circumferential groove 3 has smaller depth at a portion opposed to the flat wall 6 than that at a portion opposed to the ridge-line wall 13, as a result the portion opposed to the ridge-line wall 13 of the central circumferential groove 3 is hardly deformed, while the portion opposed to the flat wall 6 is easily bent or depressed. Therefore, when portions of the central circumferential groove 3 and the flat wall 6 are bent or deformed by depressing, the ridge-line walls 13 effects as a strong supporting portions so that the deformation of the groove and the flat wall is effected in a stable mode.

Fig. 3 illustrates an embodiment of a wall structure near the central circumferential groove 3 in vertical section. A bottle 1 including such a wall structure has an internal space of 1.5 litre and is shaped such that the diameter of the lower body portion 7 is larger than that of the upper body portion 7 positioned above the central circumferential groove 3. In such a wall structure, since the lower side wall 4 of the central circumferential groove 3 is mainly subjected to a depressing force by grasping when the bottle is handled, the lower side wall 4 of the central circumferential groove 3 is set at an angle of inclination of 27°, while the upper side wall 4 of the central circumferential groove 3 is set at an angle of inclination of 24° and angle of inclination of the sidewall 91, 92 of the recessed portion 7 opposed to the central circumferential groove 3 is set at an angle of 21°

The angle of inclination of the groove sidewall 4 and the recess sidewall 91, 92 and their combination may be selectively set is a range of 21°-28°, but since the purpose of providing the central circumferential groove 3 is to enhance the self configuration sustaining capability, preferably the angle of inclination of the lower groove side wall 4 which is subjected to the depression force upon handling of the bottle 1 may be set at the maximum to enhance the self configuration sustaining capability of the body 2 owing to the central circumferential groove 3.

It has been found from results of many experiments that when all of the groove sidewalls 4 and the recess sidewalls 91, 92 are set at an angle of inclination of 28°, a higher self

configuration sustaining capability than that of the embodiment shown in Fig. 3 is obtainable, but a mode of a self returning operation from a bent reversed deformation is not smooth and particularly such a tendency is remarkably enhanced as the angle of inclination of the lower sidewall 91 of the central circumferential groove 3 is set at larger angle. It is advantageous from the results of experiments and the main purpose of providing the deformed panel wall 8 in the recessed portion 7 that the angle of inclination of the recess sidewall 9 is set small.

A number of ribs 21 extending parallel to each other are transversely formed on the shaped panel wall 8. These ribs 21 define crests 22 and roots 23 and the radius of curvature of the crest 22 is set to four times of the radius of curvature of the root 23 to thereby enhance moldability of each of ribs 21.

The ridge-line of the crest of each of ribs 21 is set to the same height as that of the inner peripheral edge of the deformed peripheral groove 9 so as to connect the opposite ends of the rib to the inner peripheral edges of the deformed peripheral groove 9 directly, respectively, and the opposite ends of the root 23 becomes gradually shallow along a curve having a large radius of curvature to connect to the inner peripheral edges of the deformed peripheral groove 9, respectively. Thus, the opposite ends of the root 23 is formed gradually shallow along a curve of a large radius of curvature, so that it is capable of enhancing the moldability of the ridge-line wall 13 which is continuously elongated after the flat wall 6 has been deformed during the blow molding of the bottle.

The upper end of the bottle body 2 adjacent the shoulder 11 is shaped as a regular polygon having the same number of sides as the combined number of flat walls 6 and ridge-line walls 13 of the main portion of the body by gradually straightening the curve of the ridge-line walls towards the upper end of the body and gradually reducing the diameter of the upper end portion of the body to decrease the width of the flat wall 6 and increase the width of the ridge-line walls 13 towards the upper end. In the embodiment shown in the drawings, the diameter of the upper end portion of the body 2 is gradually reduced to decrease the width of the flat walls 6 and increase the width of the ridge-line walls 13 to thereby shape the upper

end of the body as a regular octagon. It is desirable for the sake of the external appearance and ease of molding the body that it is molded in a square cylindrical shape.

