A container made of plastic material, such as PET, that is adapted to be hot-fillable. The container has flex panels located on its sides. The flex panels are surrounded by frames. The frames and the flex panels have medallions located on them to prevent creasing from occurring during the hot-fill process.
Provide the container
102

Hot fill the container
104

Cap the container
106

Let the container cool
108

FIG. 12
PRESSURE RESISTANT MEDALLIONS FOR A PLASTIC CONTAINER

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention
[0002] The present invention is directed to the field of containers used with food products. In particular the field of the invention is directed to hot-fillable plastic containers.

[0003] 2. Description of the Related Technology
[0004] Plastic blow-molded containers, particularly those molded of PET, have been utilized in hot-fill applications where the container is filled with a liquid product heated to a temperature in excess of 180°F (82°C), capped immediately after filling, and allowed to cool to ambient temperatures. Plastic blow-molded containers have also been utilized in pasteurization and retort processes, where a filled and sealed container is subjected to thermal processing and is then cooled to ambient temperatures.

[0005] Plastic containers are used more frequently today due to their durability and lightweight nature. Polyethylene terephthalate (PET) is used to construct many of today’s containers. PET containers are lightweight, inexpensive, recyclable and manufactured in large quantities.

[0006] PET containers are used for products, such as beverages. Often these liquid products, such as juices and isotonic, are placed into the containers while the liquid product is at an elevated temperature, typically between 68°F-96°F (15°C-25°C) and usually about 85°F (18°C). When packaged in this manner, the hot temperature of the liquid is used to sterilize the container at the time of filling. This process is known as hot-filling. The containers that are designed to withstand the process are known as hot-fill containers.

[0007] Many of the design aspects that go into the formation of containers are directed to the creation of appealing aesthetic features. In some instances the preferred design for a container has features that pose issues with respect to the underlying utility of the container. For example, during the pressure filling of the container with liquid the container may be damaged or creased. Furthermore, during the hot-fill process, when a plastic container is subjected to relatively high temperatures and pressures, the plastic container’s shape will distort. Upon cooling, the plastic container may generally retain this distorted shape or at least fail to return to its pre hot-fill shape. Accordingly, there remains a need to provide plastic containers that can withstand the rigors of the hot-fill process in order to take advantage of the cost savings that can be realized through manufacture and recycling. The lighter weight of plastic containers as compared to glass can also advantageously reduce shipping costs.

[0008] While using plastic containers is advantageous in the long run. The difficulty in producing such a container is that the hot-fill process causes deformation in the container structure. Therefore there is a need in the field to produce container structures that are able to capture the aesthetic and traditional look of glass containers, while being able to utilize the benefits of plastic.

SUMMARY OF THE INVENTION

[0009] An object of the present invention may be a plastic container having structure located on the flex panels to prevent creasing during the fill process.

[0100] Another object of the present invention may be medallions located on a flex panel.

[0101] Still yet another object of the present invention may be a hot-fillable container with a plurality of flex panels having a plurality of medallions.

[0102] An aspect of the present invention may be a plastic container comprising: a shoulder portion; a body portion located below the shoulder portion; a base portion located below the body portion; and wherein the body portion further comprises a flex panel and a medallion.

[0103] Another aspect of the present invention may be a hot-fillable container comprising: a shoulder portion; a body portion located below the shoulder portion, wherein the body portion comprises a front side, a rear side and two sides further comprising flex panels; a base portion located below the body portion; and wherein a medallion is located on at least one of the flex panels.

[0104] Still yet another aspect of the present invention may be a hot-fillable container comprising: a shoulder portion; a body portion located below the shoulder portion, wherein the body portion comprises a front side, a rear side and two sides further comprising flex panels; a base portion located below the body portion; and wherein a medallion is located on at least one of the flex panels.

[0105] These and various other advantages and features of novelty that characterize the invention are pointed out with particularity in the claims annexed hereto and forming a part hereof. However, for a better understanding of the invention, its advantages, and the objects obtained by its use, reference should be made to the drawings which form a further part hereof, and to the accompanying descriptive matter, in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0106] FIG. 1 is perspective view of a container made in accordance with the present invention.

[0107] FIG. 2 is a side view of the container shown in FIG. 1.

[0108] FIG. 3 is a front view of the container shown in FIG. 1.

[0109] FIG. 4 is a bottom view of the container shown in FIG. 1.

[0110] FIG. 5 is a cross-sectional view of the container shown in FIG. 3 taken along the line 5-5.

[0111] FIG. 6 is a cross-sectional view of the container shown in FIG. 3 taken along the line 6-6.

