A method of packaging interlocking containers including the steps of creating a container having an interlocking structure suitable to achieve a nesting relationship with a complementary mating surface of an adjacent container. The containers are filled with a commodity. A closure is engaged with each container so as to seal each container. A label is affixed to each container. A second label is affixed around the containers such that the containers achieve the nesting relationship.
FILLING CONTAINERS WITH A COMMODITY

ENGAGING A CLOSURE WITH EACH CONTAINER TO SEAL THE CONTAINER

AFFIXING A LABEL TO EACH CONTAINER

AFFIXING A SECOND LABEL AROUND A PLURALITY OF CONTAINERS SO THAT ADJACENT CONTAINERS ACHIEVE NESTING RELATIONSHIP

Fig-10
METHOD OF PACKAGING INTERLOCKING CONTAINERS

CROSS-REFERENCE TO RELATED APPLICATIONS


TECHNICAL FIELD

[0002] This disclosure generally relates to plastic containers for retaining a commodity, and in particular a liquid commodity. More specifically, this disclosure relates to a method of packaging rectangular plastic containers, each such container having structure that allows adjacent containers to interlock in a stable nested relationship.

BACKGROUND

[0003] The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

[0004] As a result of environmental and other concerns, plastic containers, more specifically polyester and even more specifically polyethylene terephthalate (PET) containers are now being used more than ever to package numerous commodities previously supplied in glass containers. Manufacturers and fillers, as well as consumers, have recognized that PET containers are lightweight, inexpensive, recyclable and manufacturable in large quantities.

[0005] Blow-molded plastic containers have become commonplace in packaging numerous commodities. Studies have indicated that the configuration and overall aesthetic appearance of a blow-molded plastic container can affect consumer purchasing decisions. For example, a dented, distorted or otherwise unattractively pleasing container may provide the reason for some consumers to purchase a different brand of product which is packaged in a more aesthetically pleasing fashion.

[0006] While a container in its as-designed configuration may provide an appealing appearance when it is initially removed from a blow-molding machine, many forces act subsequently on, and alter, the as-designed shape from the time it is blow-molded to the time it is placed on a store shelf. Plastic containers are particularly susceptible to distortion since they are continually being re-designed in an effort to reduce the amount of plastic required to make the container. While this strategy realizes a savings with respect to material costs, the reduction in the amount of plastic can decrease container rigidity and structural integrity.

[0007] Manufacturers currently supply PET containers for various liquid commodities, such as juice and isotonic beverages. Suppliers often fill these liquid products into the containers while the liquid product is at an elevated temperature, typically between 155°F - 205°F (68°C - 96°C) and usually at approximately 185°F (85°C). When packaged in this manner, the hot temperature of the liquid commodity sterilizes the container at the time of filling. The bottling industry refers to this process as hot filling, and the containers designed to withstand the process as hot-fill or heat-set containers.

[0008] The hot filling process is acceptable for commodities having a high acid content, but not generally acceptable for non-high acid content commodities. Nonetheless, manufacturers and fillers of non-high acid content commodities desire to supply their commodities in PET containers as well.

[0009] For non-high acid content commodities, pasteurization and retort are the preferred sterilization processes. Pasteurization and retort both present an enormous challenge for manufacturers of PET containers in that heat-set containers cannot withstand the temperature and time demands required of pasteurization and retort.

[0010] Pasteurization and retort are both processes for cooking or sterilizing the contents of a container after filling. Both processes include the heating of the contents of the container to a specified temperature, usually above approximately 155°F (approximately 70°C), for a specified length of time (20-60 minutes). Retort differs from pasteurization in that retort uses higher temperatures to sterilize the container and cook its contents. Retort also applies elevated air pressure externally to the container to counteract pressure inside the container. The pressure applied externally to the container is necessary because a hot water bath is often used and the overpressure keeps the water, as well as the liquid in the contents of the container, in liquid form, above their respective boiling point temperatures.

[0011] PET is a crystallizable polymer, meaning that it is available in an amorphous form or a semi-crystalline form. The ability of a PET container to maintain its material integrity relates to the percentage of the PET container in crystalline form, also known as the “crystallinity” of the PET container. The following equation defines the percentage of crystallinity as a volume fraction:

\[
\% \text{ Crystallinity} = \left( \frac{\rho_c - \rho_a}{\rho_c - \rho_i} \right) \times 100
\]

where \( \rho \) is the density of the PET material; \( \rho_a \) is the density of pure amorphous PET material (1.33 g/cc); and \( \rho_i \) is the density of pure crystalline material (1.455 g/cc).

[0012] Container manufacturers use mechanical processing and thermal processing to increase the PET polymer crystallinity of a container. Mechanical processing involves orienting the amorphous material to achieve strain hardening. This processing commonly involves stretching a PET preform along a longitudinal axis and expanding the PET preform along a transverse or radial axis to form a PET container. The combination promotes what manufacturers define as biaxial orientation of the molecular structure in the container. Manufacturers of PET containers currently use mechanical processing to produce PET containers having approximately 20% crystallinity in the container’s sidewall.

