US 20060113274A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2006/0113274 A1

Keller et al. (43) Pub. Date: Jun. 1, 2006

(54) VACUUM PANEL BASE

(75) Inventors: **Gilles Keller**, Amberieu En Bugey (FR); **Michel Romand**, Serrieres-De-Briord (FR); **Gilles Rapet**, Montalieu Vercieu (FR); **Gilles Perez**, Vourles (FR)

Correspondence Address:
VENABLE LLP
P.O. BOX 34385
WASHINGTON, DC 20045-9998 (US)

(73) Assignee: **GRAHAM PACKAGING COMPANY, L.P.**, York, PA

(21) Appl. No.: **11/000,422**

(22) Filed: **Dec. 1, 2004**

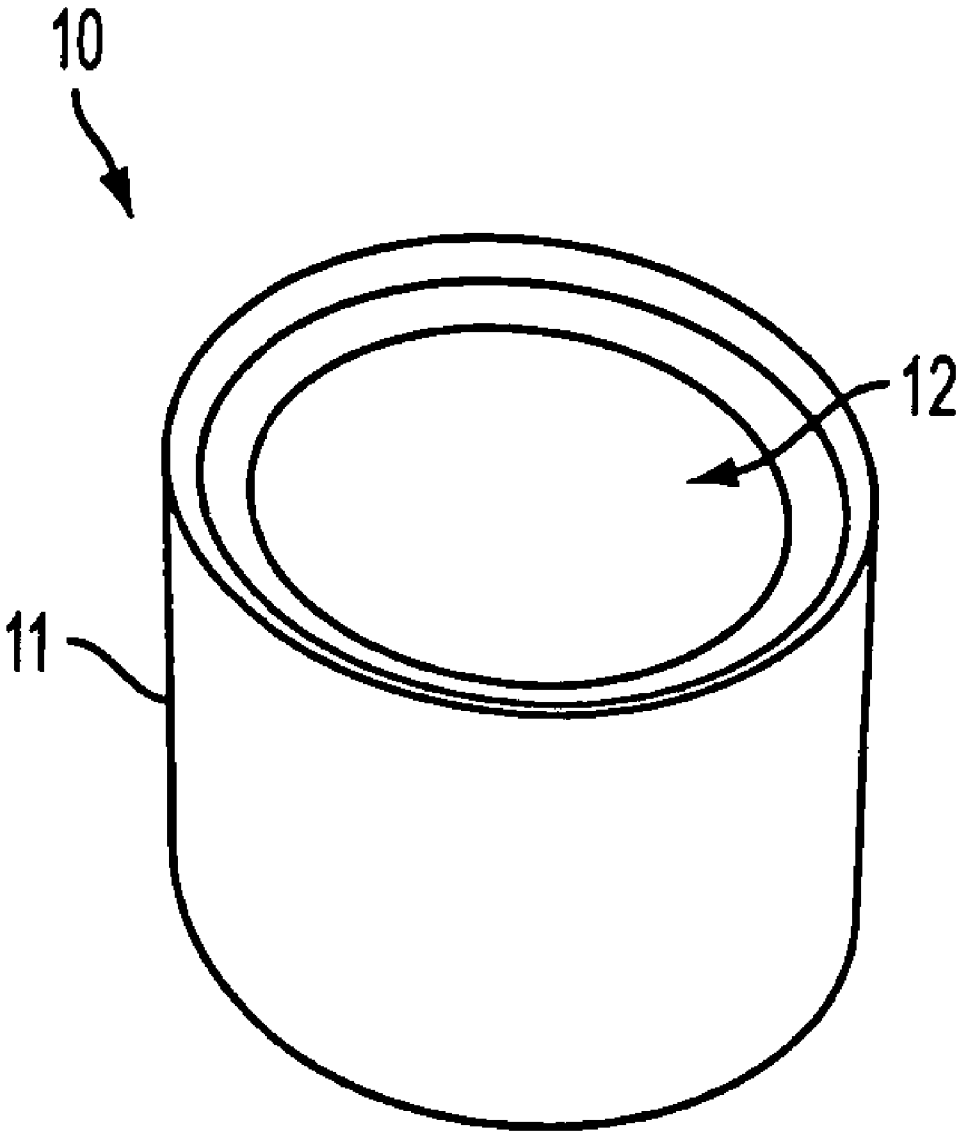
Publication Classification

(51) **Int. Cl.**
B65D 90/12 (2006.01)

