

Description

Background of the Invention

This invention relates generally to plastic bottles for the retention of fluids under pressure such as carbonated beverages or the like. The invention particularly relates to an improved integral base for such bottles.

During the last twenty years or so, there has been a dramatic shift in the packaging of carbonated beverages, particularly, soft drinks, away from glass containers and toward plastic containers. The plastic containers initially took the form of a two-piece construction wherein a plastic bottle included a generally hemispherical bottom to which was applied a separate base cup which would permit the bottle to stand upright. The hemispherical bottom was seen as the most desirable shape for retaining the pressure generated by the carbonation within the beverage. The pressures can rise up to 6.895×10^5 Pa (100 p.s.i.) or more when the bottled beverage is exposed to the sun, stored in a warm room, car trunk, or the like. Such plastic containers represented a significant safety advantage over glass containers when exposed to the same internal pressures. However, the two-piece construction was not viewed as optimum inasmuch as it required a post molding assembly step, and, generally, a separation step prior to reclaiming or recycling of the resins forming the bottle and base cup.

During this period of development, various attempts were made to construct a one-piece, self-supporting container which would be able to retain the carbonated beverages at the pressures involved. Such a one-piece container requires the design of a base structure which would support the bottle in an upright position and would not bulge outwardly at the bottom. A variety of designs have been attempted following one of two principal lines of thought. One line of designs involved a so-called champaign base having a complete annular peripheral ring. Examples of such bottles are found in Patents US-A-3 722 726; US-A-3 881 621; US-A-4 108 324; US-A-4 247 012; and, US-A-4 249 666. Another variety of designs is that which includes a plurality of feet protruding downward from a curved bottom. Examples of this variety are to be found in Patents US-A-3 598 270; US-A-4 294 366; US-A-4 368 825; US-A-4 865 206; and, US-A-4 867 323.

Bottles using each of these general designs have, in the past, shown significant drawbacks. In order to prevent involution of the bottom of bottles using a champaign style, it was generally found necessary to incorporate a significant amount of resin in the base of the bottle thereby ensuring its stability at room temperature. This incorporation of significant amounts of resin in the base of the bottle had the ef-

fect of not only increasing the cost of the bottle, but also making it increasingly subject to drop impact failure.

Reasonably stable footed bottles could be made employing less resin, but the uneven orientation of the polymer in the footed area of the bottom often contributed to uneven post filling expansion of either one or more feet or the central portion of the bottom creating what is generally referred to as a "rocket." Further, it was recognized that the stability of the bottle was directly related to the size of the footprint of the bottle. Whereas some of the earlier designs were in the form of a plurality of nearly point-like feet spaced apart by about half the diameter of the bottle, more recent designs have tended toward a wider spacing of the feet with each foot designed to contact an increased area of the underlying surface.

Throughout the development of various improvements on the two basic designs has been the constant goal to develop a container of stable configuration using as little resin as possible thereby reducing the cost of the container while maximizing the utility of natural resources.

Summary of the Invention

The invention concerns a bottle as disclosed in the preamble of claim 1. Such a bottle is disclosed in the document EP-A-0346858 (corresponding to US-A-4865206 previously cited). A bottle according to the invention further includes the features of the characterizing part of claim 1.

A blow-molded bottle of thermoplastic resin of the present invention has a hollow body with a generally cylindrical side wall rotationally symmetric about a longitudinal axis of the bottle, and an integral base merging with the side wall. The base is defined by an outer surface comprising a plurality of downward projections, the lower most extent of which is arcuately extending. The downward projections are separated from each other by quarter-spherical segments extending from the cylindrical side wall to the longitudinal axis of the bottle. Each of the downward projections has, in cross section, a first inclined portion contiguous to the longitudinal axis. A second inclined portion is situated radially outside of, and axially displaced downwardly from the first inclined portion. A generally vertical ring segment parallel to the longitudinal axis has an upper edge united with the first inclined portion and a lower edge united with the second inclined portion. The lower most extent of each downward projection is defined by a radially outwardly and upwardly curved portion having an inner edge united with the second inclined portion and an outer edge leading to the cylindrical side wall. The pair of inclined portions coupled together by the substantially vertical ring segment provides significant pressure stability for the base. The wide stance and large

arcuate proportion of each of the downward projections provides for significant mechanical stability for the container against tipping or toppling.

The stability of the bottom is provided in part by providing the base with a thickened resin portion extending at least from the inner margin of the first inclined portion through the lower edge of the generally vertical ring segment united with the second inclined portion. This thickened portion has a thickness of between about two and five times the thickness of the side wall of the bottle. Despite the presence of an enhance resin thickness in this area, bottle capacities of 0.5 liter have been achieved with about 25 grams of resin. The preferred resin employed to make the bottle is polyethylene terephthalate (PET). Other resins can be employed including other saturated polyesters, polyvinylchloride, nylon and polypropylene. The inner surface is curved along each of the hemispherical segments such that the thickness is uniformly tapered from the cylindrical side wall to a point contiguous to the longitudinal axis of the bottle.