[0013] Thermal processing involves heating the material (either amorphous or semi-crystalline) to promote crystal growth. On amorphous material, thermal processing of PET material results in a spherical morphology that interferes with the transmission of light. In other words, the resulting crystalline material is opaque, and thus, generally undesirable. Used after mechanical processing, however, thermal processing results in higher crystallinity and excellent clarity.
for those portions of the container having biaxial molecular orientation. The thermal processing of an oriented PET container, which is known as heat setting, typically includes blow molding a PET preform against a mold heated to a temperature of approximately 250°F-350°F (approximately 121°C-177°C), and holding the blown container against the heated mold for approximately two (2) to five (5) seconds. Manufacturers of PET juice bottles, which must be hot-filled at approximately 185°F (85°C), currently use heat setting to produce PET bottles having an overall crystallinity in the range of approximately 25%-35%.

[0014] After being hot-filled, the heat-set containers are capped and allowed to reside at Generally the filling temperature for approximately five (5) minutes at which point the container, along with the product, is then actively cooled prior to transferring to labeling, packaging, and shipping operations. The cooling reduces the volume of the liquid in the container. This product shrinkage phenomenon results in the creation of a vacuum within the container. Generally, vacuum pressures within the container range from 1-380 mm Hg less than atmospheric pressure (i.e., 759 mm Hg-380 mm Hg). If not controlled or otherwise accommodated, these vacuum pressures result in deformation of the container, which leads to either an aesthetically unacceptable container or one that is unstable. Hot-fillable plastic containers must provide sufficient flexibility to compensate for the changes of pressure and temperature, while maintaining structural integrity and aesthetic appearance.

Typically, the industry accommodates vacuum related pressures with sidewall structures or vacuum panels formed within the sidewall of the container. Such vacuum panels generally distort inwardly under vacuum pressures in a controlled manner to eliminate undesirable deformation.

[0015] Filled containers are often packaged in bulk such as on a pallet or bundle pack. In this way, it is generally desirable to group a large amount of containers together in a small area. It is also necessary to stabilize the containers on the pallet or bundle pack such that damage from shifting is minimized. In general, external forces are applied to sealed containers as they are packaged and shipped. A bottom row of filled containers may support several upper tiers of filled containers, and potentially, several upper boxes of filled containers. Therefore, it is important that each container have a top loading capability as well as lateral stability to prevent distortion from the intended container shape. Similarly, in some instances, a marketing advantage exists when containers are packaged in pairs.

[0016] As such, with the growing popularity of bulk and club stores, consumers are purchasing products, such as beverages and non-perishables, in larger quantities. Thus, there exists a need for an improved method of packaging these commodities to make it more convenient for consumers to purchase and subsequently use products packaged and sold in such larger quantities.

[0017] Many commodities are shelf stable meaning that the commodity does not need to be refrigerated prior to opening. Typically, however, such commodities must be kept refrigerated after opening. Larger sized commodity containers are commonly offered in 96 fl. oz. (2837 cc) and 128 fl. oz. (3782 cc) sizes. Such containers are often too large to conveniently fit in a commonly sized refrigerator and/or refrigerator door. This makes it increasingly inconvenient to store such containers after they are opened.

[0018] Commodities contained in such larger sized containers are typically dispensed by the consumer over a relatively long period of time during which the container must be stored in a refrigerator to prevent spoilage. The current disclosure enables two (2) or more smaller sized containers to be securely bundled together when purchased, providing approximately the same total volume of commodity as found in larger sized containers in multiple, more manageable, smaller sized containers without adding significant weight or requiring additional space. After purchase, the bundled containers may be separated. In that way, a single, smaller sized container can be stored in a refrigerator while the remaining container(s) can be stored elsewhere at room temperature until needed. Thus, the present disclosure provides consumers with the volume benefits of larger containers and the space efficient, ease of transport, and handling benefits of smaller containers.

[0019] Containers are normally placed in trays, boxes or other means to aid in transporting the containers. Currently this is necessary in order to hold the containers in place. This significantly increases material and costs to the overall transportation operation. Past attempts to eliminate the trays, boxes, etc. by wrapping the containers together with shrink-wrap or labels have often led to undesirable results due to the tendency for containers to simply slide or fall out of the bundle. Thus, it is important to prevent unwanted damage to containers caused by containers sliding or shifting during storage and transportation.

[0020] Thus, there is a need for an improved method of packaging rectangular containers, such containers providing an interlock feature so that adjacent containers, having a complementary mating surface, can remain stable during storage and transportation when packaged on a pallet or bundle pack, or packaged in pairs.

SUMMARY

[0021] This disclosure provides for a rectangular plastic container which maintains aesthetic and mechanical integrity during any subsequent handling after being hot-filled and cooled to ambient allowing for significant absorption of vacuum pressures without unusual deformation of the container. In one example, the vacuum pressures are accommodated at vacuum panels formed in the sidewall of the container. An interlocking feature is also provided on the container allowing for the container to nest with complementary mating surfaces of adjacent containers. The interlocking feature is formed on an area of the container away from the vacuum panels. In this way, the container can accommodate distortion at the vacuum panels while substantially不影响 mating, interlocking feature between adjacent containers.

