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Hanan et al.

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(54) **SWIRL BELL BOTTLE WITH WAVY RIBS**

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Related U.S. Application Data

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(60) Provisional application No. 61/746,535, filed on Dec. 27, 2012.

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B65D 90/02 (2006.01)
B65D 1/02 (2006.01)

(52) **U.S. Cl.**
CPC ***B65D 1/0284*** (2013.01); ***B65D 1/0223*** (2013.01); *B65D 2501/0036* (2013.01)

(58) **Field of Classification Search**
CPC B65D 8/00; B65D 1/44; B29B 2911/14486
USPC 215/382, 370, 381, 384; 425/542; 220/669, 670, 671
See application file for complete search history.

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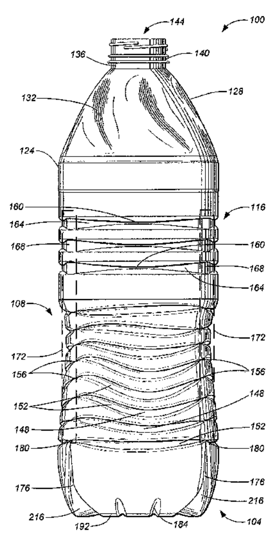
(57) **ABSTRACT**

An apparatus is provided for a container comprising a base, a bell, a sidewall between the base and the bell, a neck and a finish which define an opening to an interior of the container, and a shoulder between the sidewall and the bell. Strap ribs extend from a central portion of the base and terminate at the sidewall. The strap ribs cooperate with vertically aligned recessed columns of the sidewall to resist bending, leaning, crumbling, or stretching along the sidewall and the base. An inwardly offset portion of the sidewall is disposed between each pair of adjacent recessed columns. The inwardly offset portions of the sidewall are configured to resist outward bowing of the sidewall due to internal pressure of contents within the container.

12 Claims, 11 Drawing Sheets



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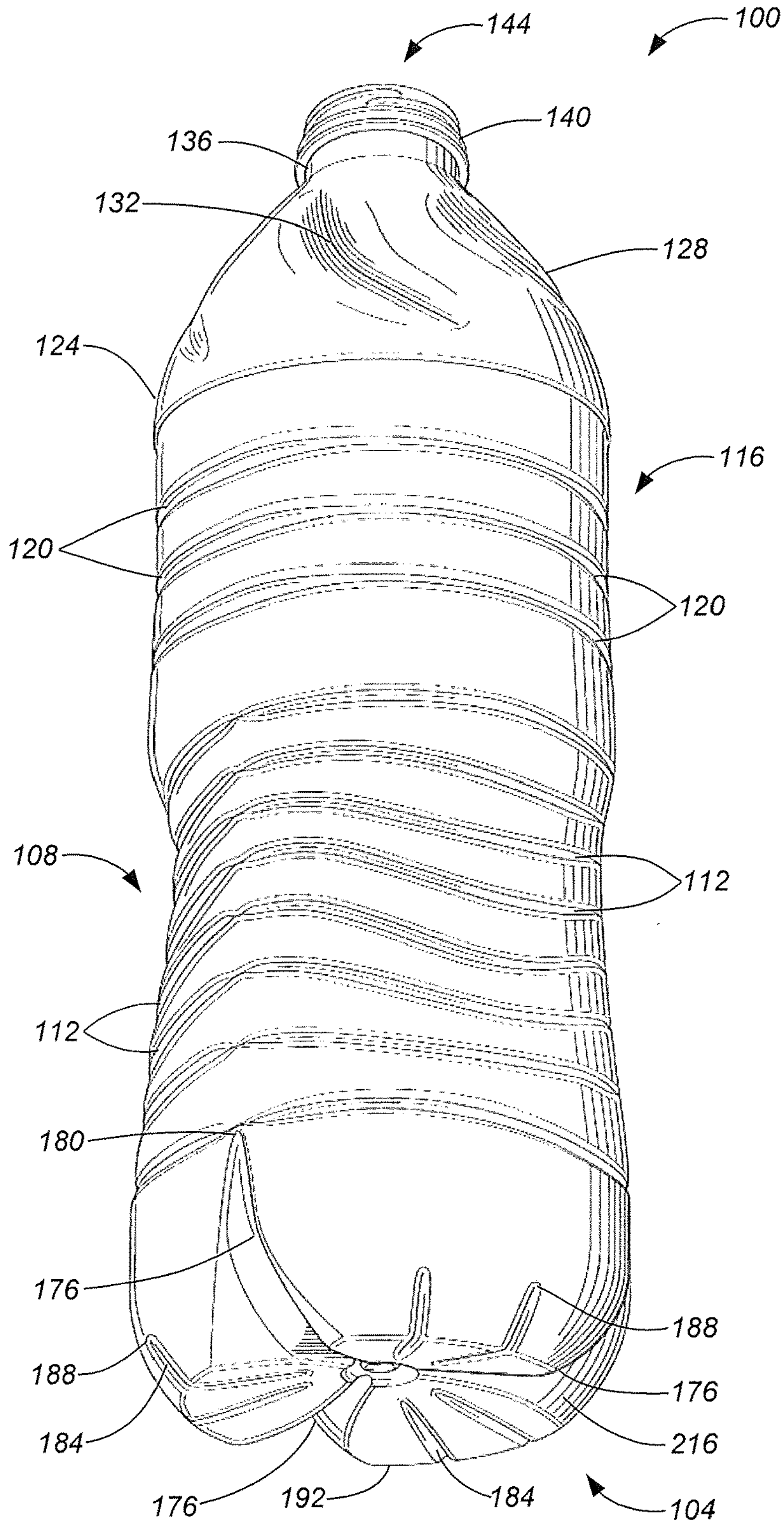
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FIG. 1

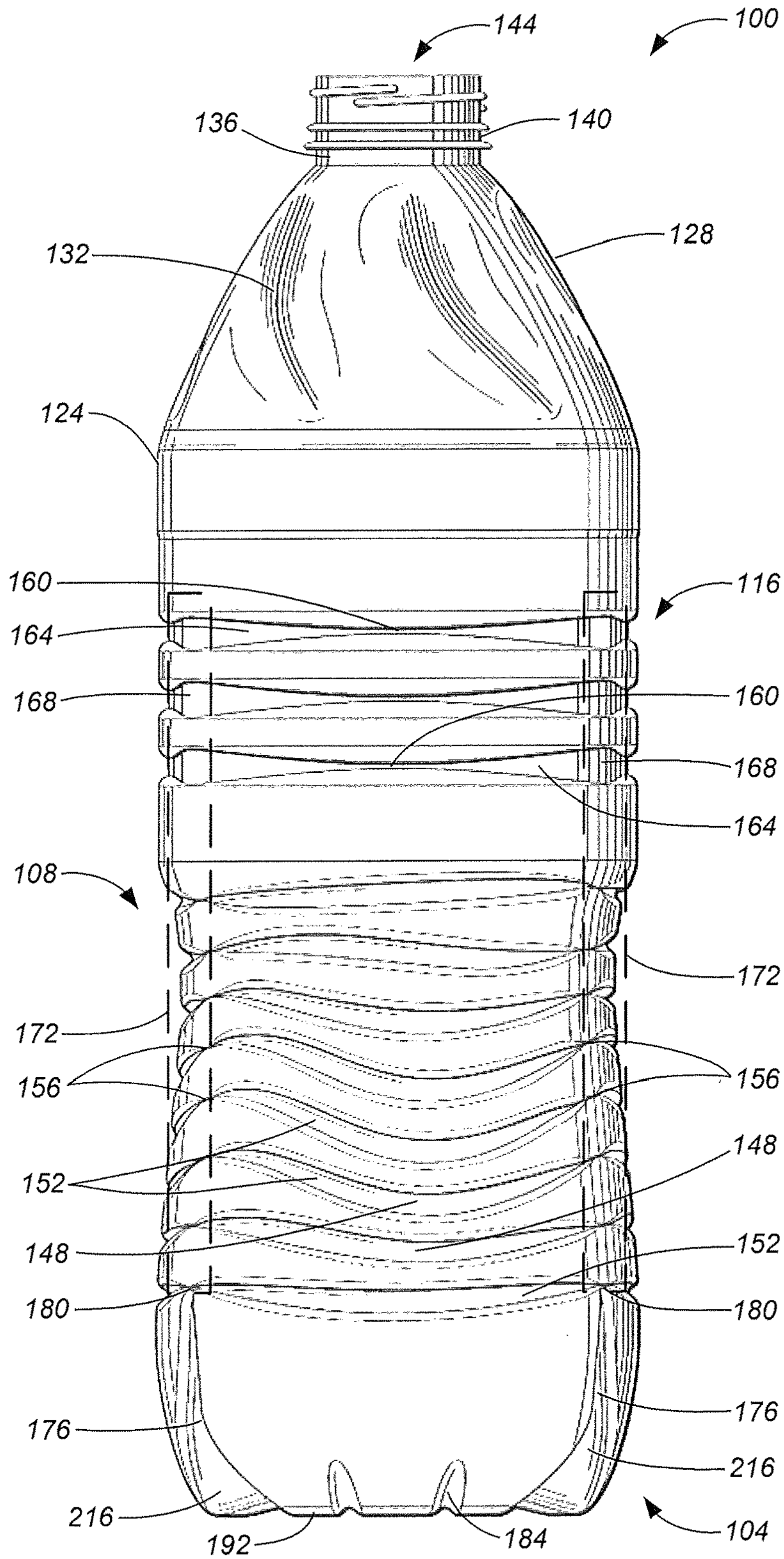
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FIG. 2

