A food storage container has a cover and a base that provide a sealed storage area. The cover has a central engagement portion containing venting holes. The venting holes can be covered or exposed by an adjustable venting cover.
CONTAINER HAVING ADJUSTABLE VENTED COVER

FIELD OF THE INVENTION

[0001] The present invention relates generally to a plastic container having a cover and a base, which when sealingly engaged together form a sealed storage area, and, more particularly, to container covers that have an adjustable venting feature. Slots or holes in the cover are variably exposed by rotating a secondary venting cover which attaches to the top of the container cover.

BACKGROUND OF THE INVENTION

[0002] Rigid, thermoplastic food containers are generally known. These containers are substantially airtight, which can present a variety of problems during consumer use. When the contents of the container are micro-waved, the contents may heat up and expand with the evolution of steam causing the cover to violently pop off the container and resulting in a potential mess. In other storage applications, it may be desirable to adjustably vent the container. For example, in the storage of fruits and vegetables, it may be desirable to adjustably control the ventilation and moisture transmission within the container.

[0003] Prior art examples in U.S. Pat. No. 5,806,703 to Grando, U.S. Pat. App. 2002/0148845 to Zettle et al, and U.S. Pat. No. 3,362,565 to McCormick provide a level of venting as a safety valve for packages of products to be cooked. The present invention has as a general aim to provide containers that solve the problems of the current food containers, which lack the ability to controllably adjust venting of the container.

SUMMARY OF THE INVENTION

[0004] In view of the foregoing, the present invention provides for a container comprising a cover having a first closure portion, said first closure portion being sealingly engageable with a second closure portion of a base so that when said first closure portion and said second closure portion are engaged with each other, said cover and said base define a substantially sealed storage area; an engagement portion; and a venting cover adjustingly attached to the engagement portion; and the base having a bottom; a peripheral sidewall extending from said bottom; an open top; and said second closure portion.

[0005] In some embodiments, the container comprises a cover having a first closure portion, said first closure portion being sealingly engageable with a second closure portion of a base so that when said first closure portion and said second closure portion are engaged with each other, said cover and said base define a substantially sealed storage area; a central engagement portion; and a circular venting cover rotationally attached to the engagement portion; and the base having a bottom; a peripheral sidewall extending from said bottom; an open top; and said second closure portion.

[0006] The features of the present invention will become apparent to one of ordinary skill in the art upon reading the detailed description, in conjunction with the accompanying drawings, provided herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is an perspective view of a container with a cover and a base according to an embodiment of the present invention.

[0008] FIG. 2 is an perspective view of the base of FIG. 1;

[0009] FIG. 3 is a partial sectional perspective view with the engagement portion of the cover of FIG. 1 locking engaged with and engagement portion of a second cover;

[0010] FIG. 4 is a top plan view of a cover according to an embodiment of the present invention;

[0011] FIG. 5 is a top plan view of a cover according to an embodiment of the present invention;

[0012] FIG. 6 is a top plan view of a cover according to an embodiment of the present invention;

[0013] FIG. 7 is a top plan view of a cover according to an embodiment of the present invention;

[0014] FIG. 8 is a top plan view of a cover according to an embodiment of the present invention;

[0015] FIG. 9 is a top plan view of a venting cover according to an embodiment of the present invention;

[0016] FIG. 10 is a top plan view of a venting cover according to an embodiment of the present invention;

[0017] FIG. 11 is a top plan view of a cover with a secondary venting cover according to an embodiment of the present invention;

[0018] FIG. 12 is a top plan view of a cover with a secondary venting cover according to an embodiment of the present invention;

[0019] FIG. 13 is a top plan view of a cover with a secondary venting cover according to an embodiment of the present invention;

[0020] FIG. 14 is a top plan view of a cover according to an embodiment of the present invention; and

[0021] FIG. 15 is a top plan view of a secondary venting cover according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Reference will now be made to the drawings wherein like numerals refer to like parts throughout. For ease of description, the components of this invention are described in the normal (upright) operating position, and terms such as upper, lower, horizontal, etc., are used with reference to this position. It will be understood, however, that the components embodying this invention may be manufactured, stored, transported, used, and sold in an orientation other than the position described.