[0022] In one form, the present disclosure provides a method of packaging interlocking containers including the steps of creating a container having an interlocking structure suitable to achieve a nesting relationship with a complementary mating surface of an adjacent container and affixing a label around the containers such that the containers achieve the nesting relationship.

[0023] Additional benefits and advantages of the present disclosure will become apparent to those skilled in the art to which the present disclosure relates from the subsequent
description and the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a plastic container constructed in accordance with the present teachings, the container as molded and empty.

FIG. 2 is a front elevational view of the plastic container according to the present invention, the container as molded and empty.

FIG. 3 is a rear elevational view of the plastic container of FIG. 1.

FIG. 4 is a right side view of the plastic container of FIG. 1.

FIG. 5 is a left side view of the plastic container of FIG. 1.

FIG. 6 is a cross-sectional view of the plastic container, taken generally along line 6-6 of FIG. 2.

FIG. 7 is a cross-sectional view of the plastic container, taken generally along line 7-7 of FIG. 4.

FIG. 8 is a front elevational view of a series of containers shown in an interlocked position according to the present disclosure.

FIG. 9 is a side elevational view of a series of containers shown in an interlocked position according to the present disclosure.

FIG. 10 is a schematic representation of a method of packaging interlocking containers in accordance with the present disclosure.

FIG. 11 is a perspective view of two (2) containers shown in an interlocked position according to the method of packaging interlocking containers described in the present disclosure; and

FIG. 12 is a perspective view of a series of containers shown in an interlocked position according to the method of packaging interlocking containers described in the present disclosure.

DETAILED DESCRIPTION

The following description is merely exemplary in nature, and is in no way intended to limit the disclosure or its application or uses.

In a PET heat-set container, a combination of controlled deformation and vacuum resistance is required. This disclosure provides for a plastic container which enables its sidewall portion under typical hot-fill process conditions to deform and move easily while maintaining a rigid structure (i.e., against internal vacuum) in the remainder of the container. As an example, in a 64 fl. oz. (1891 cc) plastic container, the container typically should accommodate roughly 60 cc of volume displacement. In the present plastic container, the sidewall portion accommodates a significant portion of this requirement. Accordingly, the sidewall portion accounts for all noticeable distortion. The improved rigid construction of the remaining portions of the plastic container is easily able to accommodate the rest of this volume displacement without readily noticeable distortion. In the present plastic container, such remaining portions include a shoulder region and a base portion.

The container according to the present teachings provides interlocking structures formed at the shoulder region and the base portion. The interlocking structures allow the opposing surfaces of adjacent containers to achieve a nesting relationship resulting in a more stable positioning. In this way, a collection of containers such as in a bulk pallet, bundle pack, or packaged in pairs may achieve a stable collective footprint or unit. The interlocking structures between adjacent containers cooperate to resist unwanted movement of one container relative to an adjacent container during packaging and shipping operations.

FIGS. 1-7 show the present container. In the figures, reference number 10 designates a plastic, e.g. polyethylene terephthalate (PET), hot-fillable container. As shown in FIG. 2, the container 10 has an overall height A of about 10.45 inches (266.19 mm), and a sidewall and base portion height B of about 5.94 inches (151.37 mm). The height A is selected so that the container 10 fits on the shelves of a supermarket or store. As shown in the figures, the container 10 is substantially rectangular in cross sectional shape including opposing longer sides 14 each having a width C of about 4.72 inches (120 mm), and opposing shorter, parting line sides 15 (FIGS. 4 and 5) each having a width D of about 3.68 inches (93.52 mm). The widths C and/or D are selected so that the container 10 can fit within the door shelf of a refrigerator. Said differently, as with typical prior art bottles, opposing longer sides 14 of the container 10 of the present disclosure are oriented at approximately 90 degree angles to the shorter, parting line sides 15 of the container 10 so as to form a generally rectangular cross section. In this particular embodiment, the container 10 has a volume capacity of about 64 fl. oz. (1891 cc). Those of ordinary skill in the art would appreciate that the following teachings of the present disclosure are applicable to other containers, such as round, triangular, hexagonal, octagonal or square shaped containers, which may have different dimensions and volume capacities. It is also contemplated that other modifications can be made depending on the specific application and environmental requirements.

As shown in FIGS. 1-5, the plastic container 10 includes a finish 12, a shoulder region 16, a sidewall portion 18 and a base portion 20. Those skilled in the art know and understand that a neck (not illustrated) may also be included having an extremely short height, that is, becoming a short extension from the finish 12, or an elongated height, extending between the finish 12 and the shoulder region 16. The plastic container 10 has been designed to retain a commodity during a thermal process, typically a hot-fill process. For hot-fill bottling applications, bottlers generally fill the container 10 with a liquid or product at an elevated temperature between approximately 155°F. to 205°F. (approximately 68°C to 96°C) and seal the container 10 with a closure (not illustrated) before cooling. As the sealed container 10 cools, a slight vacuum, or negative pressure, forms inside causing the container 10, in particular, the sidewall portion 18, as will be described, to change shape. In addition, the plastic container 10 may be suitable for other high-temperature pasteurization or retort filling processes, or other thermal processes as well.