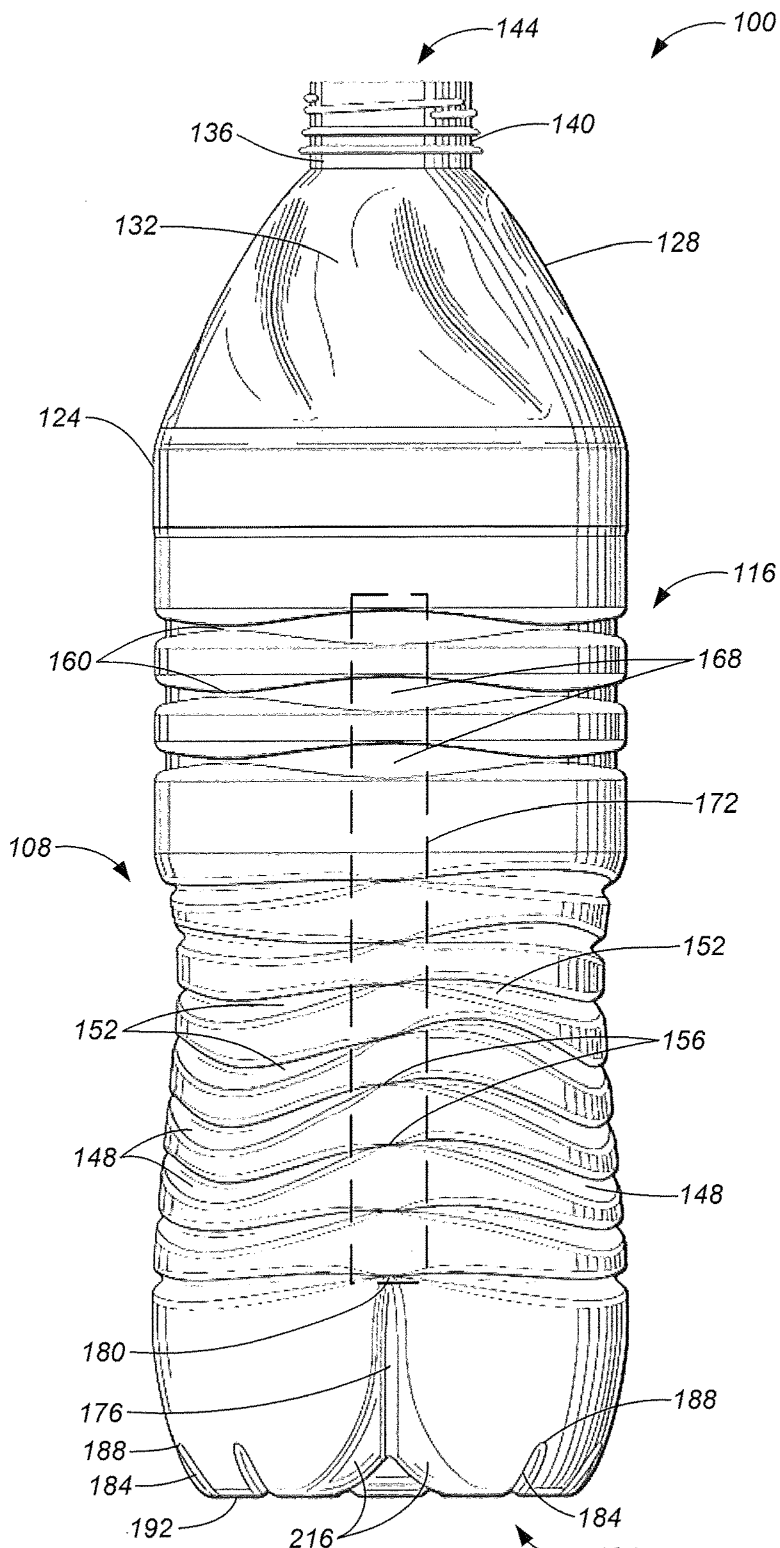
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FIG. 3

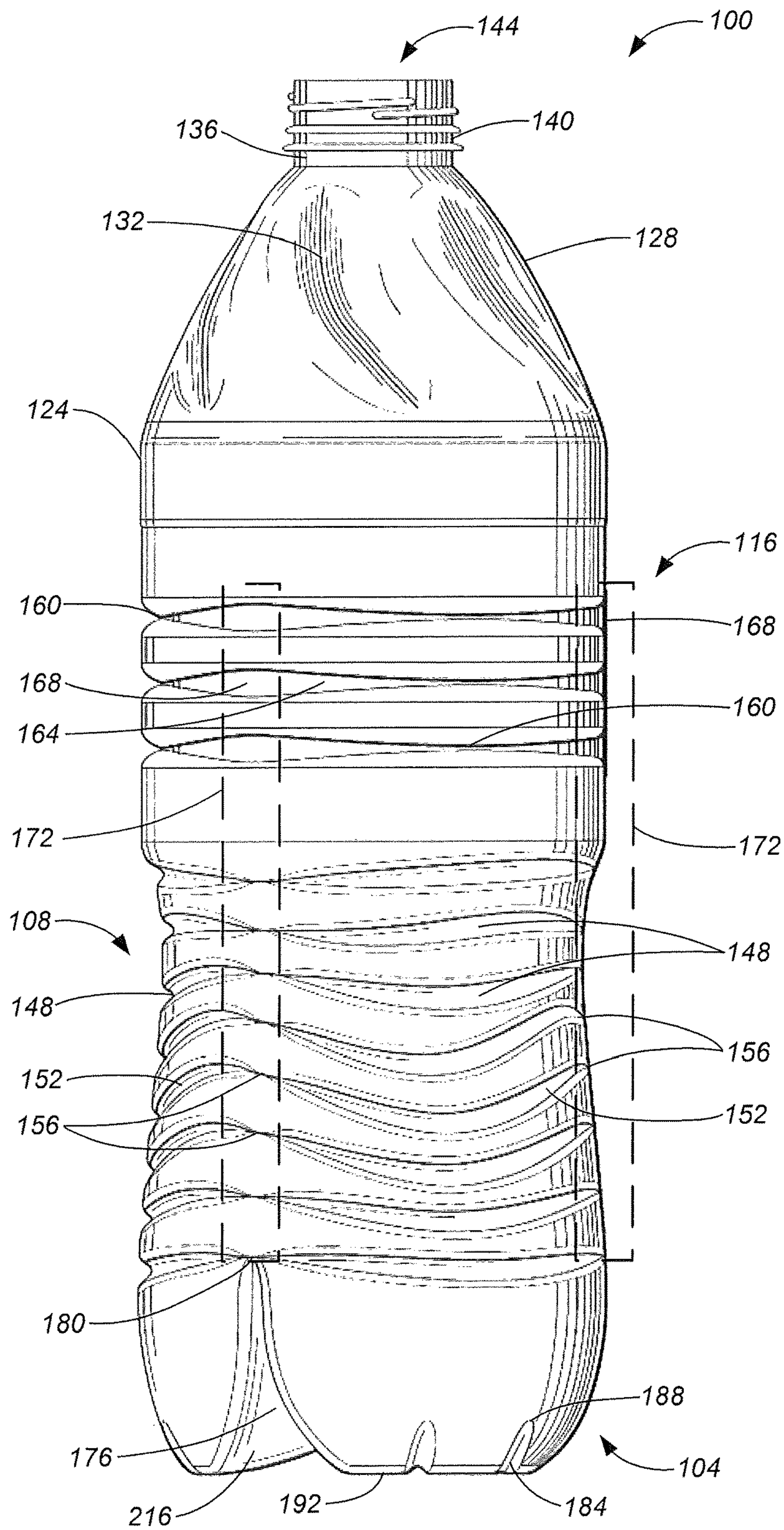
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FIG. 4

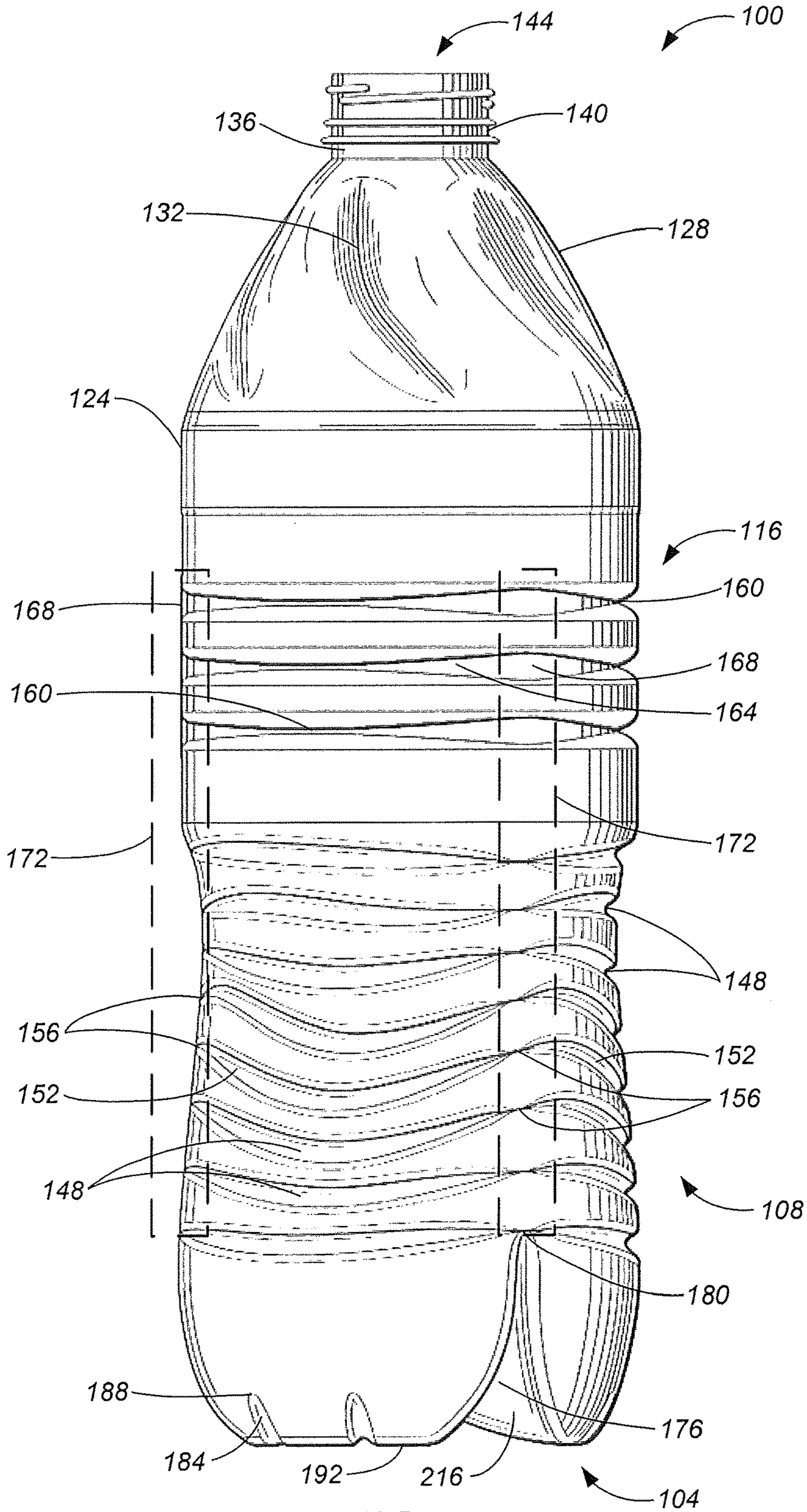
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FIG. 5

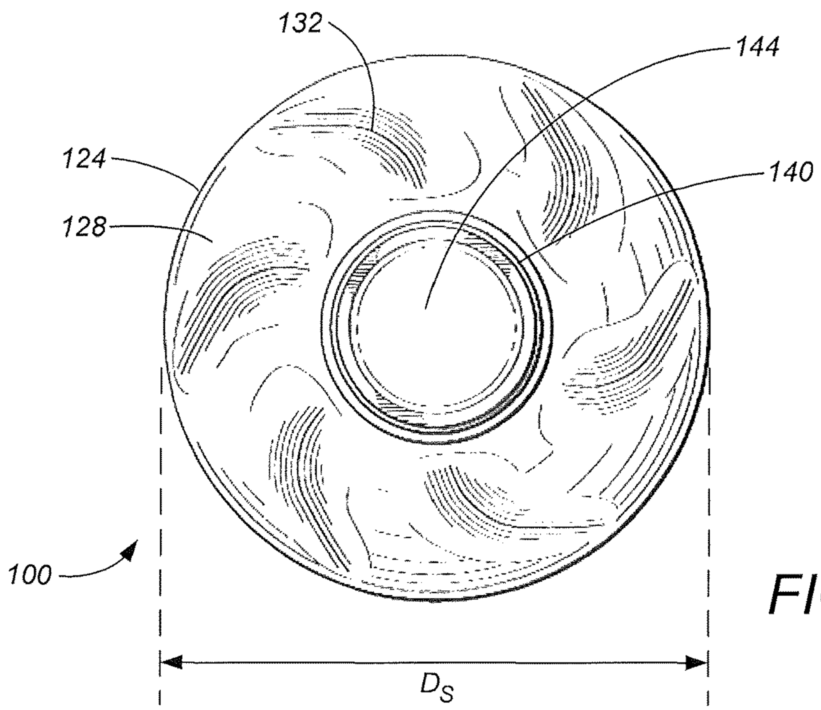
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FIG. 6