[0112] FIG. 7 is perspective view of a container made in accordance with another embodiment of the present invention.

[0113] FIG. 8 is a side view of the container shown in FIG. 7.

[0114] FIG. 9 is a front view of the container shown in FIG. 7.

[0115] FIG. 10 shows the stressed areas of a container without the medallion.

[0116] FIG. 11 shows the stressed areas of a container with the medallion.
FIG. 12 is a flowchart showing the method for hot-filling a container.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

Referring to the drawings, wherein like reference numerals designate corresponding structure throughout the views, and now referring in particular to FIG. 1 showing a front view of a container 10 made in accordance with an embodiment of the present invention.

The container 10 may be a one-piece construction and may be prepared from a monolayer plastic material, such as a polyamide, for example, nylon; a polyolefin such as polyethylene, for example, low density polyethylene (LDPE), high density polyethylene (HDPE), polypropylene, a polyester, for example, polyethylene terephthalate (PET), polyethylene naphthalate (PEN), or others, which may also include additives to vary the physical or chemical properties of the material. For example, some plastic resins may be modified to improve the oxygen permeability. Alternatively, the container may be prepared from a multilayer plastic material. The layers may be any plastic material, including virgin, recycled and reground material. The layers may include plastics or other materials with additives to improve physical properties of the container. In addition to the above-mentioned materials, other materials often used in multilayer plastic containers may be used including, for example, ethylene vinyl alcohol (EVOH) and tie layers or binders to hold together materials that are subject to delamination when used in adjacent layers. A coating may be applied over the multilayer or multilayer material to introduce oxygen barrier properties. In an exemplary embodiment, the present container is prepared from PET.

The container 10 is constructed to withstand the rigors of hot-filling processing, a retort process and/or pasteurization. The container 10 may be made by conventional blow molding processes including, for example, extrusion blow molding, stretch blow molding and injection blow molding. These molding processes are discussed briefly below.

In extrusion blow molding, a molten tube of thermoplastic material, or plastic parison, is extruded between a pair of open blow mold halves. The blow mold halves close about the parison and cooperate to provide a cavity into which the parison is blown to form the container 10. As so formed, container 10 may include extra material, or flash, at the region where the molds come together. A mold may be intentionally present above the top portion of the container.

After the mold halves open, the container 10 drops out and is then sent to a trimmer or cutter where any flash of mold attached to the container 10 is removed. The finished container 10 may have a visible ridge (not shown) formed where the two mold halves used to form the container came together. This ridge is often referred to as the parting line.

With stretch blow molding a pre-formed parison, or pre-form, is prepared from a thermoplastic material, typically by an injection molding process. The pre-form typically includes an opened end, which becomes part of the closure of the container 10. The pre-form is positioned between two open blow mold halves. The blow mold halves close about the pre-form and cooperate to provide a cavity into which the pre-form is blown to form the container 10. After mowing, the mold halves open to release the container 10.

With injection blow molding, a thermoplastic material may be extruded through a rod into an injection mold in order to form a parison. The parison is then positioned between two open blow mold halves. The blow mold halves close about the parison and cooperate to provide a cavity into which the parison may be blown to form the container 10. After molding, the mold halves open to release the container 10.

As discussed above, the plastic blow-molded containers, particularly those molded of PET, are utilized in hot-fill applications and/or pasteurization. Hot-filling involves filling the container 10 with a liquid product heated to a temperature in excess of 180°F (i.e., 82°C.), capped immediately after filling, and then allowed to cool to ambient temperatures. Pasteurization and retort differ from hot-fill processing by including heating the filled container to a specified temperature, typically greater than 93°C (200°F), until the contents of the filled container reach a specified temperature, for example 80°C (175°F), for a predetermined length of time. That is, the external temperature of the hot-filled container may be greater than 93°C so that the internal temperature of a solid or semi-solid product reaches approximately 80°C. Retort processes may also involve applying overpressure to the container.

In the construction of containers it is important to keep the container’s top load and hot-fill characteristics strong. The structural integrity of the container must be maintained after the hot-fill process. It is also important to prevent creasing and/or structural damage to the container that may occur during the initial pressure fill of the liquid. Furthermore, consideration must be made for preventing bulging of the container that can occur. For the purpose of this application, when a container 10 is said to be adapted for a hot-fill process, and/or pasteurization process, it is meant that the container 10 is designed and structured so as to withstand the heating and/or overpressuring that are involved in these processes without undergoing significant structural deformation.