(52) **U.S. Cl.** **215/376**

(57) **ABSTRACT**

A plastic container having a sidewall and a base merging with the sidewall. The base includes an annular bearing surface and an inner portion for accommodating inner forces tending to collapse the sidewall. The inner portion has a hinge for facilitating the inward collapse of the inner portion, a vacuum panel, and a support ring interposed between the hinge and the vacuum panel for facilitating a flexure of the vacuum panel.



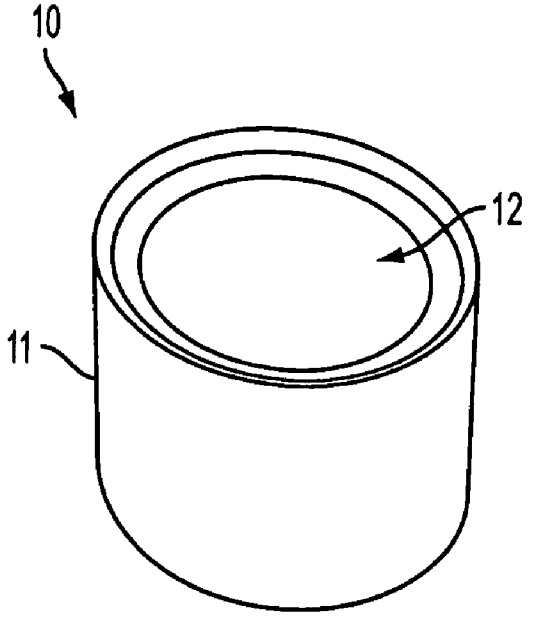


FIG. 1

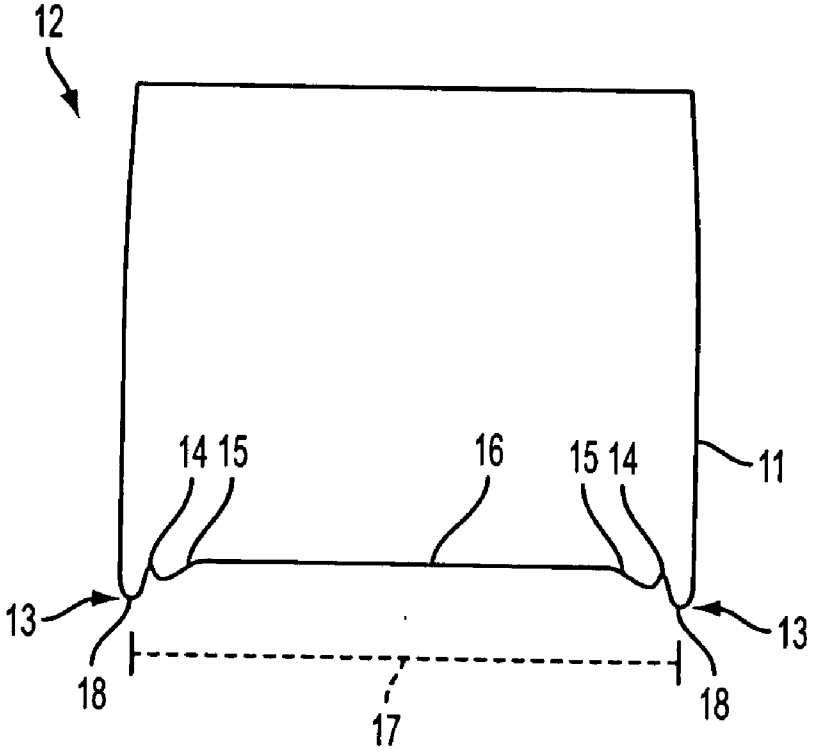


FIG. 2

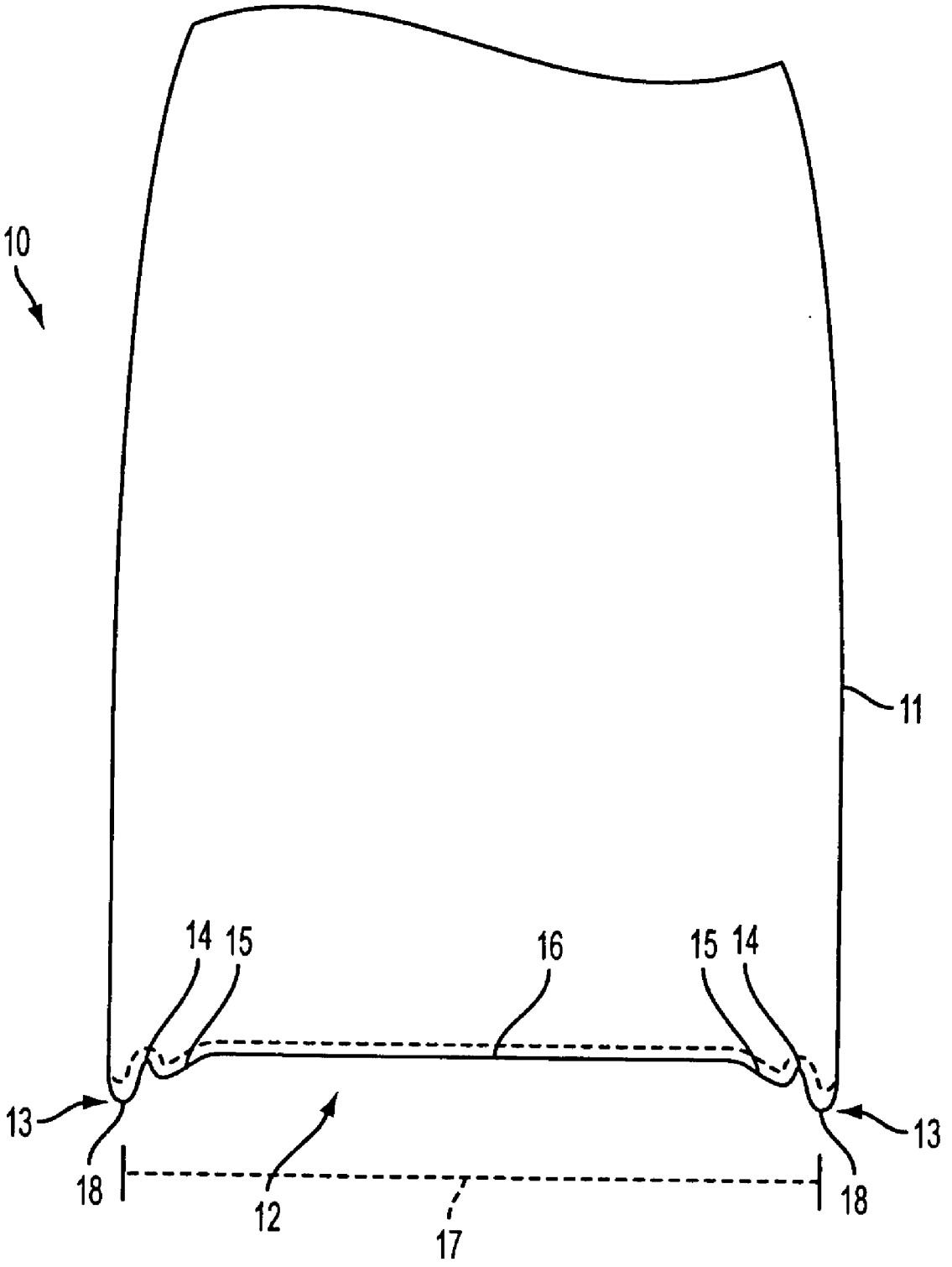


FIG. 3

VACUUM PANEL BASE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates generally to a container having a base structure for enhancing the structural integrity of the container.

[0003] 2. Related Art

[0004] Many liquid products are now sold to the consuming public in plastic containers that are more aesthetically pleasing. Such containers can have smooth, contoured sidewalls that appear to look more like glass. When these containers are filled by the so-called hot-fill process, they must be structurally sound to withstand various forces relating to the hot-fill process.

[0005] The hot-fill process is the procedure by which containers are filled with a beverage at a high temperature and capped soon thereafter. As the beverage cools within the container, stresses and strains develop in the container due to changes in the volume of the contents. In some instances, the hot-fill process can create a vacuum inside the container.