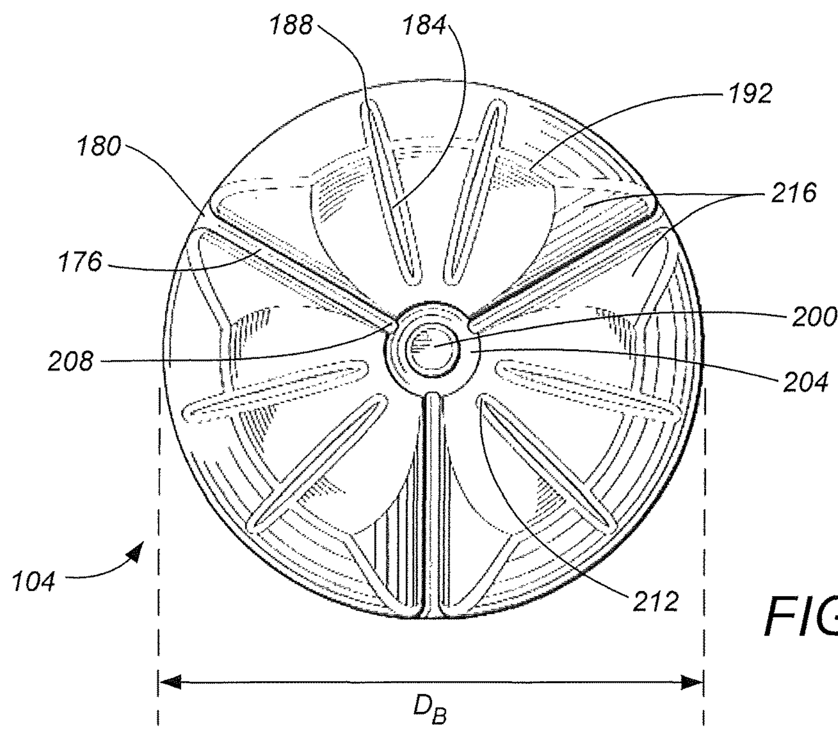
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FIG. 7