In FIGS. 1-4 a cylindrical shaped container 10 is shown made in accordance, with an embodiment of the present invention. The container 10 has a finish 12, an elongated neck 14, a shoulder portion 16, a body 15 and a base 18.

The finish 12 may be a standard finish that can accommodate the placement of a twist on, twist off cap. The neck 14 extends downwards from the finish 12 to the shoulder portion 16. While the neck 14 is shown as being elongated it should be understood that the neck 14 may also be shorter in length. The shoulder portion 16 has a rounded surface that curves downward from the neck 14 to the circumferential rib 26. Located on the shoulder portion 16 may be a label area 19. The label area 19 may have an embossed surface that identifies the product that is within the container 10.

The circumferential rib 26 is located beneath the shoulder portion 16. The circumferential rib 26 merges the shoulder portion 16 into the body portion 15. The circumferential rib 26 is recessed with respect to the shoulder portion 16 and the body portion 15. During the hot-fill process the circumferential rib 26 provides structural integrity to the container 10 so as to prevent negative vacuum pressure from deforming the shoulder portion 16.

The body portion 15 has four curved sides 24a, 24b and 32. The sides 24a and 24b have a plurality of ribs 20. The ribs 20 are recessed and provide structure to enable the placement of a label. The side 24a may be larger than the side 24b.
That is to say the front side 24a is larger than the rear side 24b. This can be seen in the cross-sectional views of the container 10 shown in FIGS. 5 and 6.

[0041] Still referring to FIGS. 1-4, the sides 32 have vacuum flex panels 30. The vacuum flex panels 30 are surrounded by frames 22. The frame 22 may be thicker than the surrounding portions of the container 10. The frame 22 further assists in isolating the negative vacuum pressure that occurs during the hot-fill process so that it is focused in the vacuum flex panel 30. The frame 22 is comprised of the top frame portion 36, bottom frame portion 38, front frame portion 37 and rear frame portion 39. The front frame portion 37 is located closest to the front side 24a, while the rear frame portion 39 is located closest to the rear side 24b. The top frame portion 36 is located closest to the shoulder portion 16 and the bottom frame portion 38 is located closest to the base 18.

[0042] Located on the frame 22 is a plurality of medallions 28. The medallions 28 are tear-drop in shape and are formed from an original spherical shaped structure (i.e. they are a portion of the sphere). While the medallions 28 are all shown being equal in size they may each be differently sized. The medallion base 31 is arc shaped and extends into the surface of the flex panel 30. The medallion 28 further has two medallion sides 33 which extend from the medallion base 31 to the medallion apex 34. The medallion sides 33 are located primarily on the frame 22. The medallion apex 34 is also located primarily on the frame 22. Preferably and as shown in FIGS. 1-4, the medallions 28 are shown located on the front frame portion 37.

[0043] As shown in FIGS. 1 and 3 the medallions 28 are located with the middle medallion 28 being located equal distances from the other two medallions 28. The medallions 28 provide additional support structure to the frame 22 that prevents deformation of the container 10 outside the frame 22. It should be understood that while three medallions are shown in the figures more or less medallions 28 may be used. Furthermore, while a tear drop shaped medallion is used, other shapes may be employed provided they prevent creasing in the container 10. The tear drop shaped medallion 28 is used in the embodiments disclosed herein due to its ease of creation and effectiveness.

[0044] The deformation that the medallions 28 may prevent primarily occurs during the fill process with the liquid. Creasing may occur in the sides 32 of the container 10 if the medallions 28 are not present. However, placement of structure on the frame 22 or the flex panel 30 may result in decreased negative pressure accommodation of the flex panel 30. However, the location of the medallions 28 on the front frame portion 37 as opposed to the rear frame portion 39 operates to prevent creasing during the fill process and does not inhibit the vacuum flex panel during the capping and creation of internal negative vacuum pressure. Locating the medallions 28 on other frame portions, such as the top frame portion 36, the bottom frame portion 38, or the rear frame portion 39 does not result in the same measure of success.

[0045] Located beneath the body portion 15 is the base 18. FIG. 4 shows a bottom view of the container 10. Shown in this view are base fingers 21 which are formed during the bottle forming process.

[0046] In FIGS. 5 and 6 the cross-sectional views of the container 10 are shown. FIG. 5 shows how the distance D1 taken as part of front side 24a from the point A to the point B is greater than the distance D2 taken as part of the rear side 24b from the point C to the point D. Also shown in the cross-sectional views is the increased thickness provided by the presence of the medallion 28 in FIG. 6. In the cross-sectional view shown in FIG. 6 it can be seen how the distance D3 taken from points E and F located on the medallions is greater than the distance D4 taken from the points G and H located on the rear frame portion 39.