[0023] Figures illustrating the components of this invention show some conventional mechanical elements that are known and that will be recognized by one skilled in the art. The detailed descriptions of such elements are not necessary to an understanding of the invention, and accordingly, are herein presented only to the degree necessary to facilitate an understanding of the novel features of the present invention.

[0024] All publications, patents and patent applications cited herein, whether supra or infra, are hereby incorporated by reference in their entirety to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated by reference.

[0025] As used herein and in the claims, the term "comprising" is inclusive or open-ended and does not exclude additional unrecited elements, compositional components, or method steps. Accordingly, the term "comprising" encompasses the more restrictive terms "consisting essentially of" and "consisting of".

[0026] It must be noted that, as used in this specification and the appended claims, the singular forms "a," "an" and "the" include plural referents unless the content clearly dic-
states otherwise. Thus, for example, reference to a "surfactant" includes two or more such surfactants.

[0027] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. Although a number of methods and materials similar or equivalent to those described herein can be used in the practice of the present invention, the preferred materials and methods are described herein. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise indicated.

[0028] The term "container", as used herein, is meant to mean and include any storage container for storing food in a refrigerator. A container may be made of any suitable material, depending upon the product therein. For example, a container may be made of plastic.

[0029] An embodiment of the present invention is illustrated in FIGS. 1 and 2. A container 100 includes a flexible cover 102 seamingly engaged to a base 104. In the example of FIGS. 1 and 2, the container 100 is depicted as substantially circular in top plan view. In other embodiments of the present invention, the container 100 has other shapes such as rectangular, square, or elliptical.

[0030] The cover 102 includes a central engagement portion 106 that is lockingly engageable with the central engagement portion of a second cover (shown in FIG. 3). Circumscribing the engagement portion 106 of the cover 102 can be at least one articulation element 108. The engagement portion 106 of the Figures is depicted as circular but, as with the shape of the container 100 itself, other shapes are possible. In some embodiments, a standard shape and configuration of the engagement portion 106 is used with covers 102 of various shapes and sizes. This enhances storage flexibility by allowing different types of covers 102 to be stored together in a locked stack.

[0031] The cover 102 includes a first closure portion 110 on the outer portion of the base. The first closure portion 110 is sealingly engageable with a second closure portion 210 of the base 104. The first closure portion 110 of the cover 102 can be sealingly engaged with a second closure portion 210 of the base 104 to provide a leak-resistant, re-sealable closure. When the first closure portion 110 of the cover 102 and the second closure portion 210 of the base 104 are abutted and sealingly engaged with each other, the cover 102 and the base 104 define a substantially sealed storage area within container 100 (FIG. 1).

[0032] As shown in FIG. 2, the base 104 of the container 100 includes a bottom 202 and a peripheral sidewall 204 extending upwardly from the peripheral edge of the bottom 202. The top of the base 104 is open. The second closure portion 210 of the base 104, which, as noted above, is adapted to sealingly engage with the first closure portion 110 of the cover 102, is positioned at the open end of the peripheral sidewall 204 of the base 104. In one embodiment, the second closure portion 210 of the base 104 is a raised locking ring that extends from an upper edge of the peripheral sidewall 204 of the base 104.

[0033] More particularly with reference to the engagement portion 106, the cover 102 illustrated in FIGS. 1 and 3 includes the engagement portion 106 that allows the cover 102 to lockingly engage with the engagement portion 306 of a second cover 302 to form a locked stack of covers (FIG. 3). This locking feature makes the resultant stack of covers more structurally rigid and thus less precarious than a traditional, non-interlocked, stack of covers.

[0034] As shown in FIG. 3 the cover 102 is locked together with the second cover 302 by their central engagement portions 106 and 306 respectively. In the example of FIG. 3, the engagement portion 106 of the cover 102 includes an upper protrusion 118 (see also FIG. 1) and a lower protrusion 120. Further, the engagement portion of the second cover 302 likewise includes an upper protrusion 318 and a lower protrusion 320. Each protrusion 118, 318, 120, and 320 is convex on one side and concave on the other. The lower protrusion 120 of the cover 102 fits over and receives the upper protrusion 318 of the second cover 302, thus locking the covers 102 and 302 together. In this manner, the covers 102 and 302 are held together and form a structurally stable cover stack. A third cover (not shown) may be lockingly engaged with the second cover 302, a fourth cover with the third and so on to form a stack of any number of covers.