The stability of the bottom is also provided in part by providing the base with a very small radius curved portion between the outer margin of the first inclined portion and the upper edge of the generally perpendicular ring segment. The radius of this curved portion is preferably between about 0.381 mm (0.015 in.) and 1.524 mm (0.060 in.). If this curved portion has a radius of greater than about 1.524 mm (0.060 in.), the generally perpendicular ring segment has a tendency to flatten when the bottle is filled with a carbonated liquid. If the curved portion has a radius of less than about 0.381 mm (0.015 in.), the bottle base is susceptible to stress cracking and failure at this point. It has been found that with this curved portion having a radius of about 0.762 mm (0.030 in.), the bottle is able to contain in excess of five volumes of CO₂ at temperatures greater than 37.8°C (100°F).

These and other features of the present invention, together with their inherent advantages, will become apparent to those skilled in the art upon consideration of the following detailed description of preferred embodiments exemplifying the best mode of carrying out the invention as presently perceived. The detailed description particularly refers to the accompanying drawings.

Brief Description of the Drawings

Fig. 1 is a perspective view of a bottle constructed in accordance with the present invention.

Fig. 2 is a bottom plan view of the bottle shown in Fig. 1.

Fig. 3 is a sectional view taken along lines 3-3 of Fig. 2.

Fig. 4 is a bottom plan view of an alternative embodiment of the present invention.

Fig. 5 is a sectional view of the lower portion of

the bottle shown in Fig. 4 taken along lines 5-5.

Description of Preferred Embodiments

A perspective view of a bottle 10 made in accordance with the present invention appears in Fig. 1. The bottle 10 includes a mouth 12 defined by a rim 14 at the top of a finish 16 adapted, in the conventional manner, to receive a closure (not illustrated) for sealing the contents of the bottle. A support ring 18 below the finish 16 is employed during the blow-molding procedure in the usual manner. Immediately below the support ring 18 is neck 20 which flares outwardly via a shoulder portion 22 to a generally cylindrical body portion 24. The bottle terminates at its lower end in a base 26 which is integrally formed with the cylindrical side wall 24. While the container 10 is shown in Fig. 1 to have a mouth 14 which is only a small fraction of the diameter of the cylindrical side wall 24, the size and appearance of that portion of the bottle above the cylindrical side wall plays no unique part in the present invention and is merely for illustrative purposes so as to show a complete bottle 10.

The base 26 includes a plurality of arcuately extending downward projections 28 which are separated from each other by quarter-spherical arc segments 30. The quarter-spherical arc segments 30 are at the intersection of slanted radial facets 32 which define the sides of each of the downward projections 28. The lower most extremities of each of the downward projections is an arcuate line segment 34 on a radially outwardly and upwardly curved outer surface 36.

A plan view of the bottom as shown in Fig. 2, reveals a central portion 38 surrounded by four arcuately extending downward projections 28 which are in turn separated from each other by four quarter-spherical segments 30. The slanted radial facets 32 define the sides of each of the arcuately extending downward projections 28 and merge with the quarter-spherical segments 30. The quarter-spherical segments and adjoining slanted radial facets 32 occupy an angle α which is shown to be about 20°. The arcuate extent of the downward projections 28 is then about 70° in the embodiment shown in Figs. 1 and 2.

In the sectional view shown in Fig. 3, it will be seen that the cylindrical side wall 24 is generally symmetric about a longitudinal axis Y of the bottle 10. The quarter-spherical segment 30 can be seen to be the result of a constant radius R established from a center of curvature C located on the longitudinal axis Y. Each of the downward projections 28 includes a first inclined portion 40 and a second inclined portion 42 joined together by a substantially vertical ring segment 44. The inner margin of the first inclined portion merges with the central portion 38 contiguous to the longitudinal axis Y. The first inclined portion is shown to be radially inside and axially upwardly offset from

the second inclined surface 42 by virtue of the essentially vertical ring segment 44.

A very small radius curved portion 43 is between the outer margin of the first inclined portion 40 and the upper edge of the generally vertical ring segment 44. The radius of curved portion 43 is preferably between about 0.381 mm (0.015 in.) and 1.524 mm (0.060 in.). If the curved portion 43 has a radius of greater than about 1.524 mm (0.060 in.), the generally vertical ring segment 44 has a tendency to flatten when the bottle 10 is filled with a carbonated liquid. If the curved portion 43 has a radius of less than about 0.381 mm (0.015 in.), the bottle base is susceptible to stress cracking and failure at this point. It has been found that with this curved portion 43 having a radius of about 0.762 mm (0.030 in.), the bottle 10 is able to contain in excess of five volumes of CO₂ at temperatures in excess of 37.8°C (100°F).