The lower end portion 31 of the shoulder 11 extending from the regular octagonal upper end of the body 2 has a shape of a low regular octagonal truncated pyramid. The upper end of the lower end portion 31 is connected to a main portion 33 of the shoulder, in the form of a substantially part-spherical shell though a narrow stage portion 32. An opening 12 is provided at the upper end of the main portion 33. The lower end portion of the substantially part-spherical main portion 33 has inclined flat wall portions 34 each extending from a respective one of the flat walls of the lower end portion 31 with arcuate ridge-lines 35 formed at the boundary between each inclined flat wall portion 34 and the remainder of the substantially part-spherical surface 33.

A shrunk label (not shown) printed with a display such as a trade name, the contents and other information is applied to the upper half portion of the body 2 defined above the central circumferential groove 3 of the body, with the lower edge of the shrunk label being positioned in the central circumferential groove 3 and the upper edge being positioned on the stage portion 32 of the shoulder 11. By positioning the lower edge of the shrunk label in the central circumferential groove, ie. on the upper groove surface of the central circumferential groove, the lower edge of the shrunk label may be hardly noticed as separate from the bottle. Therefore, for example, even if the lower edge of the shrunk label has been slightly wrinkled, the external appearance of the bottle may not be adversely affected by the wrinkle. Similarly, since the upper edge of the shrunk label is located on the stage portion 32 which forms a flat surface along the radial direction, the upper edge of the shrunk label may be hardly wrinkled. Moreover, since both the upper and lower edges are located in areas which are sharply reduced in diameter, the shrunk label is very strongly and stably attached to the bottle 1.

A wall structure arranged according to the invention defined in our copending application AU-A-67994/96 is applied to the shoulder 11 and the bottom portion 10 of the bottle 1. Referring to Figure 7 in the case of the shoulder 11, the main portion 33 of the shoulder

constitutes the second wall surface portion while each flat wall portion 34 constitutes a first wall surface. While, in the case of the bottom 10, as shown in Figs. 9 and 10, the peripheral wall of the base portion 10, which is a tapered cylindrical wall portion extending upwardly from the bottom, constitutes the second wall surface portion 42 and each flat wall portion 41, which is formed by obliquely cutting the upper half portion of the second wall surface portion 42 and is continued to the flat wall portion of the body 2, constitutes a first wall surface portion.

An embodiment of the wall structure arranged according to the present invention is illustrated in a sectional view of Fig. 11 which is section taken on line IV-IV in Fig. 9 illustrating the embodiment of the bottom portion 10. A portion of a protruded ridge-line 43 shown in Fig. 11 is illustrated in Fig. 12 in enlarged scale.

It will be seen by comparing the portion of the protruded ridge-line 43 of the wall structure according to the present invention shown by a solid line with a prior art wall construction of a ridge-line wall portion shown by a dotted chain line, a protruding amount of the protruded ridge-line 43 is greater than the prior art ridge-line structure. The ridge-line wall portion 44 defining the protruding ridge-line 43 is disposed between an extended portion of the first wall surface portion 41 and a shortened second wall surface portion 42 (compared to the illustrated prior art wall construction) and is inclined at a relatively small inwardly obtuse angle to the first wall surface portion 41 so as to define a standing rib wall.

According to the above arrangement of the present invention, the following effects are obtained.

The ridge-line at the boundary between the first wall surface portion and the second wall surface portion can be greatly protruded by the ridge-line wall portion and the ridge-line can be sharply observed. Therefore, any difference of degree of refraction of transmitted light between the first and second wall surface portions is emphasized and a crystal effect is enhanced.

The ridge-line wall portion forms a ribbed wall piece standing with respect to both the first and second wall surface portions to provide a thicker portion to the transmitted light, thereby sufficiently refracting the transmitted light. Consequently, the ridge-line wall portion can give more remarkable crystal effect.

The protruded ridge-line slightly extends the connecting edge of the first wall surface portion and the extended connecting edge is only connected to the connecting edge of the second wall portion through ridge-line wall portion. Accordingly, the bottle can be easily and accurately molded in the conventional molding operation independent of whether a new or existing molding die is used.