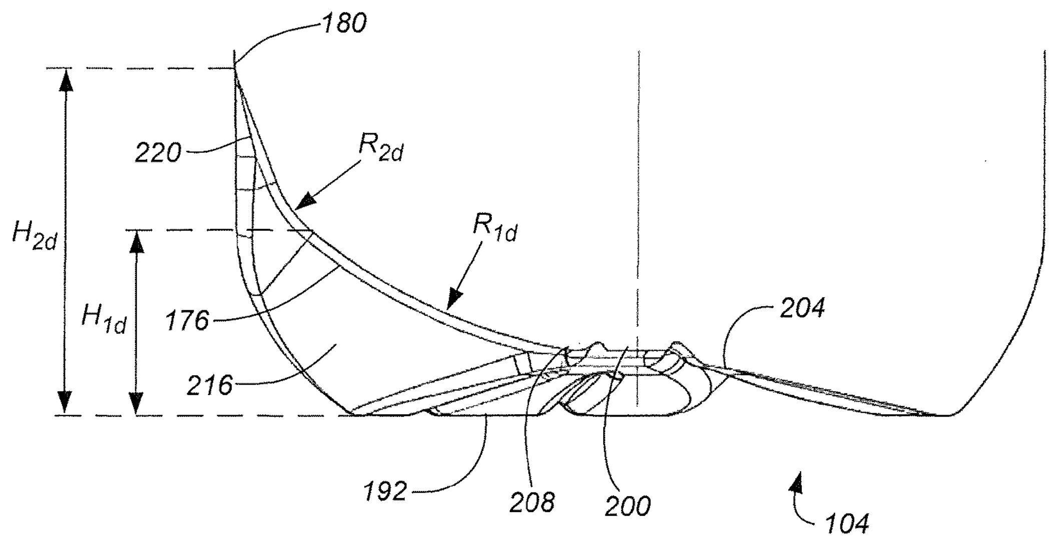

FIG. 8

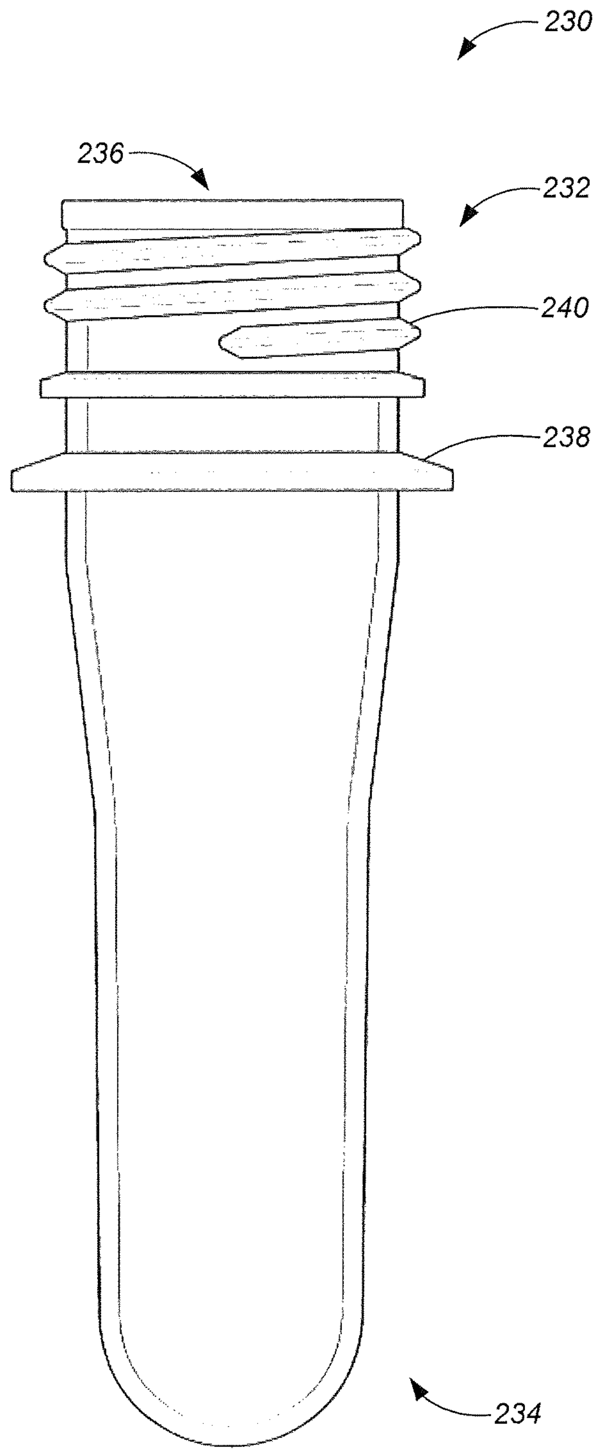

FIG. 9

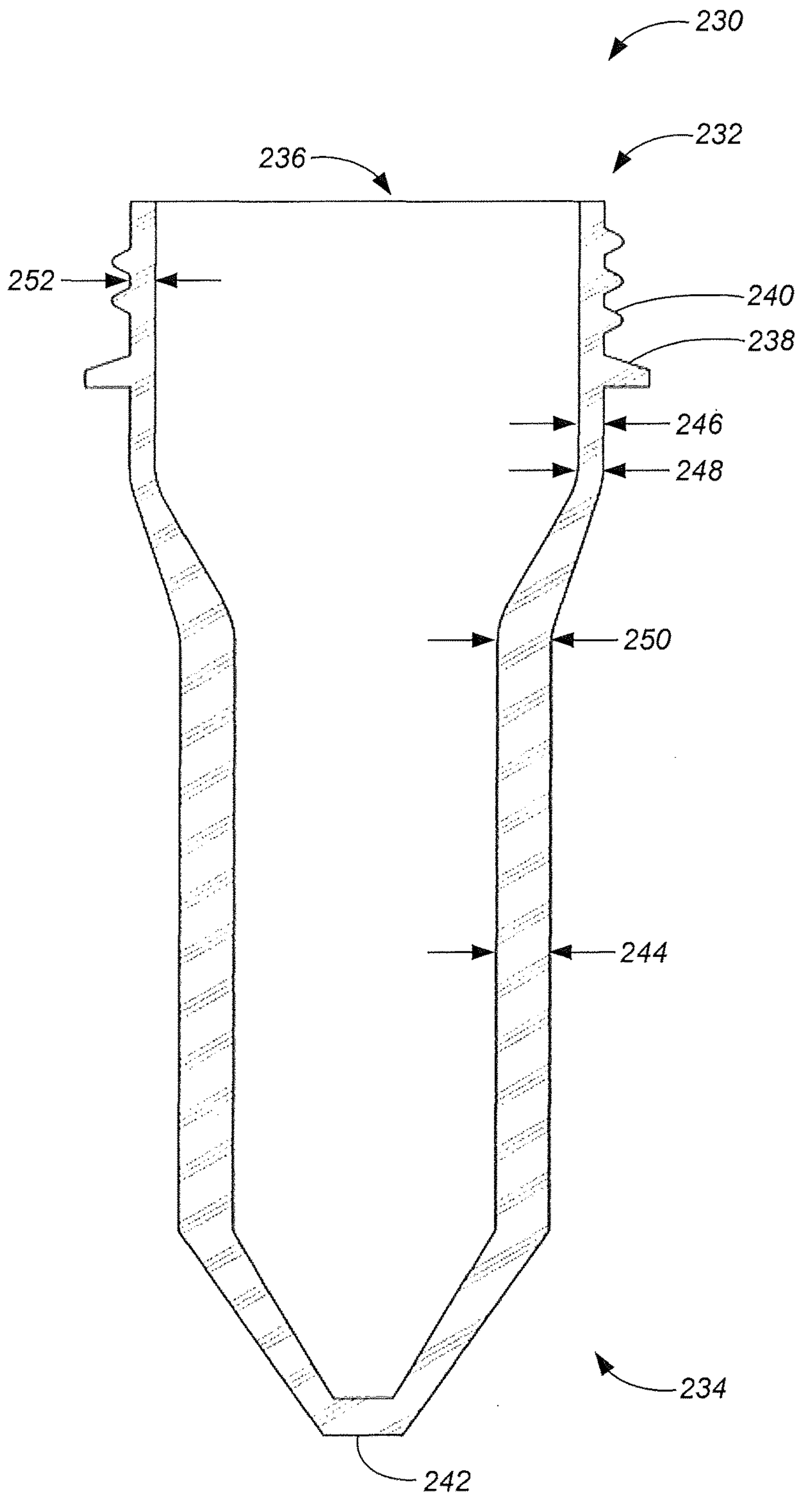

FIG. 10

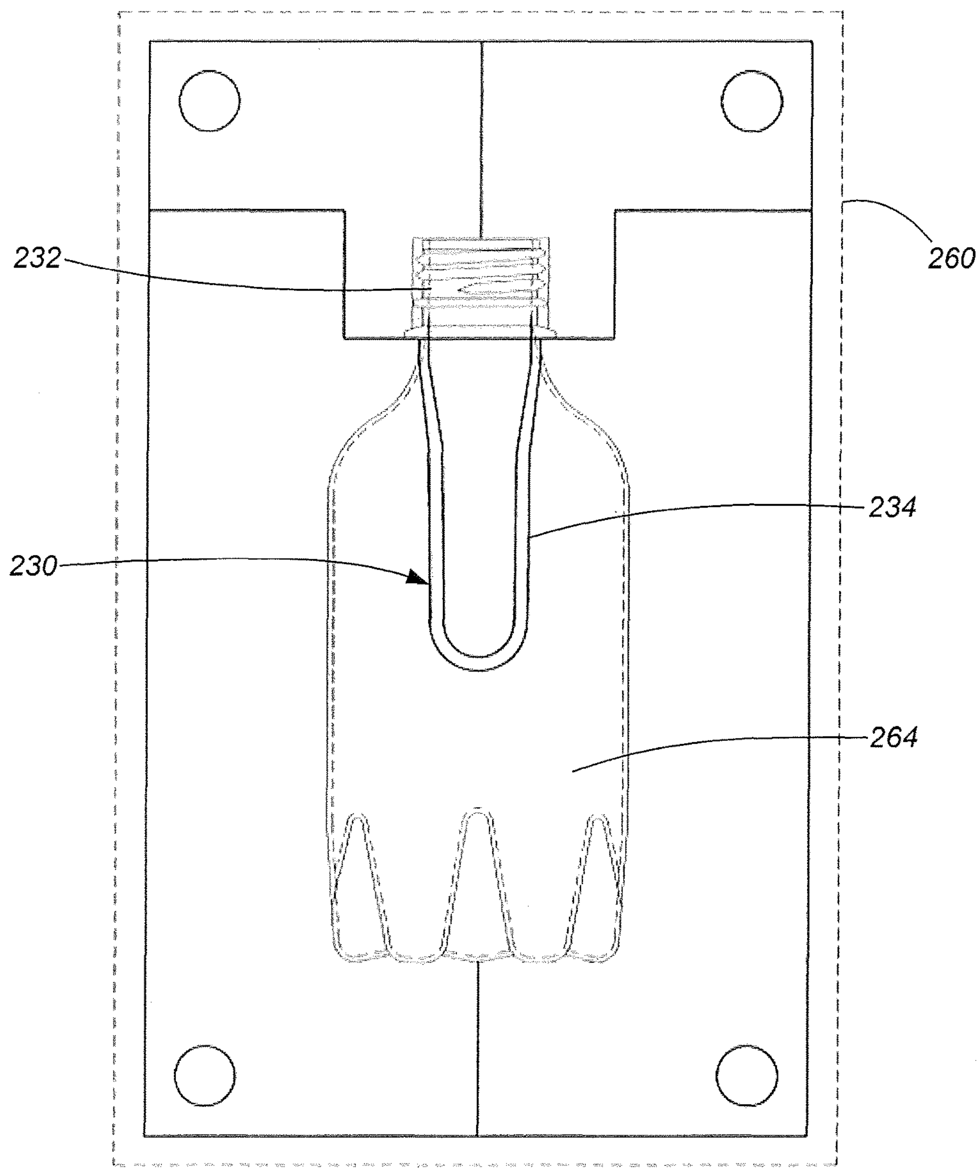

FIG. 11

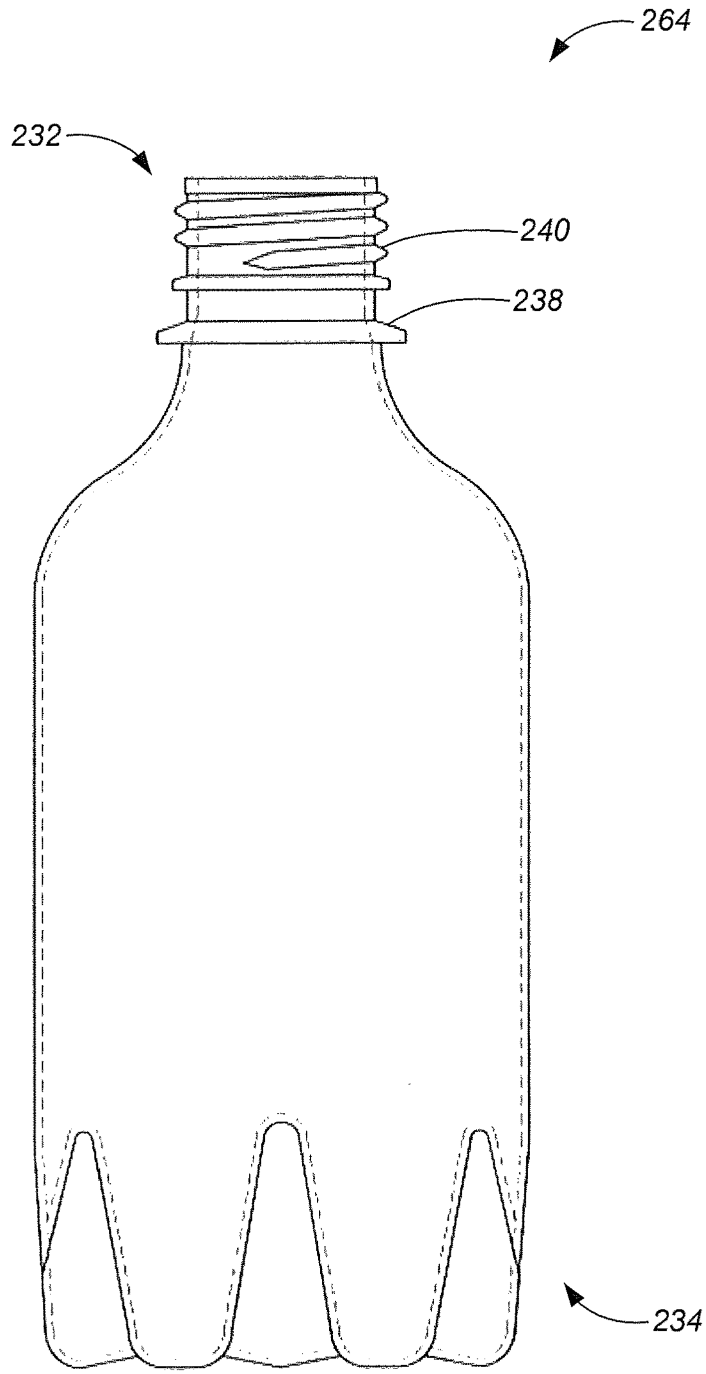

FIG. 12

SWIRL BELL BOTTLE WITH WAVY RIBS

PRIORITY

This application is a continuation in part of, and claims the benefit of, U.S. patent application Ser. No. 14/157,400, entitled "Plastic Container With Strapped Base," filed on Jan. 16, 2014, which is a continuation in part of, and claims the benefit of, U.S. patent application Ser. No. 14/141,224, entitled "Plastic Container with Strapped Base," filed on Dec. 26, 2013, which claims the benefit of U.S. Provisional Application No. 61/746,535, filed on Dec. 27, 2012. This application also claims the benefit of U.S. patent application Ser. No. 13/705,040, entitled "Plastic Container with Varying Depth Ribs," filed on Dec. 4, 2012, now U.S. Pat. No. 8,556,098, entitled "Plastic Container Having Sidewall Ribs with Varying Depth," which claims benefit to U.S. Provisional Patent Application Ser. No. 61/567,086, entitled "Plastic Container with Varying Depth Ribs," filed on Dec. 5, 2011. Each of the aforementioned applications is incorporated by reference in its entirety into this application.

FIELD

This invention relates to plastic bottles and preforms, more specifically plastic performs and bottles blown from such preforms that are suitable for containing beverages and utilize less resin such that they are lighter in weight than conventional bottles.

BACKGROUND

Plastic containers have been used as a replacement for glass or metal containers in the packaging of beverages for several decades. The most common plastic used in making beverage containers today is polyethylene terephthalate (PET). Containers made of PET are transparent, thin-walled, and have the ability to maintain their shape by withstanding the force exerted on the walls of the container by their contents. PET resins are also reasonably priced and easy to process. PET bottles generally are made by way of a process that includes blow-molding of plastic preforms which have been made by injection molding of PET resin.

Advantages of plastic packaging include lighter weight and decreased breakage as compared to glass, as well as lower costs overall when taking both production and transportation into account. Although plastic packaging is lighter in weight than glass, there is still great interest in creating the lightest possible plastic packaging so as to maximize the cost savings in both transportation and manufacturing by making and using containers that contain less plastic.

SUMMARY

The bottling industry is moving in the direction of removing auxiliary packaging from cases or pallets. A case of bottles with film only and no paperboard is called a "film only conversion" or "lightweighting" of auxiliary packaging. The removal of supporting elements such as paperboard places additional stress on a bottle, which increases the structural demands on the bottle. In certain embodiments, a bottle design can provide one or more of the benefits of reducing bending and point loading failures. The disclosed design embodiments can alleviate the stresses during shipping and handling (including film only packaging) while maintaining ease of blow-molding. In certain embodiments, a bottle design uses less resin for the same or similar mechanical performance, resulting in a lightweight product.

Embodiments of the bottle disclosed herein may use polyethylene terephthalate (PET), which has viscoelastic properties of creep and relaxation. As a plastic, PET and other resins tend to relax at temperatures normally seen during use. This relaxation is a time dependent stress relieving response to strain. Bending can provide exaggerated strains over what would be seen in tensile loading. Due to exaggerated strains, the relaxation in bending can be much more severe. Bending happens at multiple length scales. Bending can happen at the length scale of the bottle or on a small length scale. An example of the bottle length scale bending is a person bending the bottle in his/her hands, or bending experienced during packing in a case on a pallet. An example of the small scale is the flexing or folding of ribs or other small features on the wall of the bottle. In response to loads at the first, larger length scale, ribs flex at the local, smaller length scale. When they are held in this position with time, the ribs will permanently deform through relaxation.

Further, embodiments of the bottles disclosed herein may undergo pressurization. Pressure inside a bottle can be due to the bottle containing a carbonated beverage. Pressure inside a bottle can be due to pressurization procedures or processes performed during bottling and packaging. For example, a bottle can be pressurized to help the bottle retain its shape. As another example, the bottle can be pressurized with certain gases to help preserve a beverage contained in the bottle.

Embodiments of the bottles disclosed herein have varying depth ribs that achieve a balance of strength and rigidity to resist the bending described above while maintaining hoop strength, such as, for example, when pressure is not used or relieved. A collection of flattened and/or shallow depth ribs act as recessed columns in the body of the bottle that distribute bending and top load forces along the wall to resist leaning, stretching, and crumbling. The collection of flattened and/or shallow depth ribs can help the bottle retain its shape during pressurization, such as, for example, help inhibit stretching of the bottle when pressurized. Inhibiting stretching of the bottle helps retain desired bottle shape to aid in packaging of the bottles as discussed herein by, for example, maintaining a substantially constant height of the bottle. Inhibiting stretching of the bottle can help with applying a label to a label portion of the bottle. For example, with a label applied to a bottle, inhibiting stretching of the bottle helps retain a constant length or height of the bottle at the label panel portion, which can help prevent tearing of the label and/or prevent the label from at least partially separating from the bottle (i.e., failure of the adhesive between the bottle and the label). Further details on the features and functions of varying depth ribs are disclosed in U.S. patent application Ser. No. 13/705,040, entitled "Plastic Container with Varying Depth Ribs," filed on Dec. 4, 2012, now U.S. Pat. No. 8,556,098, entitled "Plastic Container Having Sidewall Ribs with Varying Depth," which claims benefit to U.S. Provisional Patent Application Ser. No. 61/567,086, entitled "Plastic Container with Varying Depth Ribs," filed on Dec. 5, 2011, the entirety of each of which is incorporated herein by reference and made a part of this disclosure.