[0035] The engagement portion 106 can also be chosen to have a shape or otherwise include elements that provide an aligned or locked stack of covers 102 with rotational alignment. Rotation, as used herein, is defined about an axis A (FIG. 1) normal to the plane formed by orthogonal midlines, i.e., first midline 405A and second midline 405B at the top surface of the cover 102 as shown in FIG. 4. The origin of the rotational axis is at the center point 407 at which the orthogonal midlines intersect. For instance, shapes that inherently require alignment prior to engagement or that may be self-aligning during the process of connecting engagement portions would be shapes with linear or curvilinear sides, vertices or lobes such as triangular, square, rectangular, or multi-petal shapes. Additionally, the cover may have one or more elements on or about the engagement portion that require alignment prior to connection of engagement portions or elements that may be self-aligning during the process of connecting engagement portions.

[0036] Other embodiments of the engagement portion may include one or more of the following features to enable engagement: convex portions or ribs, concave portions or ribs, linear or curvilinear undercuts, discrete snap elements or buttons, interference fits, textured surfaces, or elements that modify surface friction or tackiness at or around the point of engagement. The engaging areas that create a locking condition can be continuous about the engagement portions or discretely segmented about the engagement portions. In some embodiments, the force required to connect the cover and the second cover may differ substantially from the force required to disengage the covers. For instance, it may be beneficial during manufacturing that the force needed to connect the covers is less than the force required to separate the covers. As a result, the covers are relatively easy to connect during manufacturing, yet they will lock securely and not undesirably separate during the manufacturing process. To accomplish this, the protrusions on the engagement portion may be designed where, for a given protrusion, the upper protrusion
edge comprises a gradual taper whereas the lower protrusion edge comprises a more abrupt shape. For example, in one embodiment, the shape of the protrusion may be similar to a barbed hook with gradual taper on the upper edge of the barb that would impart little resistance during engagement and with an abrupt shape on the lower edge of the barb that would impart relatively high resistance during disengagement. Conversely, it may be beneficial to design the engagement portion so that the force that needs to be applied to connect the covers is more than the force required to separate the covers, since the user may perceive that a high connecting force equates to satisfactory locking integrity, whereas a weak connecting force may lead the user to perceive that the cover stack lacks the integrity required to insure the expected organizational benefit. Thus, the high connecting force provides the perceived benefit, yet a lower disengagement force does not require that the user untowardly struggle during separation of covers. To accomplish this, the protrusions on the engagement portion may be designed where, for a given protrusion, the upper protrusion edge comprises an abrupt shape whereas the lower protrusion edge comprises a more gradual taper. For example, in one embodiment, the shape of the protrusion may be a reversed barb with an abrupt shape on the upper edge of the barb that would impart relatively high resistance during engagement and with a gradual taper on the lower edge of the barb that would impart little resistance during disengagement. Furthermore, during the process where the user applies force to aligned covers in a direction normal to the general cover plane so as to lock the covers together, the engagement portion can provide tactile or audible feedback upon locking. In this way, the user would sense that the covers are connected and that no further force need be applied.

More particularly, the first closure portion 410 and the second closure portion 210 forms the sealing engagement of the cover 102 and the base 104. As would be apparent to one of ordinary skill in the art, the present invention can be embodied with a variety of closure designs including outer closures and/or inner closures. Related U.S. Patent Application 2009/0166369, co-owned with the present invention and incorporated in its entirety herein by reference, further describes the closure portions. However, the closure portions described herein are examples only, and many other types of closure portions could be used with the present invention.

As shown in FIG. 5, the central engagement portion 106 of the cover 502 may contain one or more openings 508 of various shapes, for example slits, allantoids, rounded openings, etc. that are useful for venting. FIG. 6 shows cover having a central engagement portion 106 having several smaller openings 504 and one large opening 506. FIG. 7 shows an embodiment of the cover 502 having circular openings 508 that fan out from the center. FIG. 8 shows an embodiment of the cover 502 having allantoid openings 510 that fan out from the center.