Other advantages of the described bottle are as follows:

By controlling the angle of inclination of the groove sidewall, any bent and/or depressed deformations which could not be restored can be perfectly prevented from occurring in the junction between the groove sidewall and the flat wall portion, as a result there is no inconvenience of loss of commercial value of a bottle caused by occurring of bent and/or depressed permanent deformation.

Since any bent and/or depressed deformation occurred in the junction between the groove sidewall and the flat wall portion is an elastic deformation in all range of its deformation, when the bottle is grasped by the hand and consequently bent and/or depressed by depressing force, the finger tips of the hand applying the depressing force is always reacted by a rebound so that a stable grasping operation is achieved even if the bent and/or depressed deformation is occurred.

By controlling the angle of inclination of the groove sidewall and the recess sidewall to a relatively small, the depth of the central circumferential groove and the recessed portion can be made shallow and the degree of concave and convex in the body can be made small and therefore the amount of elongation in the flat wall portion can be uniformized to provide a

bottle having a good moldability and less deformation.

The shaped panel wall can be deformed for taking up the negative pressure by a large bent deformation of the whole shaped panel wall and an inward depressed deformation of the whole shaped panel wall and therefore such a negative pressure taking up deformation in the recessed portion is not observed in the external appearance of the bottle to thereby prevent degradation of the external appearance caused by the deformation of taking up negative pressure and reserve the excellent external appearance of the bottle.

The ribs serve as reinforcing ribs to enhance the self configuration sustaining capability in the transverse direction of the modified panel wall portion. Accordingly, when the bottle is grasped by hand, the shaped panel wall which is pressure contacted with the finger tips is hardly depressed by the pressure of the finger tips and supports the urging pressure and therefore the bottle can be stably grasped by hand and smoothly and stably handled as the whole.

The modified panel wall is consisted of a number of ribs to form a wall structure having a violent concave and convex shape and thereby giving a strong optical action to transmitted light. Therefore, the body of the bottle can make an appearance having a crystal like decoration effect by optical action and then the external appearance of the bottle can be satisfactorily improved.

When the shrunk label is attached around the body of the bottle, the upper edge of the shrunk label is located on the lower end portion of the shoulder of a regular polygonal cylindrical shape having corners of two times of number of corners in the body, as a result the upper edge of the shrunk label is hardly wrinkled. Therefore, a disadvantage such as degradation of the external appearance of the bottle caused by wrinkles in the edge of the shrunk label can be prevented from occurring in the body.

The upper edge of the shrunk label locates on the lower end portion of the shoulder having

a reduced diameter and the lower edge locates in the central circumferential groove having a reduced diameter. Therefore, the shrunk label can be strongly and stably attached to the body with simple shrinkage.

Since the lower end portion of the shoulder is formed in the shape of a regular polygonal truncated pyramid having corners in the body, the elongation along the circumferential direction of the lower end portion of the shoulder is substantially uniformly achieved. Therefore, even if the shoulder is thermally deformed, this thermal deformation occurs uniformly over the shoulder and then there is no strain causing some degradation of the external appearance of the shoulder.

Throughout this specification and the claims which follow, unless the cor t requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A biaxially oriented blow-molded bottle-shaped container made of synthetic resin, comprising a tubular body having a main body portion with side walls defining a generally rectangular cross-section and corner walls between adjacent side walls and having an upper end which forms a regular polygon having the same number of sides as the combined number of side walls and corner walls of the main body portion, the container further comprising a shoulder having a lower end portion connected to the upper end of the body, the lower end portion of the shoulder being in the form of a regular polygonal truncated pyramid having the same number of sides as the upper end of the body, each side of the upper end of the body being aligned with a respective one of the side walls and corner walls of the main body portion and with a respective side of the shoulder lower end portion.

2. A container according to claim 1, wherein the body has an upper end portion merging the main body portion with the upper end and the sides of the upper end portion of the body aligned with the corner walls of the main body portion comprise substantially flat walls each disposed between a respective pair of flat sides, and wherein the upper end portion gradually decreases in cross-section towards the upper end with a decrease in width of each of the flat sides and an increase in width of each of the substantially flat walls to form the regular polygon at the upper end.