The plastic container 10 is a blow molded, biaxially oriented container with a unitary construction from a
single or multi-layer material. A well-known stretch-molding, heat-setting process for making the hot-fillable one-piece plastic container 10 generally involves the manufacture of a preform (not illustrated) of a polyester material, such as polyethylene terephthalate (PET), having a shape well known to those skilled in the art similar to a test-tube with a generally cylindrical cross section and a length typically approximately fifty percent (50%) that of the resultant container height. In one example, a machine (not illustrated) places the preform heated to a temperature between approximately 190° F. to 250° F. (approximately 88° C. to 121° C.) into a mold cavity (not illustrated) having a shape similar to the plastic container 10. The mold cavity may be heated to a temperature between approximately 250° F. to 350° F. (approximately 121° C. to 177° C.). A stretch rod apparatus (not illustrated) stretches or extends the heated preform within the mold cavity to a length approximately that of the container 10 thereby molecularly orienting the polyester material in an axial direction generally corresponding with a central longitudinal axis 28 (FIGS. 6 and 7) of the container 10. While the stretch rod extends the preform, air having a pressure between 500 PSI to 600 PSI (2.07 MPa to 4.14 MPa) assists in extending the preform in the axial direction and in expanding the preform in a circumferential or hoop direction thereby substantially conforming the polyester material to the shape of the mold cavity and further molecularly orienting the polyester material in a direction generally perpendicular to the axial direction, thus establishing the biaxial molecular orientation of the polyester material in most of the container 10. Typically, material within the finish 12 and a sub-portion of the base portion 20 are not substantially molecularly oriented. The pressurized air holds the mostly biaxial molecularly oriented polyester material against the mold cavity for a period of approximately two (2) to five (5) seconds before removal of the container 10 from the mold cavity. This process is known as heat setting and results in a heat-resistant container suitable for filling with a product at high temperatures.

Alternatively, other manufacturing methods, such as for example, extrusion blow molding, one step injection stretch blow molding and injection blow molding, using other conventional materials including, for example, high density polyethylene, polypropylene, polyethylene naphthalate (PEN), a PET/PEN blend or copolymer, and various multilayer structures may be suitable for the manufacture of the plastic container 10. Those having ordinary skill in the art will readily know and understand plastic container manufacturing method alternatives.

The finish 12 of the plastic container 10 includes a portion defining an aperture or mouth 22, a threaded region 24 having threads 25, and a support ring 26. The aperture or mouth 22 allows the plastic container 10 to receive a commodity while the threaded region 24 provides a means for attachment of a similarly threaded closure or cap (not illustrated). Alternatives may include other suitable devices that engage the finish 12 of the plastic container 10. Accordingly, the closure or cap (not illustrated) engages the finish 12 to preferably provide a hermetic seal of the plastic container 10. The closure or cap (not illustrated) is preferably of a plastic or metal material conventional to the closure industry and suitable for subsequent thermal processing, including high temperature pasteurization and retort. The support ring 26 may be used to carry or orient the preform (the precursor to the plastic container 10) (not illustrated) through and at various stages of manufacture. For example, the preform may be carried by the support ring 26, the support ring 26 may be used to aid in positioning the preform in the mold, or an end consumer may use the support ring 26 to carry the plastic container 10 once manufactured.

Integrally formed with the finish 12 and extending downward therefrom is the shoulder region 16. The shoulder region 16 merges into and provides a transition between the finish 12 and the sidewall portion 18. The sidewall portion 18 extends downward from the shoulder region 16 to the base portion 20. The specific construction of the sidewall portion 18 of the heat-set container 10 allows the shoulder region 16 and the base portion 20 to not necessarily require additional vacuum panels, and therefore, the shoulder region 16 and the base portion 20 are capable of providing increased rigidity and structural support to the container 10. The base portion 20 functions to close off the bottom portion of the plastic container 10 and, together with the finish 12, the shoulder region 16, and the sidewall portion 18, to retain the commodity.

The plastic container 10 is preferably heat-set according to the above-mentioned process or other conventional heat-set processes. To accommodate vacuum forces, the sidewall portion 18 may include vacuum panels 30 formed therein. As illustrated in the figures, vacuum panels 30 may be generally rectangular in shape and are formed in the opposing longer sides 14 of the container 10. It is appreciated that the vacuum panels may define other geometrical configurations. Accordingly, the container 10 illustrated in the figures has two (2) vacuum panels 30. The inventors however equally contemplate that more than two (2) vacuum panels 30, such as four (4), can be provided. That is, that vacuum panels 30 also be formed in opposing shorter, parting line sides 15 of the container 10 as well. Surrounding vacuum panels 30 is land 32. Land 32 provides structural support and rigidity to the sidewall portion 18 of the container 10.