The outer margin of the second inclined portion merges with a radially outward and upwardly curved portion 46 which defines the axially lower most extent of each downward projection forming a generally circular but segmented ring 34 on which the bottle stands.

An outer wall portion 48 which is inclined at an angle γ with respect to the cylindrical side wall 24 joins the cylindrical side wall to the curved portion 46. As shown in Fig. 3, the angle γ is between about 1° and 10°, and preferably about 5° thereby permitting the ring 34 to have a diameter d which is approximately 0.7 times the major diameter D of the cylindrical side wall 24.

The facets 32 which define the sides of the downward projections are shown to be inclined at an angle β with respect to a plane passing through the axis of symmetry Y . As shown in Fig. 3, the angle β is about 10°.

While Figs. 1-3 illustrate an embodiment of the bottle 10 having four downward projections 28, the number is subject to some variation. Figs. 4 and 5 illustrate another embodiment of the container 10 having five downward projections 28'. It will be noted that the quarter-spherical segments 30 and adjacent slanted radial facets 32 occupy approximately the same arcuate extent as shown in Fig. 2 while the arcuate extent of each of the downward projections 28' occupies only about 55-57°. From the sectional view in Fig. 5, it will be seen that the upper inclined portion 40 and the lower inclined portion 42 are inclined at about the same angle so as to be essentially parallel to each other and inclined at an angle δ with respect to the underlying surface. The angle δ is preferably greater than 10°, and is shown in Fig. 5 to be about 15°. It is to be additionally noted that angle δ of inclination of the lower segment 42 and the vertical extent of the vertical ring segment 44 is such that the lower inclined portion 42 is co-planar with a tangent to the opposite quarter-spherical segment 30.

The base 26 of the container 10 is further defined by an inside surface 50 which does not mirror the outside surface but rather provides for a thickened portion 52 extending from the inner margin of the first inclined portion 40 through the lower edge of the vertical ring segment united with the second inclined portion 42. This thickened portion has a thickness between about 2 and 5 times the thickness of the cylindrical side wall 24 and inclined outer wall portions 48. The thickened portion 52 tapers essentially uniformly along the length of the quarter-spherical segments 30 from a maximum thickness contiguous to the axis Y to a thickness corresponding to the cylindrical side wall 24 at the merger therewith.

The step 54 shown in the interior of the thickened portion in the area of the central region 38 is an artifact caused by the extension of the stretch rod during the blowing process into "soft contact" with the interior of the blow mold to ensure that the parison does not wander during the blowing operation. This soft contact assures the proper deposition of a lower portion of the parison as shown in Figs. 3 and 5 so as to achieve the desired mechanical strength in the bottle while placing sufficient resin to fully develop the downward projections 28 and 28'.

In preliminary tests of bottles in accordance with the present design, 500 ml. bottles were able to be formed using less than 25 grams of PET resin. The bottles, when filled with a carbonated liquid and capped, maintained the desired configuration and in particular maintained an outer segmented ring like contact along line 34.

Although the invention has been described in detail with reference to certain preferred embodiments and specific examples, variations and modifications exist within the scope of the invention as described and as defined in the following claims.

Claims

1. A blow-molded bottle (10) of thermoplastic resin having a hollow body with a generally cylindrical side wall (24) rotationally symmetric about a longitudinal axis (Y) of the bottle (10), and an integral base (26) merging with the side wall (24), the base (26) being defined by an outer surface (36) comprising a plurality of arcuately extending downward projections (28) separated from each other by quarter-spherical segments (30) extending from the cylindrical side wall (24) to the longitudinal axis (Y) of the bottle (10), each of said arcuately extending downward projections (28) having a first inclined portion (40) whose inner margin merges with a central portion (38) contiguous to the longitudinal axis (Y), a second inclined portion (42) situated radially outside of, and axially displaced downwardly from, the first

the second inclined surface 42 by virtue of the essentially vertical ring segment 44.

A very small radius curved portion 43 is between the outer margin of the first inclined portion 40 and the upper edge of the generally vertical ring segment 44. The radius of curved portion 43 is preferably between about 0.381 mm (0.015 in.) and 1.524 mm (0.060 in.). If the curved portion 43 has a radius of greater than about 1.524 mm (0.060 in.), the generally vertical ring segment 44 has a tendency to flatten when the bottle 10 is filled with a carbonated liquid. If the curved portion 43 has a radius of less than about 0.381 mm (0.015 in.), the bottle base is susceptible to stress cracking and failure at this point. It has been found that with this curved portion 43 having a radius of about 0.762 mm (0.030 in.), the bottle 10 is able to contain in excess of five volumes of CO₂ at temperatures in excess of 37.8°C (100°F).