[0006] A polyolefin container prepared by a continuous extrusion blow-molding process can be used in the hot-fill process. Polyolefin continuous extrusion blow-molded containers include multi-layer containers that provide the requisite structure and barriers to oxygen and oils, for example. These multi-layered containers typically include a layer of polyolefin, such as polypropylene or polyethylene, as the main structure providing layer. Other layers can include oxygen barrier layers, moisture barrier layers, and regrind layers to provide the necessary barrier structures, as well as adhesives between the layers.

[0007] It is understood by a person having ordinary skill in the art that to form a polypolefin continuous extrusion blow-molded plastic container, a parison can be heated in an extruder, captured by a mold, and blown in the mold. Specifically, to form the cavity of the container, a parison can be extruded up into the mold and as the mold comes together, a pneumatic blow pin, for example, can pierce the parison and blow the parison up against the walls of the mold. The mold typically contains flash pockets above and below the mold cavity to capture the excess parison above and below the cavity. It can be understood by a person having ordinary skill in the art, that as the parison is blown inside the mold and captured in the flash pockets, portions of the parison must adhere together. Once the container is cooled, the excess flash can then be cut away from the container after being ejected from the mold.

[0008] The desire to provide structural integrity to containers that undergo the hot-fill process has resulted in the development of different design techniques and elements. For example, the introduction of vacuum panels into the sidewall of the container is known to improve the containers structural integrity. While these structural elements molded in the sidewalls' structure can afford structural integrity, they tend not to be aesthetically pleasing. By incorporating such structure into the base of the container, the aesthetically unpleasant structures can be hidden.

[0009] Although the aforementioned structural elements may function satisfactorily for their intended purposes, there is a need to provide more aesthetically pleasing containers having a base structure that can withstand the forces of the hot-fill process. The base structures should be capable of accommodating variations in volume of the containers' contents and changes of pressure and temperature. Furthermore, the base structure should be capable of being manufactured in conventional high-speed equipment.

BRIEF SUMMARY OF THE INVENTION

[0010] Exemplary embodiments of the invention provide a plastic container having a tubular sidewall and a base merging with the sidewall. The base includes an annular bearing surface having a weak point, and an inner portion for accommodating inner forces tending to collapse the sidewall. The inner portion has a hinge for facilitating the inward collapse of the inner portion, a vacuum panel, and a support ring interposed between the hinge and the vacuum panel to maintain the shape of the vacuum panel as the inner portion collapses.

[0011] Further embodiments of the invention provide a plastic container having a substantially cylindrical sidewall and a base merging with the sidewall. The base includes an annular bearing surface having a weak point, and an inner portion having an annular hinge, a support ring, and a vacuum panel surrounded by the annular hinge and the support ring. In such an embodiment, the inner portion extends outward under a first state and flexes inward when a vacuum is created inside the plastic container.

[0012] Still further embodiments of the invention provide a plastic container including a substantially smooth, cylindrical sidewall and a base merging with the sidewall. The base includes an annular bearing surface having a weak point, and an inner portion having an annular hinge, a support ring, and a vacuum panel surrounded by the annular hinge and the support ring. In such an embodiment, the inner portion extends outward under a first state and flexes inward when a vacuum is created inside the plastic container without deforming the at least one of the sidewall and the base.

[0013] Further objectives and advantages, as well as the structure and function of preferred embodiments will become apparent from a consideration of the description, drawings, and examples.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The foregoing and other features and advantages of the invention will be apparent from the following, more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings wherein like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements.

[0015] **FIG. 1** depicts a perspective view of an exemplary embodiment of a container base according to the present invention;

[0016] **FIG. 2** depicts a cross-sectional view of an exemplary embodiment of a base according to the present invention; and

[0017] **FIG. 3** depicts a cross-sectional view of an exemplary embodiment of a base according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Embodiments of the invention are discussed in detail below. In describing embodiments, specific terminology is employed for the sake of clarity. However, the invention is not intended to be limited to the specific terminology so selected. While specific exemplary embodiments are discussed, it should be understood that this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components and configurations can be used without parting from the spirit and scope of the invention. All references cited herein are incorporated by reference as if each had been individually incorporated.