Vacuum panels 30 include an underlying surface 34 and a series of ribs 37. Ribs 37 are generally arcuately shaped, arranged horizontally throughout the entire height, from top to bottom, of vacuum panels 30, and generally spaced equidistantly apart from one another. A person of ordinary skill in the art will readily understand that other geometrical designs, arrangements and quantities are feasible. Such alternative geometrical designs, arrangements and quantities may increase the amount of absorption vacuum panels 30 can accommodate. Accordingly, the exact shape of ribs 37 can vary greatly depending on various design criteria.

Additionally, the wall thickness of vacuum panels 30 must be thin enough to allow vacuum panels 30 to be flexible and function properly. With this in mind, those skilled in the art of container manufacture realize that the wall thickness of the container 10 may vary considerably depending where a technician takes a measurement within the container 10.

Vacuum panels 30 may also include a perimeter edge 38. The perimeter edge 38 defines the transition between the land 32 and the underlying surface 34 of vacuum panels 30. The perimeter edge 38 provides strength
to the transition between the land 32 and the underlying surface 34. The resulting localized strength increases the resistance to creasing and denting in the sidewall portion 18.

[0049] Upon filling, capping, sealing and cooling, as illustrated in FIG. 6 in phantom, the perimeter edge 38 acts as a hinge that aids in the allowance of the underlying surface 34 of vacuum panels 30 to be pulled radially inward, toward the central longitudinal axis 28 of the container 10, displacing volume, as a result of vacuum forces. In this position, the underlying surface 34 of vacuum panels 30, in cross section, illustrated in FIG. 6 in phantom, forms a generally concave surface 34. The greater the inward radial movement between underlying surfaces 34 and 33, the greater the achievable displacement of volume.

[0050] The amount of volume which vacuum panels 30 of the sidewall portion 18 displaces is also dependant on the projected surface area of vacuum panels 30 of the sidewall portion 18 as compared to the projected total surface area of the sidewall portion 18. Accordingly, the projected surface area of vacuum panels 30 (two (2) vacuum panels) of the sidewall portion 18 is required to be 20%, and preferably greater than approximately 25%, of the total projected surface area of the sidewall portion 18. The generally rectangular configuration of the container 10 creates a large surface area on opposing longer sides 14 of the sidewall portion 18, thereby promoting the use of large vacuum panels. The inventors have taken advantage of this large surface area by placing large vacuum panels 30 in this area. To maximize vacuum absorption, the contour of vacuum panels 30 substantially mimics the contour of the sidewall portion 18. Accordingly, as illustrated in FIG. 2, this results in vacuum panels 30 having a width E and a height F. In one example, for the container 10 having a nominal capacity of approximately 64 fl. oz. (1891 cc), the width E is about 2.36 inches (60 mm) while the height F is about 3.54 inches (90 mm).

[0051] A label panel area 39 is defined at the sidewall portion 18. The label panel area 39 may generally overlap the vacuum panels 30. As is commonly known and understood by container manufacturers skilled in the art, a label 41 may be applied to the sidewall portion 18 at the label panel area 39 using methods that are well known to those skilled in the art, including shrink-wrap labeling and adhesive methods. As applied, the label 41 may extend around the entire body or be limited to a single side of the sidewall portion 18.

[0052] The sidewall portion 18 may further include a series of horizontal ribs 112. Horizontal ribs 112 circumscribe the perimeter of the sidewall portion 18 of the container 10 and are interrupted at the vacuum panels 30. Horizontal ribs 112 extend continuously in a longitudinal direction across the label panel area 39 from the shoulder region 16 to the base portion 20. Defined between each adjacent horizontal rib 112 is land 32. Again, land 32 provides additional structural support and rigidity to the sidewall portion 18 of the container 10.

[0053] Horizontal ribs 112 have an overall depth dimension 124 (FIG. 6) measured between a lower most point 126 and land 32. The overall depth dimension 124 is approximately equal to a width dimension 128 of horizontal ribs 112. Generally, the overall depth dimension 124 and the width dimension 128 for the container 10 having a nominal capacity of approximately 64 fl. oz. (1891 cc) is between approximately 0.039 inch (1 mm) and approximately 0.157 inch (4 mm). As illustrated in the figures, in one example, the overall depth dimension 124 and the width dimension 128 of horizontal ribs 112 will vary between opposing sides or all sides of the container 10, thus forming a series of modulating horizontal ribs. While the above-described geometry of horizontal ribs 112 is one example, a person of ordinary skill in the art will readily understand that other geometrical designs and arrangements are feasible. Accordingly, the exact shape, number and orientation of horizontal ribs 112 can vary depending on various design criteria.

[0054] As illustrated in FIGS. 1-5, and briefly mentioned above, the sidewall portion 18 merges into and is unitarily connected to the shoulder region 16 and the base portion 20. The unique construction of the shoulder region 16 and the base portion 20 of the container 10 allows for adjacent containers to interlock in a stable, nested relationship. Accordingly, the shoulder region 16 of the container 10 includes an interlocking structure 40 in the form of depressions or inset portions 42, and protrusions or outset portions 44 formed thereof, and support surfaces 43. Similarly, the base portion 20 of the container 10 includes an interlocking structure 50 in the form of depressions or inset portions 52, and protrusions or outset portions 54 formed thereof, and support surfaces 53.