3. A container according to claim 1 or claim 2, wherein the lower end portion of the shoulder is connected to a substantially part-spherical shell portion of the shoulder through a narrow stage portion, and

wherein a lower end portion of the shell portion has a plurality of inclined side walls each aligned with a respective side of the lower end portion of the shoulder.

4. A container according to claim 3 wherein each inclined side wall of the lower end portion of the shell is flat and each side of the lower end portion of the shell comprises a flat wall.

5. The container according to any one of claims 1 to 4, wherein the body has a circumferential groove which is formed in a substantially central portion of the body.

6. The container according to any one of claims 1 to 5, wherein the cross-section of the main body portion is generally square.

DATED this 7th day of May, 1998.

YOSHINO KOGYOSHO CO., LTD.

By its Patent Attorneys

DAVIES COLLISON CAVE

ABSTRACT

This invention relates to the structure of a large type bottle body made of polyethylene terephthalate resin formed by biaxial stretching blow molding having trunk parts (2) in the shape of angular tube. A central circumferential groove (3) is circumferentially provided nearly at the center of the trunk part (2), and the angle of inclination of the both side walls (4) of said central circumferential groove (3) with respect to the direction of center axis of a bottle body (1) is set within a range of 21°-28°. A recessed part (7) whose bottom wall serves as a deformed panel wall (8) to cushion the depressurization is provided depressed in the center part of each flat wall (6) of the trunk part (2), a deformed circumferential groove (9) that curves inverted along the circumferential edge of the aforementioned deformed panel wall (8), many rib streaks (21) are transversely provided in parallel above and below on the aforementioned deformed panel wall (8), the radius of curvature of the mountain parts forming said rib streaks (21) is set larger than the radius of curvature of the valley parts between said mountain parts, and, in addition, the both end parts of the aforementioned valley parts are made shallow along a large radius curvature. The top edge of the trunk part (2) is made to the shape of regular polygon having twice as many angles as the aforementioned trunk part (2) has, and the bottom edge part (31) of a shoulder part (11) connectively provided on the upper edge of said trunk part (2) is made to the shape of frustum of regular pyramid having twice as many angles as the aforementioned trunk part (2) has. The connecting end edge from first wall parts (34, 41) among the two wall surface parts connected through the curved line to second wall parts (33, 42) is slightly extended to the sides of the aforementioned second wall parts (33, 42), and the extended connecting end edge of the first wall parts (34, 41) is connected to the connecting end edge of the second wall parts (33, 42) through the ridge line wall part (44) curved/inverted with a small radius of curvature.