FIG. 9 shows a venting cover 902 that can fit over a central engagement portion 106 of a cover 502 of FIGS. 5, 6, 7, and 8. The venting cover 902 has curved slits 904. FIG. 10 shows a venting cover 1002 having one large opening 1004. In FIG. 11, the venting cover 902 is rotationally attached over the central engagement portion (not shown) of the cover 502. In the configuration of FIG. 11, the curved slits 904 are not ventingly connected to openings (not shown) on the cover 502. FIG. 12 shows the cover 502 with the venting cover 902 rotated to expose the openings 504. FIG. 13 shows the venting cover 1002 rotationally attached over the central engagement portion (not shown) of the cover 502 of FIG. 6 so that the large opening 1004 of the venting cover 1002 exposes the large opening 506 of the cover 502. FIG. 14 shows an example of a cover 1402 having a rectangular central engagement portion 1406 with venting openings 1404. FIG. 15 shows a venting cover 1410 slidably attached to the central engagement portion 1406 and partially exposing the venting openings 1404 of the cover 1402.

The base 104 can be made from any suitable plastic with sufficient thickness to withstand without deforming the heat of microwave cooking and of top-shelf dishwashing. It should also remain sturdy during lifting while laden with hot food. The base 104 can be made from any suitable plastic and can be made by any suitable technique, such as co-extrusion, lamination, injection molding, vacuum thermoforming, or overmolding. In one embodiment, the base 104 is formed from polypropylene. As with the cover 102, the nominal wall thickness of the base 104 can vary somewhat due to the manufacturing process.

The cover 102 can be constructed with a wall thickness thinner than that of a base 104. The cover 102 can be made from any suitable plastic and can be made by any suitable technique, such as vacuum thermoforming processes described herein. In one embodiment, the cover 102 can be formed from polypropylene. Due to the vacuum thermoforming process, the wall thickness of the cover 102 can vary slightly over its nominal thickness. A cover 102 with a nominal thickness less than the nominal thickness of the base 104, however, reduces the cost of material for the container 100. Further, with a thinner cover 102, increased cover flexibility more easily accommodates the removal of the cover 102 from, and the sealing engagement with, the base 104. The cover 102 can maintain adequate flexibility for proper sealing even during typical freezer temperatures.

The cover 102 can be made by various plastic molding processes, including but not limited to vacuum thermoforming and injection molding. Vacuum thermoforming of the cover 102 is typically the most economical means for forming the cover 102. As is well known in the art, vacuum thermoforming involves heating a suitable plastic sheet of material to a temperature at which the sheet becomes formable into a shape that is set as the plastic sheet cools. As used herein, a suitable plastic sheet is a plastic sheet that may be readily used by the vacuum thermoforming process. The heated plastic sheet is made to conform to the surface features of a single surface "male" tool by drawing the heated sheet of plastic to the surface of the tool by the force of a vacuum applied to the tool. In vacuum thermoforming, the sealed air space between the heated plastic and mold is evacuated to draw the heated plastic to contact the single male surface of the mold. Typically, however, in vacuum thermoforming, the thickness of the finished article formed by the process is nominally uniform. A side cross-section view through the vacuum thermoformed article reveals a substantially uniform thickness profile. The "bottom" surface of the heated plastic sheet that contacts the tool surface conforms to its shape. The "top" surface of the plastic element formed in the vacuum thermoforming process does not contact a tool surface and generally resides at a uniform distance from the bottom surface of the plastic article. Only nominal thinning of the plastic material occurs when it bends and stretches around curved mold features to conform to the path of the curved surfaces of these features. As used herein, a substantially uniform thick-
nesses in side cross-sectional profile is a thickness in a plastic article that is not sufficiently variable to preclude its manufacture with typical prior art single male surface vacuum thermoforming techniques. Conversely, a non-uniform thickness is a profile thickness in an article that varies enough to preclude the manufacture of the article with standard prior art vacuum thermoforming techniques requiring instead other plastic molding techniques such as injection molding.