A balance may be achieved between flattened and/or shallow ribs and deep ribs to attain a desired resistance to bending, leaning, and/or stretching while maintaining stiffness in a lightweight bottle. In some embodiments, at least some of the aforementioned desired qualities may be further achieved through a steeper bell portion of a bottle. A steeper bell portion can increase top load performance in a lightweight bell. A lightweight bottle body and bell leaves more resin for a thicker base of the bottle, which can increase stability. A thicker base may better resist bending and top load forces and benefits designs with a larger base diameter with respect to the bottle diameter for tolerance even when the base is damaged during packaging, shipping, and/or handling.

Embodiments disclosed herein have a multiplicity of strap ribs that can function as straps from a base to a sidewall of the bottle to the help further achieve resistance to bending, leaning, stretching and/or flexing while maintaining stiffness. A strap rib on a base helps the base resist deformation under pressure without necessitating the base being overly heavy in weight relative to the lightweight bottle (i.e., relative to wall thickness of flat foot base that does not resist pressure as well). The strap base rib can be incorporated into a flat foot base. A flat foot base helps retain base foot thickness. Retaining base foot thickness helps retain bottle integrity during packaging and handling using lightweight packaging, such as, for example, film only packaging that requires the base to directly resist forces, including bending and point loading, during packaging, shipping, and/or handling. A flat foot base performs well with or without internal pressure due to, for example, the ability to maintain relative foot thickness in the base in a lightweight bottle. Without strap ribs, the base may have little internal pressure resistance and may rollout (pop out and create a rocker bottom). The strap ribs help resist damage and deformation as discussed herein without requiring a relatively heavy footed base. Without requiring a relatively heavy footed base, less material is needed for the lightweight bottle. Further, the strapped base design may allow for a relatively easier blowing process than other known pressure bases. Thus, a base with strap ribs as disclosed herein provides for a material efficient, pressure optional bottle base.

Incorporating strap ribs into the base with column formations in the sidewall of the bottle as discussed herein offers pressure resistance for internally pressurized bottles while maintaining strength and performance (i.e., resistance to bending and leaning) when without internal pressure (i.e., pressure release by a user opening a closure of a bottle). The strap ribs can cooperate with the column formations on the sidewall of the bottle to form straps around the bottle to communicate stresses along the height of the bottle.

The base with strap ribs helps maintain strength and performance of the column formations for internally pressurized bottles. With strap ribs, resistance to bending, leaning, and/or stretching while maintaining stiffness and hoop strength is maintained without pressure while enhancing these characteristics when the bottle is pressurized. For example, strap ribs allow the utilization of a flat foot base for better base strength during processing at a plant (i.e., adding beverage contents), while preventing rollout or popping out of the base during pressurization. Rollout of the base of the bottle leads to what may be called a "rocker bottom." Preventing rollout of the base helps the bottle stay level when resting on a surface and maintains the flat feet as the contact points on the surface. Further, base rollout can also occur without pressurization or low pressurization of the bottle, such as, for example, during shipping and handling or filling at high speed. Strap base ribs also help prevent base rollout without or low internal pressurization. While the specification herein may discuss preventing or inhibiting deformation under external/internal pressures and/or forces, it is to be understood that some deformation of a bottle may occur without straying outside of the scope of this disclosure. Some deformation of the bottle under external/internal pressures and/or forces may occur while retaining excellent structural properties of the features and functions disclosed herein.

Embodiments disclosed herein can be utilized for bottle pressures of a wide range. The strap base rib can help resist pressurization pressures in the bottle of up to 3 bars, including up to 2.5, up to 2, up to 1.5, up to 1, up to 0.5 bars, and up to 0.3 bars, including ranges bordered and including the foregoing values. The preform design also plays a role in resisting pressures such that much higher pressures than already demonstrated can be resisted with greater strap thickness available from the preform. The strap design provides a more efficient way of resisting the pressure in a bottle that also performs well without pressure.

Embodiments disclosed herein can be utilized in bottle volumes of a wide range. For example, features and functions disclosed herein can be utilized with a 3 ounce bottle up to a multiple gallon bottle. As another example, features and functions disclosed herein can be utilized with an 8 ounce (0.24 liter/0.15 liter) bottle up to a 3 liter bottle, including 12 ounces (0.35 liters) to 2 liters, 16 (0.47 liters) ounces to 1 liter, 18 ounces (0.53 liters) to 0.75 liters, and 0.5 liters, including ranges bordered and including the foregoing values.

Further, a new approach which relies on a general change in preform design, which significantly improves the ability to blow efficient, lightweight bottles is disclosed herein. The design elegantly incorporates features for protecting critical dimensions of the bottle and stabilizing the production blowing process. These features may also utilize less resin while achieving suitable mechanical performance resulting in a reduction in the use of petroleum products by the industry.

In an exemplary embodiment, a container comprises a base, a bell, a sidewall between the base and the bell, a neck and a finish which define an opening to an interior of the container, and a shoulder between the sidewall and the bell. The container further comprises a grip portion of the sidewall comprising a multiplicity of circumferentially positioned grip portion ribs; a label portion of the sidewall comprising a multiplicity of circumferentially positioned label portion ribs; a plurality of strap ribs, wherein each of the strap ribs extends substantially from a central portion of the base and terminates at a sidewall end in the grip portion, and wherein the strap ribs cooperate with a plurality of vertically aligned recessed columns of the sidewall so as to resist at least one of bending, leaning, crumbling, or stretching along the sidewall and the base; a plurality of inwardly offset portions of the sidewall configured to resist outward bowing of the sidewall due to internal pressure of contents in the interior of the container, each of the plurality of inwardly offset portions being disposed between each pair of adjacent vertically aligned recessed columns; a plurality of load ribs spaced equally between adjacent strap ribs, wherein the load ribs are configured to resist deformation of the base; and a plurality of feet formed between the strap ribs and the load ribs, wherein the plurality of feet comprises a resting surface of the container.

In another exemplary embodiment, the plurality of vertically aligned recessed columns comprises three recessed columns equally spaced around the perimeter of the sidewall, such that the sidewall comprises a circumference which is offset from a generally circular cross-sectional shape to a substantially triangular cross-sectional shape. In another exemplary embodiment, each of the plurality of inwardly offset portions is offset from 0 to 30 degrees from the circular cross-sectional shape. In another exemplary embodiment, the plurality of inwardly offset portions is configured to counteract outward-directed forces on the sidewall of the container due to internal pressure, such that the pressurized container assumes a substantially circular cross-sectional shape.

In another exemplary embodiment, the base comprises a diameter which is larger than a diameter of the shoulder, such that the base creates a single point of contact with other substantially similar containers in a production line, or in packaging. In another exemplary embodiment, the diameter of the base is larger than the diameter of the shoulder by 0.5 to 4 millimeters. In another exemplary embodiment, the diameter of the base is larger than the diameter of the shoulder by 1 to 2 millimeters.

In another exemplary embodiment, the plurality of strap ribs comprises three strap ribs equally spaced around the circumference of the base, and wherein the plurality of load ribs comprises six load ribs, such that two load ribs are equally spaced between each pair of adjacent strap ribs. In another exemplary embodiment, the base further comprises a gate centered on a longitudinal axis of the container, a wall extending from the gate toward the resting surface of the container, and a dome immediately surrounding the gate, wherein the dome is a portion of the wall of the base that slopes more steeply toward the resting surface of the container. In another exemplary embodiment, each of the strap ribs has a base end which terminates in the dome, near the periphery of the gate. In another exemplary embodiment, each of the strap ribs begins at the base end substantially parallel to the resting surface of the container and then extends along an upward curved path, a first portion of the upward curved path comprising a first radius, a second portion of the upward curved path comprising a second radius, and a third portion of the upward curved path comprising a straight portion, wherein at a first height the first radius terminates and the second radius begins, and at a second height the straight portion connects to the sidewall end of the strap rib, and wherein the first radius and the second radius cooperate to give the strap rib and the base a spherical configuration, such that the container better accommodates internal pressure. In another exemplary embodiment, each of the strap ribs further comprises two rib side walls that connect the strap rib to portions of the base and the feet, the rib side walls comprising smooth and gradual transitions into the base and the feet, such that the transitions comprise spherical features of the container.

In an exemplary embodiment, a container configured to substantially reduce triangulation of the container due to internal pressure of contents within the container, comprises a base which extends upward to a sidewall of the container; a shoulder connected between the sidewall and a bell, a diameter of the bell decreasing as the bell extends upward to a neck of the container; a finish connected to the neck, the finish configured to receive a closure and defining an opening to an interior of the container; and a plurality of inwardly offset portions of the sidewall configured to resist outward bowing of the sidewall due to the internal pressure of the contents.

In another exemplary embodiment, the sidewall comprises a plurality of vertically aligned recessed columns configured to resist the internal pressure of the contents. In another exemplary embodiment, the plurality of vertically aligned recessed columns comprises three recessed columns disposed uniformly around the circumference of the sidewall, and wherein one inwardly offset portion is disposed between each pair of adjacent recessed columns, such that the circumference of the sidewall is offset from a generally circular cross-sectional shape to a substantially triangular cross-sectional shape. In another exemplary embodiment, each of the inwardly offset portions is offset from 0 to 30 degrees from the circular cross-sectional shape. In another exemplary embodiment, the inwardly offset portions are configured to counteract outward-directed forces on the sidewall of the container due to internal pressure, such that the pressurized container assumes a substantially circular cross-sectional shape.

In another exemplary embodiment, the base comprises a diameter which is larger than a diameter of the shoulder, such that the base creates a single point of contact with other substantially similar containers in a production line, or in packaging. In another exemplary embodiment, the diameter of the base is larger than the diameter of the shoulder by 0.5 to 4 millimeters. In another exemplary embodiment, the diameter of the base is larger than the diameter of the shoulder by 1 to 2 millimeters.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings refer to embodiments of the present invention in which:

FIG. **1** illustrates a lower perspective view of an exemplary embodiment of a container in accordance with the present disclosure;

FIG. **2** illustrates a front elevation view of an exemplary embodiment of a container, according to the present disclosure;

FIG. **3** illustrates a rear elevation view of an exemplary embodiment of a container in accordance with the present disclosure;

FIG. **4** illustrates a right side elevation view of an exemplary embodiment of a container, according to the present disclosure;

FIG. **5** illustrates a left side elevation view of an exemplary embodiment of a container in accordance with the present disclosure;

FIG. **6** illustrates a top plan view of an exemplary embodiment of a container, according to the present disclosure;

FIG. **7** illustrates a bottom plan view of an exemplary embodiment of a container in accordance with the present disclosure;

FIG. **8** illustrates a cross-sectional view along a longitudinal axis of an exemplary embodiment of a base of a container, according to the present disclosure;

FIG. **9** illustrates an exemplary embodiment of a preform which may be blow-molded to form a container in accordance with the present disclosure;

FIG. **10** illustrates a cross-sectional view of an exemplary embodiment of a preform, according to the present disclosure;

FIG. **11** illustrates a cross-sectional view of a preform in a cavity of an exemplary embodiment of a blow-molding apparatus that may be used to make a bottle or container; and

FIG. **12** illustrates an exemplary embodiment of a container formed by way of stretch blow-molding in accordance with the present disclosure.

While the present invention is subject to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. The invention should be understood to not be limited to the particular forms disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the present invention.