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FIG. 1

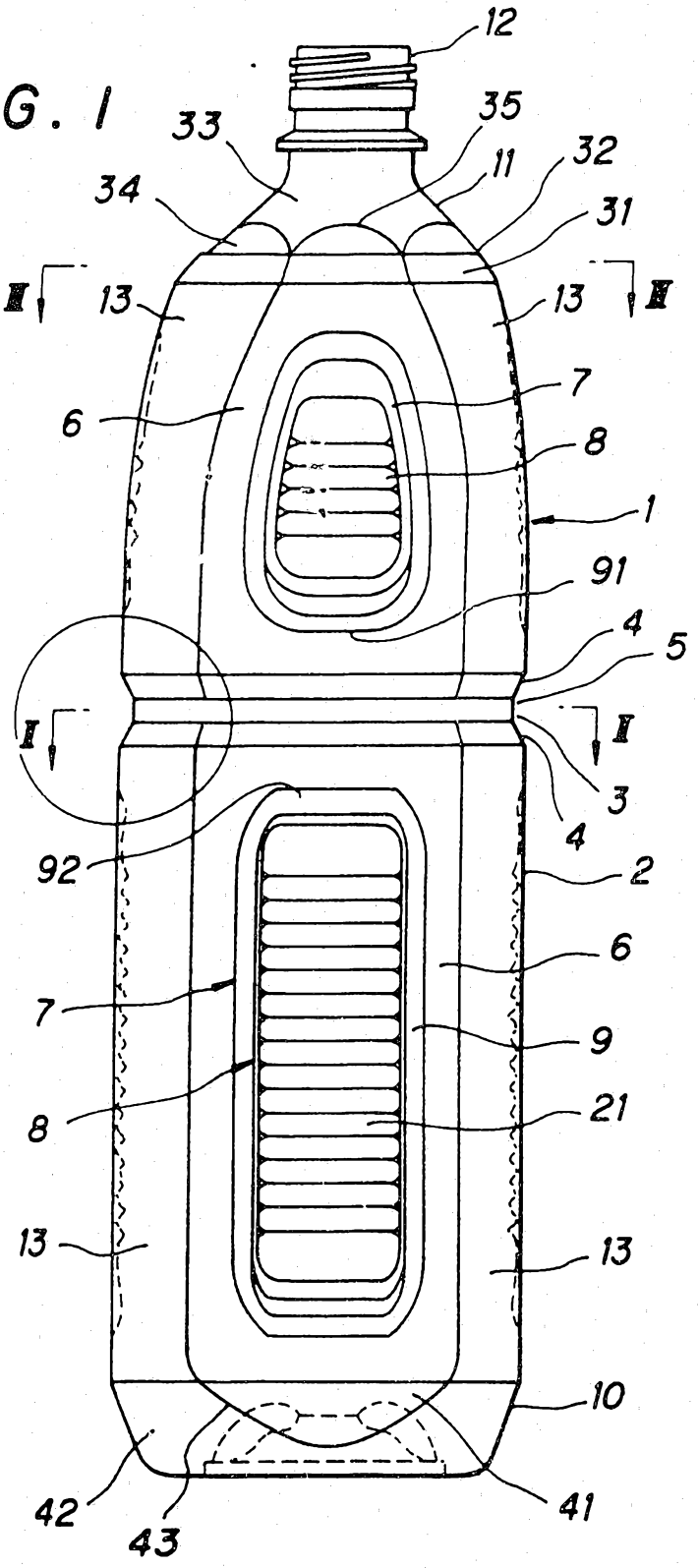

FIG. 2

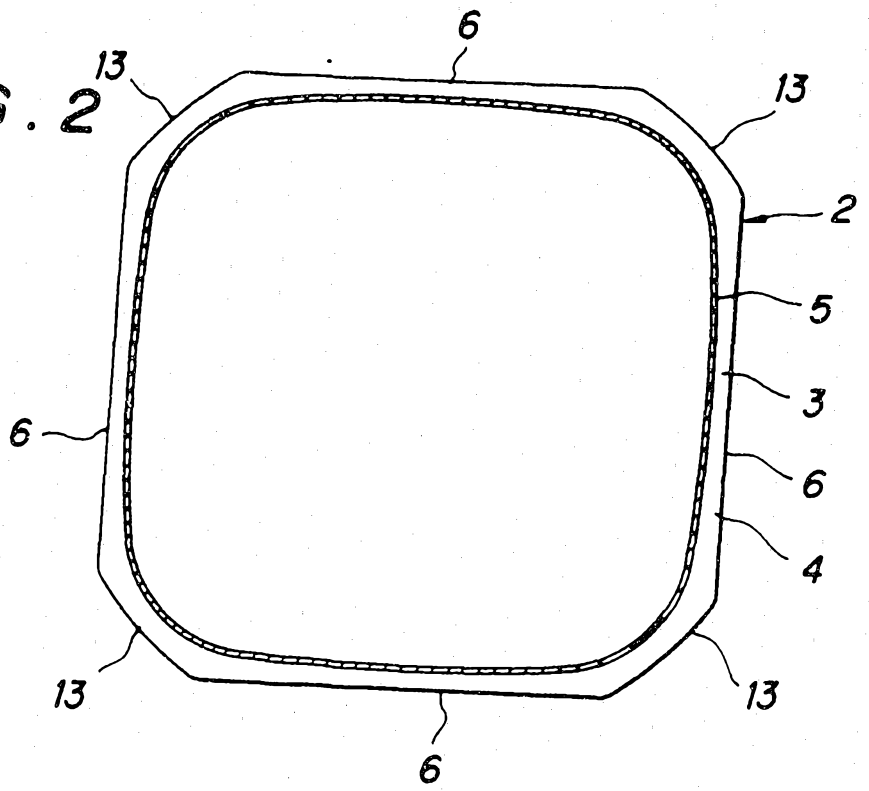