[0019] **FIG. 1** is a bottom perspective view of an exemplary embodiment of a container **10** according to the present invention. **FIG. 1** shows plastic container **10** for packaging liquids and the like. Container **10** can be made from a plastic such as a nylon, polyester, such as PET, a polyolefin, such as polyethylene, polypropylene, or the like. The plastic can be in one or more layers of a multi-layered container, or can be the only component of the container. Container **10** can have a tubular sidewall **11** that can merge with base **12**. In an exemplary embodiment of the invention, sidewall **11** can be a substantially smooth, substantially cylindrical sidewall. Sidewall **11** can be flexible, yet resistant to deformation when a vacuum is created inside container **10**.

[0020] **FIG. 2** illustrates a cross-sectional view of an exemplary embodiment of a base **12** according to the present invention. As shown in **FIG. 2**, base **12** can have an annular bearing surface **13** for contact with a horizontal surface (not shown). Annular bearing surface **13** can have a weak point **18** for enabling inward flexure of base **12**. Base **12** can also have an inner portion **17** surrounded by annular bearing surface **13**. Inner portion **17** can include annular hinge **14**, support ring **15** and vacuum panel **16**.

[0021] As shown in **FIG. 2**, annular hinge **14** can have a curved cross-section so that it is concave in a direction inwardly of the container **10**. Support ring **15** can be interposed between annular hinge **14** and vacuum panel **16**. Support ring **15** can have a curved cross-section that is concave in a direction outwardly of the container **10**.

[0022] In the use of container **10**, the container is filled with a hot liquid and when the liquid cools, inner portion **17** can collapse inwardly to a substantially indented position as shown in broken lines in **FIG. 3**. For example, in one embodiment of the invention, annular hinge **14** can provide a flexing point for inner portion **17** to flex inwardly enabling vacuum panel **16** to flex into the position shown in the broken lines in **FIG. 3**. The support ring **15** provides structural integrity to both the vacuum panel **16** and bearing surface **13**. That is, the support ring **15** assists in maintaining the shape of the inner portion **17** as inner portion **17** collapses inwardly due to pressure or volumetric changes within the container **10**. In the illustrated embodiment, the support ring **15** is maintaining the circular shape of the inner portion **17**. The support ring **15** also cooperates with hinge **14** to isolate the movement of the inner portion **17** from the bearing surface **13**. Thus, as the inner portion collapses, the shape and integrity of the bearing surface **13** is maintained. In an exemplary embodiment of the invention, weak point **18** may enable the annular bearing surface **13** to curl into the base of the container to preserve the integrity of annular bearing surface **13**, as is shown by the directional arrow A in **FIG. 3**.

[0023] In other embodiments of the invention, the vacuum panel **16** flexes inwardly and maintains its convex shape or becomes more flattened in cross-section. Such a flexure occurs about hinge **14**. In this embodiment as well, the support ring **15** functions to maintain the circular shape of the inner portion **17**. Also, either alone or through cooperation with the hinge **14**, the shape and integrity of the bearing surface is maintained.

[0024] In yet another embodiment, the shape of the inner portion **17** does not change as the base flexes. Rather, vacuum panel **16** together with support ring **15** move as a unit in an inward direction into the container **10**. The flexure occurs about hinge **14**. Flexure of the hinge **14** is sufficient to prevent a distortion of the bearing surface **13** as the inner surface **17** moves inward, as is shown by the broken lines in **FIG. 3**. In such an embodiment, weak point **18** may enable the annular bearing surface **13** to curl into the base of the container to preserve the integrity of annular bearing surface **13**, as is shown by the directional arrow A in **FIG. 3**.

[0025] When the above-described flexures of inner portion **17** occur, the vacuum in container **10** is relieved and the substantially cylindrical appearance of sidewall **11** is preserved, such that the container **10** remains firm. Additionally, the flexures provide resistance to kinks and/or deformations in the annular bearing surface **13** of the base **12**. Advantageously, container **10** will not collapse significantly in the sidewall of the container, but instead, inner portion **17** moves inside the container to compensate the vacuum that can be created inside the container **10**. thus, a container with a base as in exemplary embodiments of the present invention can be formed with smooth sidewalls. Structural features in the sidewall, which can be unappealing to consumers, can be minimized or avoided.