[0055] For reference purposes, the container 10 will be hereinafter assigned unique sides. As illustrated in FIG. 2, one of the opposing longer sides 14 of the container 10 will be referred to as front face 56. As illustrated in FIG. 3, the other of the opposing longer sides 14 of the container 10 will be referred to as rear face 58. One of the shorter, parting line sides 15 of the container 10, as illustrated in FIG. 4, will be referred to as right face 60. The other of the shorter, parting line sides 15 of the container 10, as illustrated in FIG. 5, will be referred to as left face 62.

[0056] To accommodate top load forces, provide enhanced stiffening strength capabilities and stability, and to facilitate a robust nesting, mating and interlocking action between adjacent containers, the inset and outset portions 42, 52 and 44, 54, and support surfaces 43 and 53 are relatively pronounced and distinctive. In this regard, support surfaces 43 and 53 may be any structure which provides some degree of geometric differentiation inward from the sidewall portion 18, thereby providing enhanced stiffening strength capabilities to the interlocking structures 40 and 50, such that interlocking structures 40 and 50 are not adversely affected by associated vacuum forces.

[0057] Particularly for rectangular shaped hot-filled containers, vacuum forces tend to exert the greatest amount of force and/or stress at, or near, the approximate center of gravity of the container, especially at the opposing longer sides of the rectangular container. Thus, it is advantageous to position vacuum panels at, or near, the approximate center of gravity of the container in order to accommodate a majority of the vacuum forces. Accordingly, as illustrated in FIGS. 2 and 3, the approximate center of gravity, designated as circle 70, of container 10 is found within vacuum panels 30. Additionally, as stated earlier, it is further advantageous
to locate interlocking structures 40 and 50 a distance away from the approximate center of gravity 70 of the container 10 such that interlocking structures 40 and 50 are not distorted or adversely affected by the vacuum forces acting on the container 10.

[0058] In one example, as illustrated in FIG. 3, interlocking structure 40, positioned on opposing longer sides 14, is located a distance L1, approximately 3 inches (76.2 mm), above the approximate center of gravity 70 of the container 10. The distance L1 may represent from about 20% to about 40% of the overall height A of the container 10, and more preferably about 25% to about 35%. The distance L1 may further represent from about 50% to about 70% of the width C of opposing longer sides 14 of the container 10, and more preferably about 55% to about 65%.

[0059] Similarly, in one example, as illustrated in FIG. 3, interlocking structure 50, positioned on opposing longer sides 14, is located a distance L2, approximately 3.35 inches (85.1 mm), below the approximate center of gravity 70 of the container 10. The distance L2 may represent from about 20% to about 40% of the overall height A of the container 10, and more preferably about 25% to about 35%. The distance L2 may further represent from about 60% to about 80% of the width C of opposing longer sides 14 of the container 10, and more preferably about 65% to about 75%.

[0060] The spatial relationship of the inset portions 42 and 52 will now be described. With reference to FIG. 6, in one example, the inset portions 42 and 52 defined on the front and rear faces 56 and 58, respectively, extend radially outward from the central longitudinal axis 28 a distance J measured about 1.69 inches (42.95 mm). Similarly, with reference to FIG. 7, in one example, the inset portions 42 and 52 defined on the right and left faces 60 and 62, respectively, extend radially outward from the central longitudinal axis 28 a distance H measured about 2.18 inches (55.32 mm).

[0061] The spatial relationship of the outset portions 44 and 54 will now be described. With reference to FIG. 6, in one example, the outset portions 44 and 54 defined on the front and rear faces 56 and 58, respectively, extend radially outward from the central longitudinal axis 28 a distance J measured about 1.81 inches (45.95 mm). Similarly, with reference to FIG. 7, in one example, the outset portions 44 and 54 defined on the right and left faces 60 and 62, respectively, extend radially outward from the central longitudinal axis 28 a distance K measured about 2.26 inches (57.32 mm). Accordingly, as a result, with reference to FIGS. 8 and 9, the respective outset portions 44 and 54 interfit, interlock and mate in a nested relationship with the respective inset portions 42 and 52 at a depth dimension M measured approximately 0.04 inch (1 mm) to approximately 0.12 inch (3 mm). Additionally, in one example, the depth dimension of the inset portions 42 and 52 is no more than approximately one-third (1/3) of the width dimension of the outset portions 44 and 52. The above and previously mentioned dimensions were taken from a typical 64 fl. oz. (1891 cc) hot fillable container. It is contemplated that comparable dimensions are attainable for containers of varying shapes and sizes.

[0062] The unique construction of the shoulder region 16 of the container 10 not only provides increased rigidity and stability to the container 10, but also provides additional support to a consumer when the consumer grasps the container 10 in this area of the shoulder region 16. A grip area 64 formed on the front and rear faces 56 and 58 has a height, width and depth that are dimensioned and structured to provide support for a variety of hand sizes. The grip area 64 is adapted to support the fingers and thumb of a person of average size. However, the support feature of the grip area 64 is not limited for use by a person having average size hands. By selecting and structuring the height, width and depth of the grip area 64, user comfort is enhanced, good support is achieved and this support feature is capable of being utilized by persons having a wide range of hand sizes. Moreover, the dimensioning and positioning of the grip area 64, and thus the support feature, facilitates holding, carrying and pouring of contents from the container 10. Additionally, support surfaces 43 offer a narrower hand entry point thereby enhancing a natural hand grip area.