FIG. 3

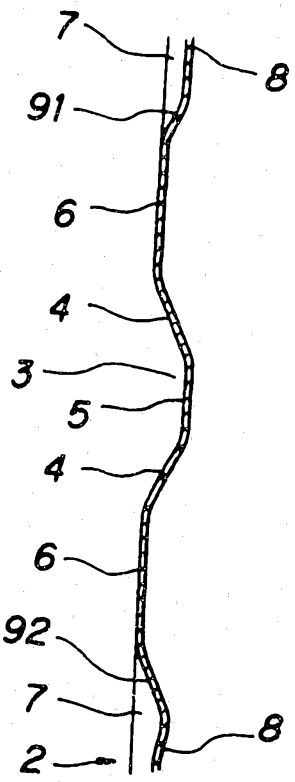

FIG. 4

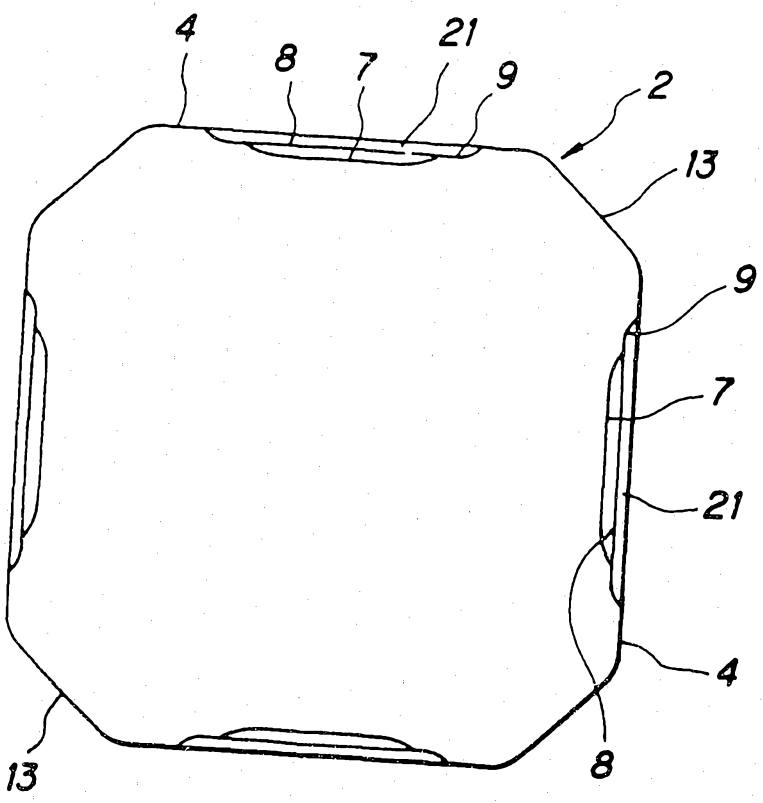

FIG. 5

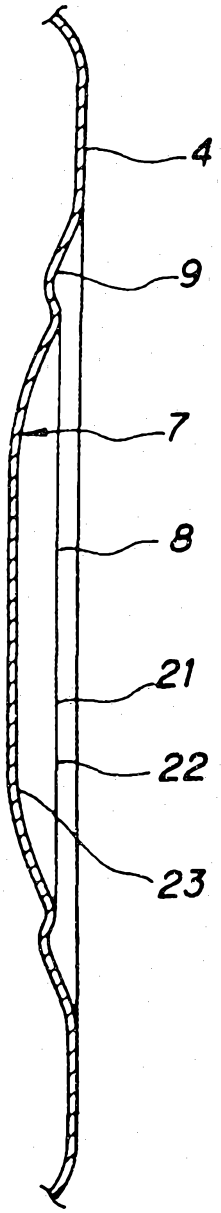