DETAILED DESCRIPTION

In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be apparent, however, to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, specific numeric references such as "first load rib," may be made. However, the specific numeric reference should not be interpreted as a literal sequential order but rather interpreted that the "first load rib" is different than a "second load rib." Thus, the specific details set forth are merely exemplary. The specific details may be varied from and still be contemplated to be within the spirit and scope of the present invention. The term "coupled" is defined as meaning connected either directly to the component or indirectly to the component through another component. Further, as used herein, the terms "about," "approximately," or "substantially" for any numerical values or ranges indicate a suitable dimensional tolerance that allows the part or collection of components to function for its intended purpose as described herein.

In general, the present disclosure provides an apparatus for a container comprising a base, a bell, a sidewall between the base and the bell, a neck and a finish which define an opening to an interior of the container, and a shoulder between the sidewall and the bell. In one embodiment, the base comprises a diameter which is larger than a diameter of the shoulder, such that the base creates a single point of contact with other substantially similar containers in a production line, or in packaging. In some embodiments, the diameter of the base is larger than the diameter of the shoulder by 0.5 to 4 millimeters, and preferably by 1 to 2 millimeters. Strap ribs extend from a central portion of the base and terminate at the sidewall. The strap ribs cooperate with vertically aligned recessed columns of the sidewall to resist bending, leaning, crumbling, or stretching along the sidewall and the base. An inwardly offset portion of the sidewall is disposed between each pair of adjacent recessed columns. In one embodiment, three recessed columns are equally spaced around the perimeter of the sidewall, such that the sidewall comprises a circumference which is offset from a generally circular cross-sectional shape to a substantially triangular cross-sectional shape. In one embodiment, each of the inwardly offset portions is offset from 0 to 30 degrees from the circular cross-sectional shape. The inwardly offset portions of the sidewall are configured to resist outward bowing of the sidewall due to internal pressure of contents within the container.

FIG. **1** illustrates a bottom perspective view of an exemplary embodiment of a container **100** in accordance with the present disclosure. The container **100** comprises a base **104** that extends up to a grip portion **108**. The grip portion **108** comprises a plurality of grip portion ribs **112** (i.e., sidewall ribs). As illustrated in FIG. **1**, the plurality of grip portion ribs **112** generally vary in depth, and swirl or angulate around the grip portion **108**. A label portion **116** is connected to the grip portion **108** and comprises one or more label panel ribs **120** (i.e., sidewall ribs). The label panel portion **116** transitions into a shoulder **124**, which connects to a bell **128**. In the embodiment illustrated in FIG. **1**, the bell **128** comprises a plurality of design features **132**. In other embodiments, however, the bell **128** may include various other design features, or may be smooth and generally unornamented. The bell **128** connects to a neck **136**, which connects to a finish **140**. As shown in FIG. **1**, the bell **128** comprises a diameter that generally decreases as the bell **128** extends upward from the shoulder **124** to the neck **136** and the finish **140**. The finish **140** is adapted to receive a closure, such as by way of non-limiting example, a container cap or bottle cap, so as to seal contents within the container **100**. The finish **140** generally defines an opening **144** that leads to an interior of the container **100** for containing a beverage, or other contents, such as any of a variety of carbonated soft drinks.

A substantially vertical sidewall comprising the grip portion **108** and the label portion **116** between the base **104** and the bell **128**, extending substantially along a longitudinal axis of the container **100**, and defines at least part of the interior of the container **100**. In some embodiments, the sidewall may include the bell **128**, the shoulder **124**, and/or the base **104**. A perimeter (i.e., periphery) of the sidewall is substantially perpendicular to the longitudinal axis of the container **100**. The finish **140**, the neck **136**, the bell **128**, the shoulder **124**, the label portion **116**, the grip portion **108**, and the base **104** each comprises a respective perimeter (i.e., periphery) which is substantially perpendicular to the longitudinal axis of the container **100**. For example, the label portion **116** comprises a label portion perimeter, whereas the grip portion **108** comprises a grip portion perimeter, both of which perimeters being substantially perpendicular to the longitudinal axis of the container **100**.

In the embodiment illustrated in FIGS. **1-5**, each grip portion rib **112** comprises a deep rib portion **148** transitioning to a middle rib portion **152** and then transitioning to a shallow rib portion **156**. Similarly, each label portion rib **120** comprises a deep rib portion **160** transitioning to a middle rib portion **164** and then transitioning to a shallow rib portion **168**. The deep, middle, and shallow rib portions may also be referred to as deep, middle, and shallow ribs as a shorthand, but it is to be understood that these terms are intended to define portions of each rib in the grip portion **108** and the label portion **116**. In the embodiment illustrated in FIGS. **1-5**, the shallow rib portions **156**, **168** are vertically aligned with the longitudinal axis of the container **100**. As best illustrated in FIG. **3**, the shallow rib portions **156**, **168** form an equivalent of recessed columns **172** at portions where the shallow rib portions **156**, **168** substantially vertically line up along the longitudinal axis of the container **100**. Further, the deep rib portions **148**, **160** are substantially vertically aligned along the vertical or longitudinal axis of the container **100**. Thus, the embodiment illustrated in FIGS. **1-5** comprises three recessed columns **172** and three portions where the deep rib portion **148**, **160** are substantially vertically aligned.

In some embodiments, the shallow rib portions **168** of the label portion **116** may be vertically misaligned with the shallow rib portions **156** of the grip portion **108**, such that the label portion **116** has a first set of recessed columns and the grip portion **108** has a second set of recessed columns. In some embodiments, the container **100** may have recessed columns solely in the grip portion **108** or solely in the label panel portion **116**.

In the illustrated embodiment of FIGS. **1-5**, the three recessed columns **172** are equally spaced apart around the perimeter of the container **100** and located on an opposite sides of the container perimeter from the deep rib portions **148**, **160**. It will be appreciated that with three equally spaced recessed columns **172**, the recessed columns **172** are spaced substantially every 120 degrees around the circumference of the container **100**. Any number of recessed columns **172** may be incorporated into a design of the container **100** by either increasing or decreasing the number of shallow rib portions **156**, **168** that are substantially vertically aligned along the longitudinal axis of the container **100**. For instance, other embodiments of the container **100** may comprise a number of the recessed columns **172** ranging between 1 and 10 recessed columns.

In some embodiments, the label portion **116** may comprise a different number of recessed columns **172** than the grip portion **108**. For example, the label portion **116** may comprise six equally spaced recessed columns, wherein three are vertically aligned with the recessed columns **172** of the grip portion **108** while the remaining three recessed columns are limited to the label portion **116**. With six equally spaced recessed columns around the perimeter of the label portion **116**, the recessed columns are positioned every 60 degrees around the circumference of the container **100**. More recessed columns can help prevent triangulation of the label portion **116**. As will be appreciated, shallow rib portions coupled with recessed columns better resists radial outward flexing, at least partially because the shallow rib portions possess a relatively smaller radial depth available for flexing. Correspondingly, shallow rib portions coupled with recessed columns provides a greater resistance to internal pressure relative to deep rib portions. Thus, incorporating more frequent shallow rib portions and/or recessed columns around the circumference of the container **100** helps inhibit outward triangulation of the container due to internal pressure of contents within the container.

The vertical alignment of the shallow rib portions **156**, **168** that form the recessed columns **172** provides resistance to leaning, load crushing, and/or stretching of the container **100**. Leaning can occur when, during and/or after bottle packaging, a bottle, such as the container **100**, experiences top load forces (tangential forces or otherwise) from other bottles and/or other objects stacked on top of the container. Similarly, top load' crushing can occur due to vertical compression (or otherwise) forces from bottles and/or other objects stacked on top. Stretching can occur when the container is pressurized. The recessed columns **172** transfer the resulting forces along the sidewall of the container **100** to the base **104** and thus increase rigidity of the container **100**. The deep rib portions **148**, **160** of the grip portion ribs **112** and label panel ribs **120**, respectively, provide a hoop strength that can be equivalent to the hoop strength imparted by ribs comprising a uniform depth. The number of ribs, including the grip portion ribs **112**, and/or the label panel ribs **120** may vary between 1 and 30 ribs positioned, for example, every 10 centimeters along any rib-containing portion of the container **100**, such as, but not necessarily limited to the grip portion **108** and/or the label portion **116**. It should be understood that the aforementioned 10-centimeters that is used to measure the number of ribs in a portion of the container need not be actually 10 centimeters in length, but rather the 10-centimeters is used illustratively to provide a relationship between the number of ribs incorporated into a given length of a portion of the container.

As discussed above, the three recessed columns **172** operate to prevent outward triangulation of the sidewall of the container **100**, wherein the shallow rib portions **156**, **168** coupled with the recessed columns **172** better resists radial outward flexing of the sidewall of the container **100**. Preferably, the portions of the sidewall between the recessed columns **172** are bowed inward, or offset, toward the interior of the container **100**, such that the perimeter of the sidewall is offset from a generally circular cross-sectional shape to a substantially inwardly triangular cross-sectional shape. In some embodiments, the offset portions of the sidewall may be offset from 0 to 30 degrees from the circular cross-sectional shape. The offset portions of the sidewall are configured to resist outward bowing of the sidewall due to internal pressure when the container **100** is filled with contents, particularly carbonated contents. It is envisioned that outward-directed forces on the sidewall of the container **100** due to internal pressure are counteracted by inward-directed resistance forces produced by the offset portions, such that the pressurized container assumes a substantially circular cross-sectional shape rather than becoming outwardly triangulated, as discussed herein. Thus, incorporating inwardly offset portions between the recessed columns **172** around the perimeter of the container **100** further inhibits outward triangulation of the container.

With reference to FIG. **1**, the base **104** comprises three strap ribs **176**. Each of the strap ribs **176** comprises a sidewall end **180** that terminates along the sidewall of the container **100**, as discussed herein. Further, the base **104** comprises six load ribs **184**. As illustrated in FIG. **1**, two load ribs **184** are positioned between two strap ribs **176**. In some embodiments, the base **104** may comprise a number of load ribs **184** ranging between 1 and 5 load ribs positioned between two strap ribs **176**. Each of the load ribs **184** has a sidewall end **188** that terminates along the base **104** at a transition from the base **104** to the sidewall of the container **100**. As illustrated in FIG. **1**, the sidewall end **188** of the load rib **184** is vertically lower than the sidewall end **180** of the strap rib **176** along the longitudinal axis of the container **100**. In some embodiments, the sidewall end **188** of the load rib **184** may terminate along the sidewall of the container **100** at a height which is substantially similar to the height of the sidewall end **180** of the strap rib **176**. As further illustrated in FIG. **1**, the base **104** comprises feet **192** formed between the strap ribs **176** and the load ribs **184**.

The strap rib **176** is relatively larger and deeper than the load rib **184**, as discussed herein. As illustrated in FIGS. **1-5**, each of the strap ribs **176** is vertically aligned with one of the recessed columns **172**, and thus the strap ribs **176** are spaced equally around the circumference of the container **100**. It will be recognized that with three equally spaced strap ribs **176**, the strap ribs **176** are positioned every 120 degrees around the container circumference. The load ribs **184** are vertically aligned with the grip portion ribs **112** between the recessed columns **172**. In some embodiments, the strap ribs **176** may be vertically misaligned with the recessed columns **172**. In some embodiments, the strap ribs **176** may be spaced unequally around the circumference of the container **100**. In some embodiments, the base **104** may comprise more or less strap ribs **176** than the number of recessed columns **172**. In some embodiments, the strap rib **176** may be vertically aligned with the deep rib portions **148**, **160** and may terminate into a first deep rib portion **148** (first from the base **104**). In some embodiments, the strap rib **176** may have a sidewall end **180** that terminates past the first shallow rib portion **156** and/or the first deep rib portion **148**, such as for example at the second, third, and/or fourth grip portion ribs **112**.