The outer margin of the second inclined portion merges with a radially outward and upwardly curved portion 46 which defines the axially lower most extent of each downward projection forming a generally circular but segmented ring 34 on which the bottle stands.

An outer wall portion 48 which is inclined at an angle γ with respect to the cylindrical side wall 24 joins the cylindrical side wall to the curved portion 46. As shown in Fig. 3, the angle γ is between about 1° and 10°, and preferably about 5° thereby permitting the ring 34 to have a diameter d which is approximately 0.7 times the major diameter D of the cylindrical side wall 24.

The facets 32 which define the sides of the downward projections are shown to be inclined at an angle β with respect to a plane passing through the axis of symmetry Y . As shown in Fig. 3, the angle β is about 10°.

While Figs. 1-3 illustrate an embodiment of the bottle 10 having four downward projections 28, the number is subject to some variation. Figs. 4 and 5 illustrate another embodiment of the container 10 having five downward projections 28'. It will be noted that the quarter-spherical segments 30 and adjacent slanted radial facets 32 occupy approximately the same arcuate extent as shown in Fig. 2 while the arcuate extent of each of the downward projections 28' occupies only about 55-57°. From the sectional view in Fig. 5, it will be seen that the upper inclined portion 40 and the lower inclined portion 42 are inclined at about the same angle so as to be essentially parallel to each other and inclined at an angle δ with respect to the underlying surface. The angle δ is preferably greater than 10°, and is shown in Fig. 5 to be about 15°. It is to be additionally noted that angle δ of inclination of the lower segment 42 and the vertical extent of the vertical ring segment 44 is such that the lower inclined portion 42 is co-planar with a tangent to the opposite quarter-spherical segment 30.

The base 26 of the container 10 is further defined by an inside surface 50 which does not mirror the outside surface but rather provides for a thickened portion 52 extending from the inner margin of the first inclined portion 40 through the lower edge of the vertical ring segment united with the second inclined portion 42. This thickened portion has a thickness between about 2 and 5 times the thickness of the cylindrical side wall 24 and inclined outer wall portions 48. The thickened portion 52 tapers essentially uniformly along the length of the quarter-spherical segments 30 from a maximum thickness contiguous to the axis Y to a thickness corresponding to the cylindrical side wall 24 at the merger therewith.

The step 54 shown in the interior of the thickened portion in the area of the central region 38 is an artifact caused by the extension of the stretch rod during the blowing process into "soft contact" with the interior of the blow mold to ensure that the parison does not wander during the blowing operation. This soft contact assures the proper deposition of a lower portion of the parison as shown in Figs. 3 and 5 so as to achieve the desired mechanical strength in the bottle while placing sufficient resin to fully develop the downward projections 28 and 28'.

In preliminary tests of bottles in accordance with the present design, 500 ml. bottles were able to be formed using less than 25 grams of PET resin. The bottles, when filled with a carbonated liquid and capped, maintained the desired configuration and in particular maintained an outer segmented ring like contact along line 34.

Although the invention has been described in detail with reference to certain preferred embodiments and specific examples, variations and modifications exist within the scope of the invention as described and as defined in the following claims.

Claims

1. A blow-molded bottle (10) of thermoplastic resin having a hollow body with a generally cylindrical side wall (24) rotationally symmetric about a longitudinal axis (Y) of the bottle (10), and an integral base (26) merging with the side wall (24), the base (26) being defined by an outer surface (36) comprising a plurality of arcuately extending downward projections (28) separated from each other by quarter-spherical segments (30) extending from the cylindrical side wall (24) to the longitudinal axis (Y) of the bottle (10), each of said arcuately extending downward projections (28) having a first inclined portion (40) whose inner margin merges with a central portion (38) contiguous to the longitudinal axis (Y), a second inclined portion (42) situated radially outside of, and axially displaced downwardly from, the first



inclined portion (40), a radially outwardly and upwardly curved portion (46) defining the axially lower most extent of each downward projection and having an inner edge united with the second inclined portion (42), and an outer edge united with the cylindrical side wall (24), and characterized by a generally vertical ring segment (44) parallel to the longitudinal axis having an upper edge united with the first inclined portion (40) and a lower edge united with the second inclined portion (42) to form a container of stable configuration for the retention of fluids under pressure.