[0026] Because the base compensates for a significant portion of the vacuum created during processing, the amount of material in the sidewall can be reduced. That is, the sidewall need not be reinforced with plastic material in order to prevent distortion. In an exemplary embodiment of a container, this can result in a weight reduction from an initial 45 grams, for example, to a final weight of 35 grams, for example. Thus, using the present invention, the container weight can be reduced by 5 percent or more, greater than 10 percent, or even more than 20 percent, for example. The actual weight reduction obtained can depend on the size of the container, the material used to make the container, and whether additional structural features are used to accommodate a vacuum.

[0027] The embodiments illustrated and discussed in this specification are intended only to teach those skilled in the art the best way known to the inventors to make and use the invention. Nothing in this specification should be considered as limiting the scope of the present invention. All examples presented are representative and non-limiting. The above-described embodiments of the invention may be modified or varied, without departing from the invention, as appreciated by those skilled in the art in light of the above teachings. It is therefore to be understood that, within the scope of the claims and their equivalents, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A plastic container comprising:

a tubular sidewall;

a base merging with the sidewall, the base including an annular bearing surface comprising a weak point, and an inner portion for accommodating inner forces tending to collapse the sidewall, the inner portion having a hinge for facilitating the inward collapse of the inner portion, a vacuum panel, and a support ring interposed between the hinge and the vacuum panel to maintain the shape of the vacuum panel as the inner portion collapses.

2. The plastic container according to claim 1, wherein the vacuum panel extends outward.

3. The plastic container according to claim 1, wherein at least one of the vacuum panel or the inner portion flexes inward when a vacuum is created inside the plastic container.

4. The plastic container according to claim 1, wherein the annular bearing surface curls inward at the weak point to further facilitate the inward collapse of the inner portion.

5. The plastic container according to claim 3, wherein the inner portion flexes by an amount sufficient to prevent deformation of the annular bearing surface when a vacuum is created inside the container.

6. The plastic container according to claim 4, wherein the inner portion flexes without deforming at least one of the sidewall and the base.

7. The plastic container according to claim 1, wherein the sidewall is substantially cylindrical.

8. The plastic container according to claim 1, wherein the sidewall is substantially smooth.

9. The plastic container according to claim 1, wherein the plastic container is composed of polyolefin.

10. The plastic container according to claim 9, wherein the polyolefin is polyethylene or polypropylene.

11. A plastic container comprising:

a substantially cylindrical sidewall;

a base merging with the sidewall, the base including an annular bearing surface comprising a weak point, and an inner portion having an annular hinge, a support ring, and a vacuum panel surrounded by the annular hinge and the support ring,

wherein the inner portion extends outward under a first state and flexes inward when a vacuum is created inside the plastic container.

12. The plastic container according to claim 11, wherein the inner portion flexes without deforming at least one of the sidewall and the base.

13. The plastic container according to claim 11, wherein the sidewall is substantially smooth.

14. The plastic container according to claim 11, wherein the plastic container comprises a plastic.

15. The plastic container according to claim 14, wherein the plastic is a polyolefin.

16. The plastic container according to claim 15, wherein the polyolefin is selected from polyethylene and polypropylene.

17. The plastic container according to claim 11, wherein the annular bearing surface curls inward at the weak point to further facilitate the inward collapse of the inner portion.

18. A plastic container comprising:

a substantially smooth, cylindrical sidewall;

a base merging with the sidewall, the base including an annular bearing surface comprising a weak point, and an inner portion having an annular hinge, a support ring, and a vacuum panel surrounded by the annular hinge and the support ring,

wherein the inner portion extends outward under a first state and flexes inward when a vacuum is created inside the plastic container without deforming the at least one of the sidewall and the base.

19. The plastic container according to claim 18, wherein the plastic container is composed of polyolefin.

20. The plastic container according to claim 19, wherein the plastic container is composed of polyethylene.

21. The plastic container according to claim 19, wherein the plastic container is composed of polypropylene.

22. The plastic container according to claim 18, wherein the annular bearing surface curls inward at the weak point to further facilitate the inward collapse of the inner portion.

* * * * *