FIG. **3** illustrates a rear elevation view of the container **100**. As shown in FIG. **3**, the sidewall end **180** of the strap rib **176** vertically aligns with, or points to substantially the center of the recessed column **172**, which is coincident with the center point of the shallow rib portion **156**. As further illustrated in FIG. **3**, the strap rib **176** forms a recess **196**, which is relatively a small area in comparison to the contact area of the feet **192** with a resting surface. Utilizing a small recess **196** aids in distributing more resin toward the feet **192** during the blowing process, which generally increases the abrasion resistance and strength of the feet **192**. Thus, the strap ribs **176** operate to provide internal pressure resistance while leaving enough resin for the feet **192** to achieve the benefits of a flat foot base (i.e., thicker resin feet **192** for greater abrasion, deformation, and/or stress resistance; and/or greater foot contact area for stability and load distribution).

As best illustrated in FIG. **7**, the strap ribs **176** extend substantially from a central portion of the base **104**, coinciding with the longitudinal axis of the container **100**, as discussed herein. As will be appreciated by those skilled in the art, the strap ribs **176** operate as a straps extending between the recessed columns **172** of the sidewall to the central portion of the base **104**. As shown in FIG. **1**, the strap rib **176** provides a more direct and shorter path from the center of the base **104** to the sidewall of the container **100** without proceeding to the vertical level of the feet **192**. As discussed herein, the strap ribs **176** thus provide a relatively more pressure resistant base **104**. Each of the strap ribs **176** provides a link for forces and stresses between the sidewall, including the recessed column **172**, and the central portion of the base **104**.

FIG. **8** illustrates a cross-sectional view along the longitudinal axis of the base **104** of the container **100**. As shown in FIG. **8**, the strap rib **176** of the base **104** begins at a base end **212** substantially parallel to a resting surface of the base **104** and then extends along a curved path, having a first radius R_{1d}, with an increasingly positive slope. At a height H_{1d}, the radius of the curved path of the strap rib **176** changes to a second radius R_{2d} with an increasingly positive slope before extending into a straight portion **220**. At a height H_{2d}, the straight portion **220** connects to the sidewall end **180** as discussed herein. The first and second radii R_{1d}, R_{2d}, as well as the corresponding positive slopes and the heights H_{1d} and H_{2d}, may have dimensional values falling within any of the appropriate ranges of values discussed in detail in U.S. patent application Ser. No. 14/157,400, entitled "Plastic Container With Strapped Base," filed on Jan. 16, 2014, the entirety of which is incorporated herein by reference and forms a part of the present disclosure. Preferably, however, the combination of the radii R_{1d} and R_{2d} cooperate to give the strap rib **176**, and thus the base **104**, a smooth and gradual, spherical configuration. As discussed herein, spherical features of the container **100** better accommodate internal pressure. Experimentation has demonstrated that the spherical configuration of the base **104** depicted in FIG. **1-5** is capable of withstanding an internal pressure at least twice the internal pressure tolerable by conventional base configurations.

It will be recognized that the strap rib **176** illustrated in FIG. **8** does not include a transition curve between the first radius R_{1d} and the second radius R_{2d}, nor between the second radius R_{2d} and the straight portion **220**. In other embodiments, however, a transition curve having a radius other than R_{1d} and R_{2d} may be positioned between the curved portions of the strap rib **176** having radii R_{1d} and R_{2d}. In still other embodiments, a transition curve may be positioned between the curved portion of the strap rib **176** having the second radius R_{2d} and the straight portion **220**. It is envisioned that the transition curves may have dimensional values that further produce a spherical configuration of the strap rib **176**, and thus the base **104**.

As illustrated in FIG. **7**, the base **104** comprises a gate **200** surrounded by a dome **204**. The dome **204** comprises a portion of a wall of the base **104** which slopes more steeply toward a resting surface when the bottle is placed on the resting surface relative to the rest of the wall of the base **104** leading to the feet **192**. The strap rib **176** comprises a base end **208** that terminates substantially at a periphery of the dome **204**. In some embodiments, the base end **208** of each strap rib **176** may be positioned outside of the dome **204** similarly to base ends **212** of the load ribs **184**. Each of the strap ribs **176** comprises a pair of rib side walls **216** that connect the strap rib **176** to portions of the base **104** and the feet **192**. The rib side wall **216** smoothly and gradually transitions into the base **104** and the feet **192**. The smooth and gradual transition provides internal pressure resistance at and near the rib side wall **216** since more spherical features of the container **100** better accommodate internal pressure. The strap rib **176** is relatively deeper in the base **104** than the load rib **184** so as to provide stress transfer and pressure resistance, as discussed herein.

As mentioned above, each of the load ribs **184** comprises a base end **212** that terminates at, or near the dome **204**. In the embodiment illustrated in FIG. **7**, the base ends **212** of the load ribs **184** terminate before the base ends **180** of the strap ribs **176**. Further, the load ribs **184** are shallow relative to the strap ribs **176**. Accordingly, the load ribs **184** each comprises rib side walls that are relatively smaller than the rib side walls **216**, and thus the transition from the load ribs **184** to the base **104** and the feet **192** is more abrupt, or sharper, than in the case of the rib side walls **216**. It will be appreciated that when the container **100** is top loaded during packaging, shipping, and/or handling, the sharper transitions of the load ribs **184** resist bending and/or leaning as discussed herein by, for example, maintaining the integrity and shape of the base **104**. Moreover, the sharper transitions of the load ribs **184** provide more area of the base **104** being available for relatively larger feet **192**. It will be further appreciated that larger feet **192** of a flat-foot base, such as the base **104** discussed herein and as illustrated in FIG. **7**, provide more resin contact area with a resting surface, and thus provide better abrasion resistance and stability of the base. As further illustrated in FIG. **7**, the rib side walls **216** generally transition into the strap ribs **176** more abruptly, or sharply, relative to the transition from the rib side walls **216** to the feet **192**. The sharper transitions to the strap ribs **176** provide more rigidity to the strap ribs so as to resist, or inhibit, flexing due to internal pressures.

In the embodiment of FIG. **7**, the base ends **208** of the strap ribs **176** terminate substantially near the gate **200**, and the base ends **212** of the load ribs **184** terminate near the periphery of the dome **204**. It will be appreciated that terminating the base ends **208** of the strap ribs **176** and/or the base ends **212** of the load ribs **184** substantially near, or at the gate **200** provides greater internal pressure resistance to the base **104**, as discussed herein, preventing, for example, base rollout. Moreover, terminating each of the base ends **208** substantially near, or at the gate **200** provides strap ribs **176** that are substantially continuous from (or near) the gate **200** to the sidewall ends **180**. As shown in FIGS. **1-5**, the sidewall ends **180** terminate at the first shallow rib portion **156** and communicate directly with the recessed columns **172**. The continuity from the recessed columns **172** to the gate **200** provides substantially continuous pressure resistance bands, or straps, from a top of the label portion **116** to the gate **200**. Pressure resistance straps that are substantially continuous provide greater resistance to internal pressure, as discussed herein.

FIG. **6** illustrates a top plan view of the container **100**, showing the shoulder **124**, the bell **128** with the design features **132**, the finish **140**, and the opening **144** to the interior of the container. As illustrated in FIG. **6**, the shoulder **124** comprises a diameter D_S. Similarly, in the embodiment of the base **104** illustrated in FIG. **7**, the base **104** comprises a diameter D_B. The diameter D_B of the base **104** preferably is larger than the diameter D_S of the shoulder **124**, such that the base **104** creates a single point of contact with other substantially similar containers in a production line, or in packaging. In some embodiments, the diameter D_B of the base **104** is larger by 0.5 to 4 millimeters than any other diameter of the container **100**, including the diameter D_S of the shoulder **124**. It will be appreciated that the larger base **104** diameter D_B advantageously improves conveying a multiplicity of the container **100** in a production line. Further, the larger base **104** diameter D_B advantageously improves stability when there is any damage to the base **104**. In some embodiments, the diameter D_S of the shoulder **124** may be equal to the diameter D_B of the base **104**, thereby providing two points of contact, at the shoulder **124** and the base **104**, with other substantially similar bottles in a production line, or in packaging. It will be appreciated that where the diameter(s) of any portion of the container **100** varies, the largest diameters create points of contact with other substantially similar containers in a production line, or in packaging. Thus, the containers generally may have either a single point of contact or multiple points of contact.

FIG. **4** illustrates a right side elevation view of container **100**, which shows a plan view of the shallow rib portions **156**, **168** along the right-hand side of the container **100** and a plan view of the deep rib portions **148**, **160** along the left-hand side of the container **100**. FIG. **5** illustrates a left side elevation view of container **100**, which shows the shallow rib portions **156**, **168** along the left-hand side of the container **100** and the deep rib portions **148**, **160** along the right-hand side of the container **100**. As discussed above in connection with FIG. **1**, the deep rib portions **148**, **160** comprise a depth which is larger than a depth of the middle rib portions **152**, **164** which is larger than a depth of the shallow rib portions **156**, **168**. In some embodiments, a depth of the deep rib portions **148** may range from 1 to 10 millimeters. In some embodiments, a depth of the deep rib portions **160** may range from 0.5 to 10 millimeters. In some embodiments, a depth of the middle rib portions **152** may range from 0 to 5 millimeters. In some embodiments, a ratio of the depth of the deep rib portions **148** to the depth of the middle rib portions **152** may vary from 1:1 to 20:1.

In some embodiments, a depth of the shallow rib portions **156** may range from 0 to 2.5 millimeters. In some embodiments, a ratio of the depth of the deep rib portions **148** to the depth of the shallow rib portions **156** may vary from 1:1 to 100:1, including where the shallow rib portions **156** have zero depth, resulting in substantially an infinite ratio. In some embodiments, a ratio of the depth of the middle rib portions **152** to the depth of the shallow rib portions **156** may vary from 1:1 to 50:1, including where shallow rib portions **156** have zero depth, resulting in substantially an infinite ratio.

In some embodiments, a depth of the shallow rib portions **168** may vary from 0 to 2.5 millimeters. In some embodiments, a ratio of the depth of the deep rib portions **148** to the depth of the shallow rib portions **168** may vary from 1:1 to 100:1, including where the shallow rib portions **168** have zero depth, resulting in substantially an infinite ratio. In some embodiments, a ratio of the depth of the deep rib portions **160** to the depth of the shallow rib portions **168** may range from 1:1 to 100:1, including where the shallow rib portions **168** have zero depth, resulting in substantially an infinite ratio. In some embodiments, a ratio of the depth of the middle rib portions **152**, **164** to the depth of the shallow rib portions **168** may vary from 1:1 to 50:1, including where the depth of the shallow rib portions **168** is zero, resulting in substantially an infinite ratio. In some embodiments, a ratio of the depth of the deep rib portions **160** to the depth of the shallow rib portions **168** may vary from 1:1 to 100:1, including a substantially infinite ratio arising when the shallow rib portions **168** have zero depth.