2. The blow-molded bottle of claim 1 wherein each of said arcuately extending downward projections (28) further includes a curved portion (43) at the union of the generally vertical ring segment (44) upper edge and the first inclined portion (40), the curved portion (43) having a radius of between about 0.381 mm (0.015 in.) and 1.524 mm (0.060 in.).
3. The blow-molded bottle of any of the claims 1 and 2 wherein each of said arcuately extending downward projections (28) further includes an inclined outer wall portion (48) between the cylindrical side wall (24) and the radially outwardly and upwardly curved portion (46).
4. The blow-molded bottle of claim 3 wherein the inclined outer wall portion (48) between the cylindrical side wall (24) and the radially outwardly and upwardly curved portion (46) is inclined with the respect to the cylindrical side wall (24) at an angle (γ) of about 1° to 10° .
5. The blow-molded bottle of any of the claims 1 to 4 wherein said second inclined portion (42) of each of said arcuately extending downward projections (28) is axially displaced downwardly a sufficient distance by said generally perpendicular ring segment (44) and is inclined at an angle (δ) such that the second inclined portion (42) is coplanar with a line tangent to an opposite one of said hemispherical segments extending from the cylindrical side wall (42) to the longitudinal axis (Y) of the bottle (10).
6. The blow-molded bottle of claim 3 wherein said second inclined portion (42) of each of said arcuately extending downward projections (28) is inclined at an angle (δ) of greater than 10° with respect to a plane normal to the longitudinal axis (Y) of the bottle (10).
7. The blow-molded bottle of claim 6 wherein said second inclined portion (42) of each of said arcuately extending downward projections (28) is

inclined at an angle (δ) of about 15° with respect to a plane normal to the longitudinal axis (Y) of the bottle (10).

8. The blow-molded bottle of any of the claims 5 to 7 wherein said first inclined portion (40) and said second inclined portion (42) of each of said arcuately extending downward projections (28) are inclined at the same angle (δ).
9. The blow-molded bottle of any of the claims 1 to 8 wherein each of said quarter-spherical segments (30) extending from the cylindrical side wall (24) to the longitudinal axis (Y) of the bottle radiates through an arc (α) of about 10° .
10. The blow-molded bottle of any of the claims 1 to 9 wherein the outer surface (36) further includes slanted radial facets (32) merging the sides of said arcuately extending downward projections (28) with said hemispherical segments (30) extending from the cylindrical side wall (24) to the longitudinal axis (Y) of the bottle (10).
11. The blow-molded bottle of claim 10 wherein the radial facets (32) merging the sides of said arcuately extending downward projections (28) with said quarter-spherical segments (30) extending from the cylindrical side wall (24) to the longitudinal axis (Y) of the bottle are slanted at an angle of about 10° from a plane passing through the longitudinal axis (Y) of the bottle (10).
12. The blow-molded bottle of any of the claims 1 to 11, wherein the base (26) is further defined by a thickened portion (52) extending from the inner margin of the first inclined portion (40) through the lower edge of the generally vertical ring segment (44) united with the second inclined portion (42), the thickened portion (52) having a thickness of between about two and five times the thickness of the side wall (24) of the bottle (10).
13. The blow-molded bottle of any of the claims 1 to 12, the base being defined by an inner surface (50) and an outer surface (36), wherein each of said arcuately extending downward projections (28) of the outer surface (36) further includes an inclined outer wall portion (48) between the cylindrical side wall (24) and the radially outwardly and upwardly curved portion (46), and wherein the inner surface (50) is spaced substantially uniformly from the outer wall from the union between the second inclined portion (42) and the radially outwardly and upwardly curved portion (46) defining the axially lower most extent of each downward projection (28) upwardly to the union with the cylindrical side wall (24).



14. The blow-molded bottle of any of the claims 1 to 13, the base being defined by an inner surface (50) and an outer surface (36), wherein the inner surface (50) is substantially uniformly tapered from the outer surface (36) over the length of the quarter-spherical segments (30) extending from the cylindrical side wall (24) to a point contiguous to the longitudinal axis (Y) of the bottle (10).