[0063] The unique construction of the interlocking structures 40 and 50, and the support surfaces 43 and 53 provide added structure, support and strength to the container 10 as a whole. This added structure, support and strength enhances the top load strength capabilities of the container 10 by aiding in transferring top load forces, thereby preventing creasing, buckling, denting and deforming of the container 10 when subjected to top load forces. This unique construction and geometry also enables inherently thicker walls providing better rigidity, lightweighting, manufacturing ease and material consistency. Furthermore, this added structure, support and strength, resulting from the unique construction of the interlocking structures 40 and 50, the support surfaces 43 and 53, location of the vacuum panels 30, and location of the interlocking structures 40 and 50 in relation to the approximate center of gravity 70, minimizes movement, bowing and sagging of the container 10 at the interlocking structures 40 and 50 during fill, seal and cool down procedure. Thus, contrary to vacuum panels 30 formed in the sidewall portion 18, the shoulder region 16 and the base portion 20 maintain their relative stiffness throughout the fill, seal and cool down procedure ensuring the integrity of the interlock feature between complementary mating surfaces of adjacent containers. Accordingly, the distance from the central longitudinal axis 28 of the container 10 to the respective inset and outset portions 42, 52 and 44, 54 is fairly consistent throughout the entire longitudinal length of the shoulder region 16 and the base portion 20, and this distance is generally maintained throughout the fill, seal and cool down procedure.

[0064] While the interlocking structure has been illustrated as cooperating longitudinal ribs, the interlocking structure may be formed as different geometries. For example, it is contemplated that annular knobs may be formed for nesting in respective annular depressions. Similarly, other complementary geometries may be defined to attain an interfitting, interlocking, nesting, mating relationship. Such geometries may include rectangles, triangles, diamonds, hexagons, octagons and others to name a few.

[0065] The above and following descriptions are merely exemplary in nature and are not intended to limit the present disclosure, application or uses. It should be understood that throughout the drawings, corresponding reference numerals indicate like or corresponding parts and features.

[0066] A schematic representation, as shown in FIG. 10, concisely and succinctly sets forth the steps for packaging...
interlocking containers according to the present disclosure. An exemplary embodiment of a method of packaging interlocking containers is illustrated in a flow-chart 200 in FIG. 10. Containers 10 generally have the same shape and size, each such container 10 including inset and outset portions 42, 52 and 44, 54 extending inward and outward are filled with a commodity in step 202. A closure is then engaged with each such container 10 to seal the container 10 in step 204. The label 41 is then affixed to each such container 10 at the label panel area 39 in step 206. Finally, a second label 140 is affixed around the containers 10 such that adjacent containers 10 achieve a nesting relationship in step 208. Alternatively, prior to the final step 208 of affixing a second label 140 around the containers 10, adjacent containers 10 may be oriented in the nesting relationship such that the respective outset portions 44 and 54 interfit, interlock and mate in a nested relationship with the respective inset portions 42 and 52.

After the containers 10 are properly oriented, a shrink-wrapping 210, that can include a label or labels may be applied around the containers 10, encircling two (2) individual containers 10 as illustrated in FIG. 11, or a large number of containers 10 as illustrated in FIG. 12. Heat can then be applied to the shrink-wrap label 210 in order to fix it to the containers 10 and hold the relative positions of the two (2) or multiple containers. One advantage of the illustrated containers 10 is that the shrink-wrap label 210 may be positioned over and surrounding the sidewall portion 18, between the shoulder region 16 and the base portion 20. Other placements of the shrink-wrap label 210 are also contemplated. The advantage to this particular configuration is that the containers 10 are strongly locked together through multiple locking features. Such multiple locking features include the respective inset and outset portions 42, 52 and 44, 54, and the shrink-wrap label 210. Accordingly, the containers 10 are locked into position in such a way that the containers 10 cannot move up and down relative to one another due to the respective outset portions 44 and 54 interfitting, interlocking and mating in a nested relationship with the respective inset portions 42 and 52, and the engagement of the shrink-wrap label 210. Similarly, relative sideways motion between the containers 10 is also prevented.

As discussed above, the shrink-wrap label 210 has the additional advantage of holding the individual containers 10 together in the finished package. When the shrink-wrap label 210 is used, the shoulder region 16 and the base portion 20 further function to hold the shrink-wrap label 210 in place and prevent the individual containers 10 from sliding up or down in the finished packaging, thus maintaining the solid, joined configuration without the need for adhesives.

As illustrated in FIG. 11, the current disclosure enables two (2) or more smaller sized containers to be securely bundled together offering approximately the same volume of product in multiple containers without adding significant weight or taking up additional space. In this regard, consumers are able to bundle the container bundle as easily as a single larger sized container. Upon arrival at home, the consumer is able to separate the bundled containers. In this way, a single container can be conveniently stored in a refrigerator door while the remaining container(s) can be stored elsewhere, such as a cupboard or pantry, at room temperature for an extended period of time. Thus, the current disclosure provides the consumer with the benefit of containers that may be used for a longer period of time, are more space efficient, and easier to transport, handle and pour.