Transitions between the various depths of the rib portions are smooth, as illustrated in FIGS. **1-5**. In some embodiments, however, the transitions may comprise other forms, such as by way of non-limiting example, a step-change connecting the varying depth portions. Moreover, some embodiments may minimize the shallow rib portions **156**, **168** to 20-30% of the circumference of the container **100**, thereby resulting in a respective 70-80%, of the container circumference comprising the deep rib portions **148**, **160** and the middle rib portions **152**, **164**. However, any ratio of shallow rib portions to deep rib portions and middle rib portions may be utilized.

FIG. **9** illustrates an exemplary embodiment of a preform **230** which may be blow-molded to form the container **100**. The preform **230** preferably is made of material approved for contact with food and beverages, such as virgin PET, and may be of any of a wide variety of shapes and sizes. The preform **230** comprises a neck portion **232** and a body portion **234**, formed monolithically (i.e., as a single, or unitary, structure). Advantageously, the monolithic arrangement of the preform **230**, when blow-molded into a bottle, such as container **100**, provides greater dimensional stability and improved physical properties in comparison to a preform comprising separate neck and body portions, which are bonded together. The preform **230** illustrated in FIG. **9** generally is of a type which will form a 12-16 oz. beverage bottle, but as will be understood by those skilled in the art, other preform configurations may be used depending upon the desired configuration, characteristics and use of the final article. The preform **230** may be made by injection molding methods including those that are well known in the art.

FIG. **10** illustrates a cross-sectional view of an exemplary embodiment of the preform **230** which may be used to form the container **100**. The neck portion **232** of the preform **230** begins at an opening **236** to an interior of the preform **230** and extends to and includes a support ring **238**. The neck portion **232** is further characterized by the presence of a structure for engaging a closure. In the illustrated embodiment, the structure includes threads **240**, which provide a means to fasten a cap to the container **100** produced from the preform **230**. It will be appreciated that the illustrated preform **230** comprises a shorter overall neck portion than most conventional preforms. Further, the neck portion **232** of the preform **230** comprises a wall thickness **252** which is generally thinner than in conventional preforms, wherein the wall thickness **252** of the neck portion **232** is measured at the very top or between the threads **240**, or between any other protruding structures.

The body portion **234** is an elongated structure extending down from the neck portion **232** and culminating in an end cap **242**. In some embodiments, the body portion **234** is generally cylindrical, and the end cap **242** is conical or frustoconical, and may also be hemispherical, and the very terminus of the end cap **242** may be flattened or rounded. The preform **230** comprises a wall thickness **244** throughout most of the body portion **234** which depends upon an overall size of the preform **230**, as well as a predetermined wall thickness and overall size of the resulting container **100**. As illustrated in FIG. **10**, the wall thickness **244** tapers, between **250** and **248**, to a wall thickness **246** immediately below the support ring **238**. In some embodiments, the wall thickness between **244** and **250** may further comprise a slight taper so as to facilitates a release of the preform **230** from a core during the injection molding process. Specific dimensions of the wall thickness, as well as dimensions of various other features of the preform **230** are discussed in detail in U.S. patent application Ser. No. 13/295,699, entitled "Preform Extended Finish for Processing Light Weight Ecologically Beneficial Bottles," filed on Nov. 14, 2011, the entirety of which is incorporated herein by reference and forms a part of the present disclosure.

Once the preform **230** has been prepared by way of injection molding, or other equivalent process, the preform **230** may be subjected to a stretch blow-molding process. As illustrated in FIG. **11**, the preform **230** is placed in a mold **260** comprising a cavity corresponding to the desired container shape. The preform **230** is then heated and expanded by stretching such as by way of a stretch rod inserted into the center of the preform **230** to push it to the end of the mold **260** and by way of air forced into the interior of the preform **230** to fill the cavity within the mold **260**, creating a container **264**, as shown in FIG. **12**. As illustrated in FIG. **12**, the container **264** comprises a neck portion **232** and a body portion **234** corresponding to the neck and body portions of the preform **230** of FIG. **11**. The neck portion **232** is further characterized by the presence of the threads **240** or other closure engagement means that provides a way to fasten a cap onto the container **264**. Thus, the blow-molding process normally is restricted to the body portion **234** of the preform **230** with the neck portion **232**, including the threads **240** and the support ring **238**, retaining the original configuration of the preform **230**.

In some embodiments, the containers **100**, **264** described herein may be made from any suitable thermoplastic material, such as polyesters including polyethylene terephthalate (PET), polyolefins, including polypropylene and polyethylene, polycarbonate, polyamides, including nylons (e.g. Nylon 6, Nylon 66, MXD6), polystyrenes, epoxies, acrylics, copolymers, blends, grafted polymers, and/or modified polymers (monomers or portion thereof having another group as a side group, e.g. olefin-modified polyesters). These materials may be used alone or in conjunction with each other. More specific material examples include, but are not limited to, ethylene vinyl alcohol copolymer ("EVOH"), ethylene vinyl acetate ("EVA"), ethylene acrylic acid ("EAA"), linear low density polyethylene ("LLDPE"), polyethylene 2,6- and 1,5-naphthalate (PEN), polyethylene terephthalate glycol (PETG), poly(cyclohexylenedimethylene terephthalate), polystryrene, cycloolefin, copolymer, poly-4-methylpentene-1, poly(methyl methacrylate), acrylonitrile, polyvinyl chloride, polyvinylidine chloride, styrene acrylonitrile, acrylonitrile-butadiene-styrene, polyacetal, polybutylene terephthalate, ionomer, polysulfone, polytetra-fluoroethylene, polytetramethylene 1,2-dioxybenzoate and copolymers of ethylene terephthalate and ethylene isophthalate. In certain embodiments, preferred materials may be virgin, preconsumer, post-consumer, regrind, recycled, and/or combinations thereof.

In some embodiments, polypropylene also refers to clarified polypropylene. As used herein, the term "clarified polypropylene" is a broad term and is used in accordance with its ordinary meaning and may include, without limitation, a polypropylene that includes nucleation inhibitors and/or clarifying additives. Clarified polypropylene is a generally transparent material as compared to the homopolymer or block copolymer of polypropylene. The inclusion of nucleation inhibitors helps prevent and/or reduce crystallinity, which contributes to the haziness of polypropylene, within the polypropylene. Clarified polypropylene may be purchased from various sources such as Dow Chemical Co. Alternatively, nucleation inhibitors may be added to polypropylene.

As used herein, "PET" includes, but is not limited to, modified PET as well as PET blended with other materials. One example of a modified PET is IP A-modified PET, which refers to PET in which the IPA content is preferably more than about 2% by weight, including about 2-10% IP A by weight, also including about 5-10% IP A by weight. In another modified PET, an additional comonomer, cylohexane dimethanol (CHDM) is added in significant amounts (e.g. approximately 40% by weight or more) to the PET mixture during manufacture of the resin. Additional techniques for forming the container **264**, including additional materials, properties of the materials, as well as various advantageous additives are discussed in detail in U.S. patent application Ser. No. 13/295,699, entitled "Preform Extended Finish for Processing Light Weight Ecologically Beneficial Bottles," filed on Nov. 14, 2011, the entirety of which is incorporated herein by reference and forms a part of the present disclosure.

While the invention has been described in terms of particular variations and illustrative figures, those of ordinary skill in the art will recognize that the invention is not limited to the variations or figures described. In addition, where methods and steps described above indicate certain events occurring in certain order, those of ordinary skill in the art will recognize that the ordering of certain steps may be modified and that such modifications are in accordance with the variations of the invention. Additionally, certain of the steps may be performed concurrently in a parallel process when possible, as well as performed sequentially as described above. To the extent there are variations of the invention, which are within the spirit of the disclosure or equivalent to the inventions found in the claims, it is the intent that this patent will cover those variations as well. Therefore, the present invention is to be understood as not limited by the specific embodiments described herein, but only by scope of the appended claims.

What is claimed is:

1. A container comprising a base, a bell, a sidewall between the base and the bell, a neck and a finish which define an opening to an interior of the container, and a shoulder between the sidewall and the bell, the container comprising:

a grip portion of the sidewall comprising a multiplicity of circumferentially positioned grip portion ribs, each grip portion rib comprising a deep rib portion transitioning to a middle rib portion and then to a shallow rib portion;

a label portion of the sidewall comprising a multiplicity of circumferentially positioned label portion ribs;

a plurality of strap ribs, wherein each of the strap ribs extends substantially from a central portion of the base and terminates at a sidewall end in the grip portion, and wherein the strap ribs cooperate with a plurality of vertically aligned recessed columns of the sidewall so as to resist at least one of bending, leaning, crumbling, or stretching along the sidewall and the base and further wherein said plurality of strap ribs offers pressure resistance for internally pressured bottles;

a plurality of inwardly offset portions of the sidewall configured to resist outward bowing of the sidewall due to internal pressure of contents in the interior of the container, each of the plurality of inwardly offset portions being disposed between each pair of adjacent vertically aligned recessed columns;

a plurality of load ribs spaced equally between adjacent strap ribs, wherein the load ribs are configured to resist deformation of the base; and

a plurality of feet formed between the strap ribs and the load ribs, wherein the plurality of feet comprises a resting surface of the container.

2. The container of claim **1**, wherein the plurality of vertically aligned recessed columns comprises three recessed columns equally spaced around the perimeter of the sidewall, such that the sidewall comprises a circumference which is offset from a generally circular cross-sectional shape to a substantially triangular cross-sectional shape.

3. The container of claim **2**, wherein each of the plurality of inwardly offset portions is offset from 0 to 30 degrees from the circular cross-sectional shape.

4. The container of claim **2**, wherein the plurality of inwardly offset portions is configured to counteract outward-directed forces on the sidewall of the container due to internal pressure, such that the pressurized container assumes a substantially circular cross-sectional shape.

5. The container of claim **1**, wherein the base comprises a diameter which is larger than a diameter of the shoulder, such that the base creates a single point of contact with other substantially similar containers in a production line, or in packaging.

6. The container of claim **5**, wherein the diameter of the base is larger than the diameter of the shoulder by 0.5 to 4 millimeters.

7. The container of claim **5**, wherein the diameter of the base is larger than the diameter of the shoulder by 1 to 2 millimeters.

8. The container of claim **1**, wherein the plurality of strap ribs comprises three strap ribs equally spaced around the circumference of the base, and wherein the plurality of load ribs comprises six load ribs, such that two load ribs are equally spaced between each pair of adjacent strap ribs.

9. The container of claim **1**, wherein the base further comprises a gate centered on a longitudinal axis of the container, a wall extending from the gate toward the resting surface of the container, and a dome immediately surrounding the gate, wherein the dome is a portion of the wall of the base that slopes more steeply toward the resting surface of the container.

10. The container of claim **9**, wherein each of the strap ribs has a base end which terminates in the dome, near the periphery of the gate.

11. The container of claim **9**, wherein each of the strap ribs begins at the base end substantially parallel to the resting surface of the container and then extends along an upward curved path, a first portion of the upward curved path comprising a first radius, a second portion of the upward curved path comprising a second radius, and a third portion of the upward curved path comprising a straight portion, wherein at a first height the first radius terminates and the second radius begins, and at a second height the straight portion connects to the sidewall end of the strap rib, and wherein the first radius and the second radius cooperate to give the strap rib and the base a spherical configuration, such that the container better accommodates internal pressure.

12. The container of claim **1**, wherein each of the strap ribs further comprises two rib side walls that connect the strap rib to portions of the base and the feet, the rib side walls comprising smooth and gradual transitions into the base and the feet, such that the transitions comprise spherical features of the container.

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