Patentansprüche

1. Blasgeformte Flasche (10) aus Thermoplastharz mit einem Hohlkörper mit einer im wesentlichen zylindrischen, um eine Längsachse (Y) der Flasche (10) rotationssymmetrischen Seitenwand (24) und einer angeformten, mit der Seitenwand (24) verbundenen Basis (26), wobei die Basis (26) durch eine äußere Fläche (36) begrenzt ist, die eine Vielzahl von sich bogenförmig nach unten erstreckenden Vorsprüngen (28) umfaßt, die durch Viertelkugelsegmente (30) voneinander getrennt sind, welche sich von der zylindrischen Seitenwand (24) zu der Längsachse (Y) der Flasche (10) erstrecken, wobei jeder der sich bogenförmig nach unten erstreckenden Vorsprünge (28) einen ersten geneigten Abschnitt (40), dessen innerer Rand in einen an die Längsachse (Y) angrenzenden Mittelabschnitt (38) übergeht, einen zweiten geneigten Abschnitt (42), der radial außerhalb und axial unterhalb von dem ersten geneigten Abschnitt (40) gelegen ist, und einen radial nach außen und unten gewölbten Abschnitt (46) besitzt, der die äußerste axiale Ausdehnung jedes nach unten gerichteten Vorsprunges festlegt und eine innere, mit dem zweiten geneigten Abschnitt (42) verbundene Kante und eine äußere, mit der zylindrischen Seitenwand (24) verbundene Kante besitzt, und gekennzeichnet ist durch ein im wesentlichen vertikales, zur Längsachse paralleles Ringsegment (44), das eine obere, mit dem ersten geneigten Abschnitt (40) verbundene Kante und eine untere, mit dem zweiten geneigten Abschnitt (42) verbundene Kante besitzt, um einen Behälter mit standsicherem Aufbau für die Aufnahme von unter Druck stehenden Flüssigkeiten zu bilden.
2. Blasgeformte Flasche nach Anspruch 1, bei der jeder der sich bogenförmig nach unten erstreckenden Vorsprünge (28) außerdem einen gewölbten Abschnitt (43) an der Verbindung der oberen Kante des im wesentlichen vertikalen Ringsegmentes (44) und des ersten geneigten Abschnitts (40) umfaßt, wobei der gewölbte Abschnitt (43) einen Radius zwischen ungefähr 0,381 mm (0.015 in.) und 1,524 mm (0.060 in.) besitzt.
3. Blasgeformte Flasche nach einem der Ansprüche 1 und 2, bei der jeder der sich bogenförmig nach unten erstreckenden Vorsprünge (28) außerdem einen geneigten Außenwandabschnitt (48) zwischen der zylindrischen Seitenwand (24) und dem radial nach außen und unten gewölbten Abschnitt (46) umfaßt.
4. Blasgeformte Flasche nach Anspruch 3, bei der der geneigte Außenwandabschnitt (48) zwischen der zylindrischen Seitenwand (24) und dem radial nach außen und unten gewölbten Abschnitt (46) in Bezug auf die zylindrische Seitenwand (24) in einem Winkel (γ) von ungefähr 1° bis 10° geneigt ist.
5. Blasgeformte Flasche nach einem der Ansprüche 1 bis 4, bei der der zweite geneigte Abschnitt (42) eines jeden der sich bogenförmig nach unten erstreckenden Vorsprünge (28) axial unterhalb eines ausreichenden Abstandes von dem im wesentlichen senkrechten Ringsegment (44) angeordnet und in solch einem Winkel (δ) geneigt ist, daß das zweite geneigte Teil (42) koplanar mit einer Linie ist, welche tangential zu einem der gegenüberliegenden, sich von der zylindrischen Seitenwand (24) zu der Längsachse (Y) der Flasche (10) erstreckenden, halbrunden Segmente ist.
6. Blasgeformte Flasche nach Anspruch 3, bei der der zweite geneigte Abschnitt (42) eines jeden der sich bogenförmig nach unten erstreckenden Vorsprünge (28) in einem Winkel (δ) von mehr als 10° in Bezug auf eine zur Längsachse (Y) der Flasche (10) senkrechte Ebene geneigt ist.
7. Blasgeformte Flasche nach Anspruch 6, bei der das zweite geneigte Teil (42) eines jeden der sich bogenförmig nach unten erstreckenden Vorsprünge (28) um einen Winkel (δ) von ungefähr 15° in Bezug auf eine zur Längsachse (Y) der Flasche (10) senkrechte Ebene geneigt ist.
8. Blasgeformte Flasche nach einem der Ansprüche 5 bis 7, bei der der erste geneigte Abschnitt (40) und der zweite geneigte Abschnitt (42) eines jeden der sich bogenförmig nach unten erstreckenden Vorsprünge (28) um denselben Winkel (δ) geneigt sind.
9. Blasgeformte Flasche nach einem der Ansprüche 1 bis 8, bei der jedes der sich von der zylindrischen Seitenwand (24) zu der Längsachse (Y) der Flasche erstreckenden Viertelkugelsegmente (30) sich strahlenförmig in einem Kreisbogen (α) von ungefähr 10° erweitert.