FIG. 6

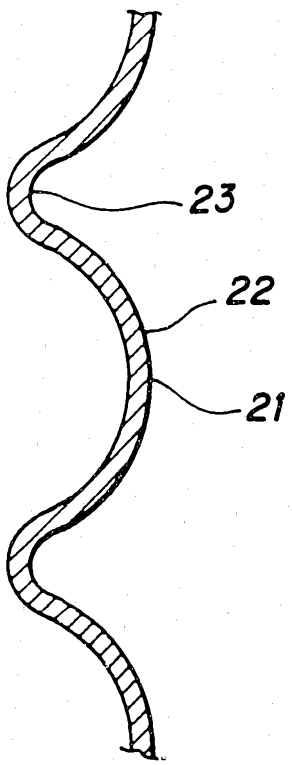

FIG. 7

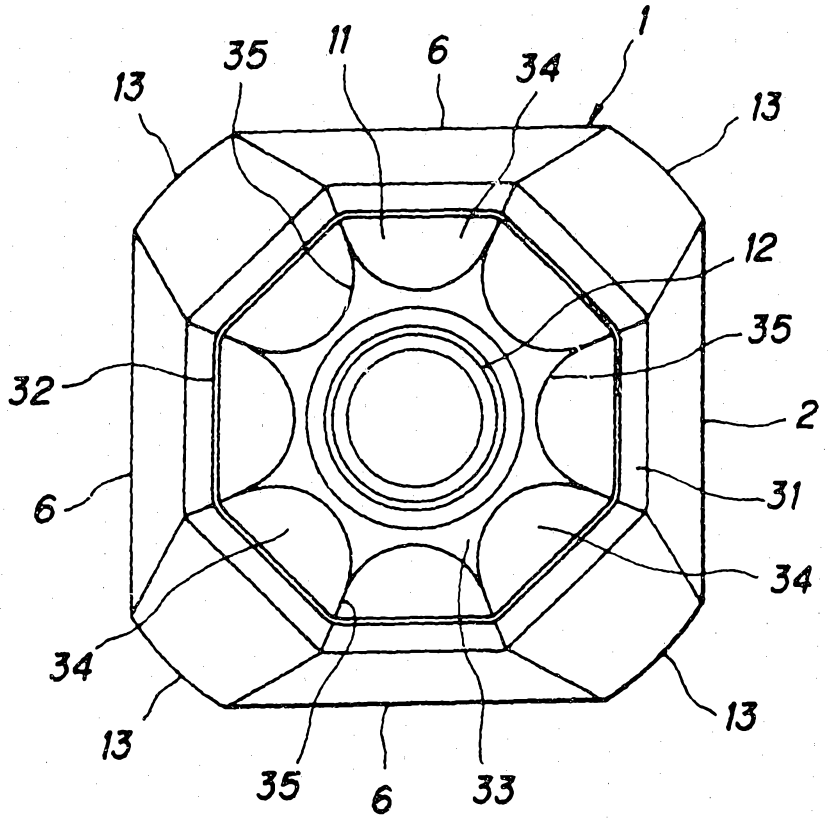

FIG. 8

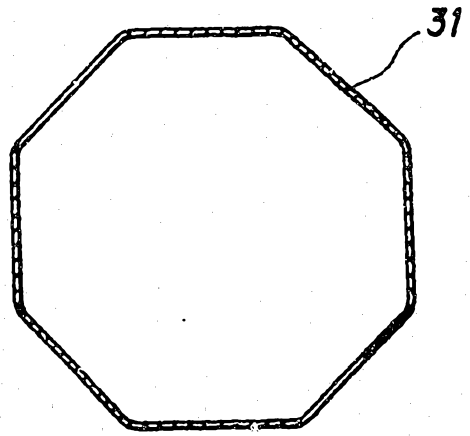

FIG. 9