The unique interlocking construction of the current disclosure prevents containers from sliding out of the bundle thus eliminating the need for a tray, box or similar means for transporting the bundled containers. A further benefit of the current disclosure is the ability to efficiently pack a large number of containers on a pallet as illustrated in FIG. 12. As such, a pallet 212 includes a large number of containers 10 packaged thereon. As discussed above, these containers 10 are surrounded by a shrink-wrap label 214. Similarly, the respective inset and outset portions 42, 52 and 44, 54 along with the shrink-wrap label 214, i.e., multiple locking features, enable a large number of containers 10 to nest together creating a collectively strong block of containers 10 and preventing layers of containers 10 from shifting on the pallet 212. This stable bundle helps to prevent unwanted damage to containers 10 often caused by the shifting of containers 10 during storage and transportation. The above-described nested relationship enables the containers 10 to support one another thus enhancing the collective ability of the containers 10 to handle top and side load forces.

Additionally, the containers 10 can be manufactured at the same time and joined, or can be made at different times and joined later. A particular advantage of the present disclosure is that the containers 10 can be made from the same mold or identical molds. All of the containers 10 can be prepared from the same manufacturing equipment. Thus, unlike the prior art, only one set of molding or forming machinery is required.

While the above description constitutes the present disclosure, it will be appreciated that the disclosure is susceptible to modification, variation and change without departing from the proper scope and fair meaning of the accompanying claims.

What is claimed is:
1. A method of packaging interlocking containers, wherein each container is defined in part by an interlocking structure suitable to achieve a nesting relationship with a complementary mating surface of an adjacent container, said method comprising the steps of:
   - filling the containers with a commodity;
   - engaging a closure with each container to seal the container;
   - affixing a label to each container; and
   - affixing a second label around a plurality of containers such that adjacent containers achieve said nesting relationship.
2. The method of packaging interlocking containers of claim 1 further including the step of orienting adjacent containers in said nesting relationship after the step of affixing a label to each container.
3. The method of packaging interlocking containers of claim 2 wherein the containers have one of a generally rectangular shaped cross-section and a generally square shaped cross-section.
4. The method of packaging interlocking containers of claim 2 wherein the step of affixing a label to each container includes affixing a label that extends around the entire container.

5. The method of packaging interlocking containers of claim 2 wherein the step of affixing a label to each container includes affixing a label to a single side of the container.

6. The method of packaging interlocking containers of claim 2 further including the step of heating said commodity to an elevated temperature.

7. The method of packaging interlocking containers of claim 2 further including the step of heat-treating said containers filled with said commodity with one of a pasteurization process and a retort process.

8. The method of packaging interlocking containers of claim 2 further including the step of cooling said filled containers with said commodity to substantially room temperature.

9. A method of packaging interlocking containers, wherein each container is defined in part by an interlocking structure suitable to achieve a nesting relationship with a complementary mating surface of an adjacent container, said method comprising the steps of:

   filling the containers with a commodity;

   engaging a closure with each container to seal the container;

   affixing a label to each container;

   orienting adjacent containers in said nesting relationship; and

   affixing a second label around at least two containers such that adjacent containers achieve said nesting relationship.

10. The method of packaging interlocking containers of claim 9 wherein the containers have one of a generally rectangular shaped cross-section and a generally square shaped cross-section.

11. The method of packaging interlocking containers of claim 9 wherein the step of affixing a label to each container includes affixing a label that extends around the entire container.

12. The method of packaging interlocking containers of claim 9 wherein the step of affixing a label to each container includes affixing a label to a single side of the container.

13. The method of packaging interlocking containers of claim 9 further including the step of heating said commodity to an elevated temperature.

14. The method of packaging interlocking containers of claim 9 further including the step of heating said containers with said commodity with one of a pasteurization process and a retort process.

15. The method of packaging interlocking containers of claim 9 further including the step of cooling said filled containers with said commodity to substantially room temperature.

16. A method of packaging interlocking containers in pairs, said method comprising the steps of:

   creating a container defined in part by an interlocking structure suitable to achieve a nesting relationship with a complementary mating surface of an adjacent container; and

   affixing a label around a pair of said containers such that said pair of containers achieve said nesting relationship.

17. The method of packaging interlocking containers of claim 16 further including the step of orienting adjacent containers in said nesting relationship prior to the step of affixing a label around said pair of said containers.

18. The method of packaging interlocking containers of claim 17 further including the step of orienting adjacent containers in said nesting relationship.

19. The method of packaging interlocking containers of claim 18 wherein said containers have one of a generally rectangular shaped cross-section and a generally square shaped cross-section.

20. The method of packaging interlocking containers of claim 16 further including the step of heating said commodity to an elevated temperature.

21. The method of packaging interlocking containers of claim 16 further including the step of cooling said filled containers with said commodity to substantially room temperature.