10. Blasgeformte Flasche nach einem der Ansprüche 1 bis 9, bei dem die äußere Fläche (36) außerdem schräge radiale Facetten (32) besitzt, die die Seiten der sich bogenförmig nach unten erstreckenden Vorsprünge (28) mit den sich von der zylindrischen Seitenwand (24) zu der Längsachse (Y) der Flasche (10) erstreckenden Halbkugelsegmenten (30) verbindet.
11. Blasgeformte Flasche nach Anspruch 10, bei der die radialen Facetten (32), welche die Seiten der sich bogenförmig nach unten erstreckenden Vorsprünge (28) mit den sich von der zylindrischen Seitenwand (24) zu der Längsachse (Y) der Flasche (10) erstreckenden Viertekugelsegmenten (30) verbinden, in einem Winkel von ungefähr 10° von einer sich durch die Längsachse (Y) der Flasche (10) erstreckenden Ebene abgeschrägt sind.
12. Blasgeformte Flasche nach einem der Ansprüche 1 bis 11, bei der die Basis (26) außerdem einen verdickten Abschnitt (52) enthält, der sich von dem inneren Rand des ersten geneigten Abschnitts (40) über die untere Kante des mit dem zweiten geneigten Abschnitt (42) verbundenen, im wesentlichen vertikalen Ringsegmentes (44) erstreckt, wobei der verdickte Abschnitt (52) eine Dicke zwischen ungefähr dem Zweifels Fünffachen der Dicke der Seitenwand (24) der Flasche (10) besitzt.
13. Blasgeformte Flasche nach einem der Ansprüche 1 bis 12, wobei die Basis eine innere Fläche (50) und eine äußere Fläche (36) enthält, bei der ein jeder der sich bogenförmig nach unten erstreckenden Vorsprünge (28) der äußeren Fläche (36) außerdem ein geneigtes Außenwandteil (48) zwischen der zylindrischen Seitenwand (24) und dem radial nach außen und unten gewölbten Abschnitts (46) umfaßt, und daß die innere Fläche (50) im wesentlichen gleichmäßig beabstandet ist von der äußeren Wand der Verbindung zwischen dem zweiten geneigten Abschnitt (42) und dem radial nach außen und unten gewölbten Abschnitt (46), welcher die unterste axiale Ausdehnung jedes nach unten gerichteten Vorsprunges (28) aufwärts zur Verbindung mit der zylindrischen Seitenwand (24) festlegt.
14. Blasgeformte Flasche nach einem der Ansprüche 1 bis 13, wobei die Basis eine innere Fläche (50) und eine äußere Fläche (36) enthält, daß die innere Fläche (50) sich im wesentlichen gleichmäßig von der äußeren Fläche (36) über eine vorgegebene Länge der Viertekugelsegmente (30) verjüngt, die sich von der zylindrischen Seitenwand (24) bis zu einem mit der Längsachse (Y)

der Flasche (10) fluchtenden Punkt erstreckt.

Revendications

1. Bouteille (10) en résine thermoplastique moulée par soufflage, comprenant un ventre creux présentant une paroi latérale (24) sensiblement cylindrique, symétrique en rotation par rapport à un axe longitudinal (Y) de la bouteille (10), et une base d'un seul tenant (26) fusionnant avec la paroi latérale (24), la base (26) étant définie par une surface extérieure (36) comprenant une pluralité d'éléments (28) faisant saillie vers le bas et s'étendant en arc de cercle, séparés les uns des autres par des segments (30) formant un quart de sphère s'étendant à partir de la paroi latérale (24) vers l'axe longitudinal (Y) de la bouteille (10), chacun desdits éléments (28) faisant saillie vers le bas et s'étendant en arc de cercle présentant une première partie inclinée (40) dont le bord intérieur fusionne avec une partie centrale (38) contigüe à l'axe longitudinal (Y), une deuxième partie inclinée (42) située radialement à l'extérieur de la première partie inclinée (40) et axialement décalée vers le bas par rapport à celle-ci, une partie (46) radialement extérieure et incurvée vers le haut, définissant axialement l'étendue la plus basse de chaque élément en saillie vers le bas et présentant une arête intérieure assemblée à la deuxième partie inclinée (42), et un bord extérieur assemblé à la paroi extérieure cylindrique (24), et caractérisé par un segment annulaire (44) sensiblement vertical, parallèle à l'axe longitudinal, présentant une arête supérieure assemblée à la première partie inclinée (40) et une arête inférieure assemblée à la deuxième partie inclinée (42) pour former un conteneur d'une configuration stable destiné à contenir des fluides sous pression.
2. Bouteille moulée par soufflage selon la revendication 1, dans laquelle chacun des éléments (28) en saillie vers le bas et s'étendant en arc de cercle inclut par ailleurs une partie courbe (43) située à la jonction de l'arête supérieure du segment annulaire (44) sensiblement vertical et de la première partie inclinée (40), la partie courbe (43) présentant un rayon compris entre environ 0,381 mm (0,015 pouce) et 1,524 mm (0,060 pouce).
3. Bouteille moulée par soufflage selon l'une quelconque des revendications 1 ou 2, dans laquelle lesdits éléments (28) en saillie vers le bas et s'étendant en arc de cercle incluent une partie de paroi (48) extérieure inclinée, entre la paroi latérale (24) cylindrique et la partie (46) courbe vers



le haut et radialement extérieure.