[0047] FIGS. 7-9 show a container 40 made in accordance with another embodiment of the present invention. Everything discussed above with respect to the container 10 is applicable to the container 40. Both containers have similar structure, formation methods and purposes. However, instead of only three medallions 28 located on the vacuum flex panel 30 and frame 22 there is only one medallion 28. Using only one medallion 28 is not as effective as using the three medallions discussed above, however the same overall result of preventing creasing during the fill process while not inhibiting the ability of the flex panel 30 is achieved.

[0048] FIG. 10 shows the flexing of a container 5 that does not have a medallion 28. Lighter shaded stress area 3 shows the portion of the container 5 that is being subjected to additional stress during the fill process. FIG. 11 shows the flexing of the container 40 with the medallion 28. It can be seen in FIG. 11 that the presence of the medallion 28 on the container 40 reduces the amount of lightly shaded area and decreases the risk of creasing the container 40 during the fill process.

[0049] FIG. 12 is a flow chart providing the steps of hot filling the container 10. The same method is applicable to each of the containers disclosed herein. In step 102, the container 10 is provided. In step 104, the container 10 is filled. The filling process involves placing a fluid in the container that is heated to a predetermined temperature. In step 106, the container 10 is capped. In step 108 the container is cooled.

[0050] It is to be understood, however, that even though numerous characteristics and advantages of the present invention have been set forth in the foregoing description, together with details of the structure and function of the invention, the disclosure is illustrative only, and changes may be made in detail, especially in matters of shape, size and arrangement of parts within the principles of the invention to the full extent indicated by the broad general meaning of the terms in which the appended claims are expressed.

What is claimed is:
1. A plastic container comprising:
a shoulder portion;
a body portion located below the shoulder portion;
a base portion located below the body portion; and
wherein the body portion further comprises a flex panel and a medallion.
2. The plastic container of claim 1, wherein the medallion is substantially tear-drop shaped.
3. The plastic container of claim 1, further comprising a plurality of medallions located on each flex panel.
4. The plastic container of claim 1, further comprising a plurality of medallions located on a plurality of flex panels.
5. The plastic container of claim 1, further comprising at least four sides, wherein two sides have flex panels.
6. The plastic container of claim 1, wherein a frame surrounds the flex panel.
7. The plastic container of claim 6, wherein the frame has a top frame portion, a front frame portion, a bottom frame portion and a rear frame portion.
8. The plastic container of claim 7, wherein the medallion is located on only one of the top frame portion, a front frame portion, a bottom frame portion and a rear frame portion.

9. The plastic container of claim 8, wherein one of the four sides of the container is a front side of the container, wherein the front side of the container is larger than the other sides.

10. The plastic container of claim 9, wherein the front side of the container is larger than the other sides and the medallion is located on the front frame portion, wherein the front frame portion is the frame portion closest to the front side of the container.

11. A hot-fillable container comprising:
   a shoulder portion;
   a body portion located below the shoulder portion, wherein the body portion comprises a front side, a rear side and two sides further comprising flex panels;
   a base portion located below the body portion; and
   wherein a medallion is located on at least one of the flex panels.

12. The hot-fillable container of claim 11, wherein the medallion is substantially tear-drop shaped.

13. The hot-fillable container of claim 11, further comprising a plurality of medallions located on each flex panel.

14. The hot-fillable container of claim 11, further comprising a plurality of medallions located on a plurality of flex panels.

15. The hot-fillable container of claim 1, wherein a frame surrounds each of the flex panels.

16. The hot-fillable container of claim 15, wherein each frame has a top frame portion, a front frame portion, a bottom frame portion and a rear frame portion.

17. The hot-fillable container of claim 16, wherein the medallion is located on only one of the top frame portion, a front frame portion, a bottom frame portion and a rear frame portion.

18. The hot-fillable container of claim 17, wherein one of the front side, the rear side and the two sides further comprising flex panels is larger than the other sides.

19. The hot-fillable container of claim 18, wherein the front side of the container is larger than the other sides and the medallion is located on the front frame portion, wherein the front frame portion is the frame portion closest to the front side of the container.

20. A hot-fillable container comprising:
   a shoulder portion;
   a body portion located below the shoulder portion, wherein the body portion comprises a front side, a rear side and two sides further comprising flex panels;
   a base portion located below the body portion; and
   wherein a medallion is located on at least one of the flex panels, wherein the medallion further comprises a medallion apex, two medallion sides and a medallion base, wherein the medallion base is arc shaped.

* * * * *