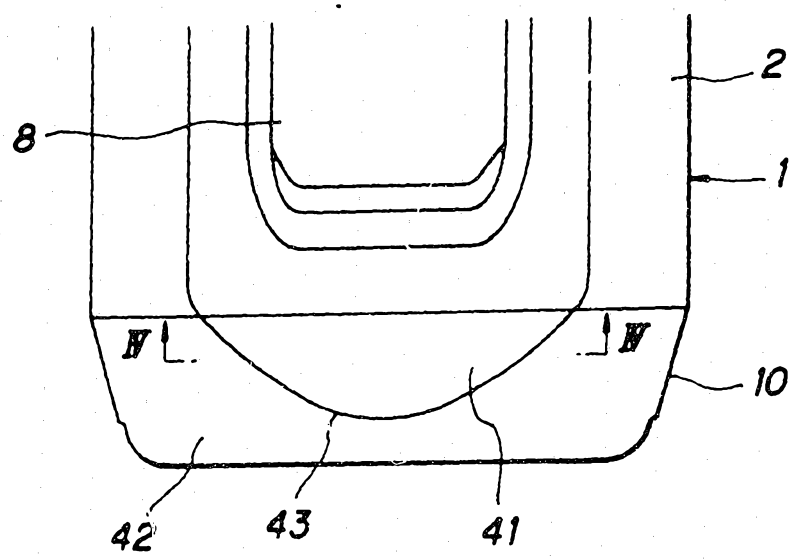

FIG. 10

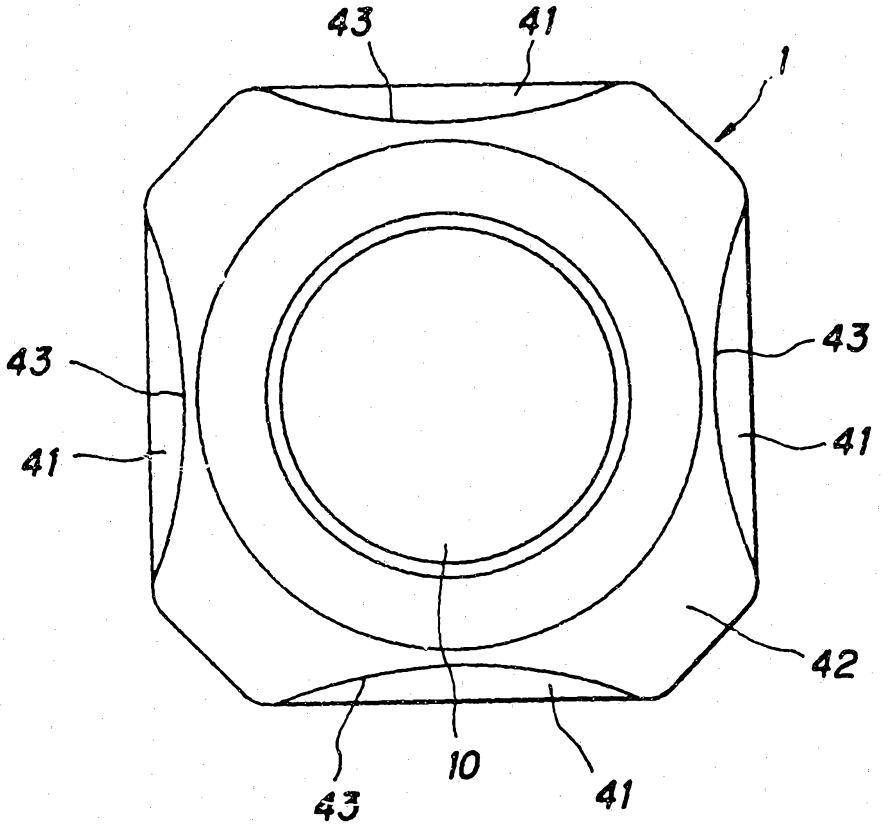

FIG. 11

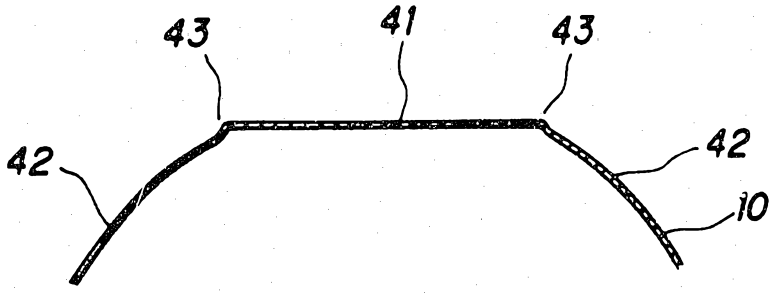

FIG. 12