4. Bouteille moulée par soufflage selon la revendication 3, dans laquelle la partie (48) de paroi extérieure inclinée, située entre la paroi latérale (24) cylindrique et la partie (46) courbe vers le haut et radialement extérieure est inclinée par rapport à la paroi latérale cylindrique (24) selon un angle (γ) compris entre environ 1° et 10° . 5
5. Bouteille (10) moulée par soufflage selon l'une quelconque des revendications 1 à 4, dans laquelle ladite deuxième partie inclinée (42) de chaque élément (28) en saillie vers le bas et s'étendant en arc de cercle est décalée axialement vers le bas sur une distance suffisante par l'intermédiaire du segment annulaire (44) sensiblement vertical et est inclinée selon un angle (δ) tel que la deuxième partie inclinée (42) est coplanaire à une ligne tangente à l'un des segments hémisphériques opposés s'étendant depuis la paroi latérale cylindrique (42) vers l'axe longitudinal (Y) de la bouteille (10). 10
6. Bouteille moulée par soufflage selon la revendication 3, dans laquelle ladite deuxième partie inclinée (42) est inclinée selon un angle (δ) supérieur à 10° par rapport à un plan perpendiculaire à l'axe longitudinal (Y) de la bouteille (10). 15
7. Bouteille moulée par soufflage selon la revendication 6, dans laquelle ladite deuxième partie inclinée (42) de chacun desdits éléments (28) en saillie vers le bas et s'étendant en arc de cercle est inclinée selon un angle (δ) d'environ 10° par rapport à un plan perpendiculaire à l'axe longitudinal (Y) de la bouteille (10). 20
8. Bouteille moulée par soufflage selon l'une quelconque des revendications 5 à 7, dans laquelle ladite première partie inclinée (40) et ladite deuxième partie inclinée (42) de chaque élément (28) en saillie vers le bas et s'étendant en arc de cercle sont inclinées selon le même angle (δ). 25
9. Bouteille moulée par soufflage selon l'une quelconque des revendications 1 à 8, dans laquelle chacun des segments (30) formant un quart de sphère s'étendant depuis la paroi latérale (24) à l'axe longitudinal (Y) de la bouteille couvre un arc (α) d'environ 10° . 30
10. Bouteille moulée par soufflage selon l'une quelconque des revendications 1 à 9, dans laquelle la surface extérieure (36) inclut par ailleurs des facettes radiales (32) fusionnant avec les côtés desdits éléments (28) en saillie vers bas et s'étendant en arc de cercle, lesdits segments (30) hé-

misphériques s'étendant de la paroi latérale (24) vers l'axe longitudinal (Y) de la bouteille (10).

11. Bouteille moulée par soufflage selon la revendication 10, dans laquelle les facettes radiales (32) reliant les côtés desdits éléments (28) en saillie vers le bas et s'étendant en arc de cercle avec lesdits segments (30) formant un quart de sphère s'étendant à partir de la paroi latérale (24) de l'axe longitudinal (Y) de la bouteille sont inclinées d'un angle d'environ 10° par rapport à un plan coupant l'axe longitudinal (Y) de la bouteille (10). 35
12. Bouteille moulée par soufflage selon l'une quelconque des revendications 1 à 11, dans laquelle la base (26) est en outre définie par une partie (52) plus épaisse s'étendant du bord intérieur de la première partie inclinée (40) à l'arête inférieure du segment annulaire (44) sensiblement vertical assemblé à la deuxième partie inclinée (42), la partie plus épaisse (52) présentant une épaisseur comprise entre 2 et 5 fois l'épaisseur de la paroi latérale (24) de la bouteille (10). 40
13. Bouteille moulée par soufflage selon l'une quelconque des revendications 1 à 12, la base étant définie par une surface intérieure (50) et une surface extérieure (36), dans laquelle chacun des éléments (28) en saillie vers le bas et s'étendant en arc de cercle de la surface extérieure (36) inclut par ailleurs une partie de paroi (48) extérieure inclinée, entre la paroi latérale (24) cylindrique et la partie (46) radialement extérieure et courbée vers le haut, et dans laquelle la surface intérieure (50) est espacée de manière substantiellement régulière de la paroi extérieure de jonction entre la seconde partie inclinée (42) et de la partie (46) radialement extérieure et courbe vers le haut, définissant l'étendue la plus basse de chaque élément (28) en saillie vers le bas, en allant vers le haut, vers la jonction avec la paroi latérale (24) cylindrique. 45
14. Bouteille moulée par soufflage selon l'une quelconque des revendications 1 à 13, la base étant définie par une surface intérieure (50) et une surface extérieure (36), dans laquelle la surface intérieure (50) s'amincit de manière régulière à partir de la surface extérieure (36) sur la longueur des segments (30) formant un quart de sphère, s'étendant de la paroi latérale (24) cylindrique à un point contigu à l'axe longitudinal (Y) de la bouteille (10). 50