[0044] Injection molding of a plastic article involves heating suitable plastic material in the form of pellets or granules until a melt is obtained. The melt is next forced into a split-die mold, sometimes referred to as a split-die tool, where it is allowed to "cool" into the desired shape. Both the bottom surface and the top surface of the plastic article are formable by the split-die mold. Thus, articles may be formed by the injection molding process that have side cross-sectional profiles of varying non-uniform thickness. After the plastic melt cools, the split-die mold is opened and the article is ejected. Since, the mold is separable, undercut surface on the plastic article may be relieved from the split-die mold when it is opened. Injection molding, well known in the art, is typically used to form plastic articles that have large undercuts and substantially varying thicknesses in side cross-sectional profile. As used herein undercuts are said to be large if a molded plastic article having undercut features is difficult or impossible to remove from a single-surface vacuum thermoforming mold after it is formed and cooled.

[0045] Since cover 102 as described, contains significant undercuts, such as included in upper protrusion 118 and lower protrusion 120 (FIGS. 1 and 3) on the engagement portion 106 of the cover 102, injection molding would typically be required to form cover 102. Further, injection molding would typically be required to form articulation elements 108 that are significantly thinner than the rest of cover 102.

[0046] The container 100 may be reusable, but it can also be constructed cheaply enough that consumers see it as a disposable item, with replacement covers 102 and bases 104 available separately for retail sale. The base 104 and the cover 102 can be fabricated by vacuum thermoforming a clarified polypropylene homopolymer material. In another embodiment, the container 100 may be fabricated by vacuum thermoforming a clarified random copolymer polypropylene material. Other plastic materials which would be suitable for fabricating the cover 102 and the base 104 of the container 100 by vacuum thermoforming include PS (polystyrene), CPET (crystalline polyethylene terephthalate), APET (amorphous polyethylene terephthalate), HDPE (high density polyethylene), PVC (polyvinyl chloride), PC (polycarbonate), and foamed polypropylene. The material used can be generally transparent to allow a user to view the contents of the container.

[0047] The container 100 may include a visual indication of closure between the cover 1102 and the base 104. The visual indication may be a color change in the area where the cover 102 engages the base 104. In one embodiment, the first closure portion 310 on the cover 102 may be a first color and the second closure portion 416 on the base 104 may be a second color. When the closure portions are engaged, the first and second colors produce a third color which is visible to the user to indicate that the container 100 is sealed.

[0048] The container 100 may include a rough exterior surface to reduce slipping and to improve grasping by the user, especially if the user’s hands are wet or greasy.

[0049] The container 100 may be divided to separate foods in the container. A divider may be integral with the container 100 or may be a separate component. Either the base 104 only may include a divider or both the base 104 and the cover 102 may each include a divider. The divider located in the cover 102 may only partially engage the divider in the base 104 so as to provide splash protection, or it may fully engage the divider in the base 104 to provide varying degrees of inter-compartmental leak resistance. The container 100 may include a strip indicating the temperature of the container 100 and its contents.

[0050] The venting cover could be injection molded or thermoformed. The venting cover could be made of a number of plastic materials as indicated above, for example polypropylene. The venting cover can be removably attached to the central engagement portion. An interference fit between the venting cover and the central engagement portion can provide a sealing engagement when the venting cover is in the closed position. If the cover or venting cover is made from a softer durometer material, the venting could be more easily closed off in the closed position. Suitable materials are impact copolymer polypropylene, polyolefin plasticomer, polyolefin elastomer and styrene butadiene rubber.

[0051] This invention has been described herein in detail to provide those skilled in the art with information relevant to apply the novel principles and to construct and use such specialized components as are required. However, it is to be understood that the invention can be carried out by different equipment, materials and devices, and that various modifications, both as to the equipment and operating procedures, can be accomplished without departing from the scope of the invention itself. Moreover, any combination of the above described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context. While the invention is described herein in connection with certain preferred embodiments, there is no intent to limit the present invention to those embodiments.

What is claimed is:
1. A container comprising: a cover having a first closure portion, said first closure portion being sealingly engageable with a second closure portion of a base so that when said first closure portion and said second closure portion are engaged with each other, said cover and said base define a substantially sealed storage area; an engagement portion; and a venting cover adjustingly attached to the engagement portion; and the base having a bottom; a peripheral sidewall extending from said bottom; an open top; and said second closure portion.
2. The container of claim 1 wherein the venting cover is rotationally attached to the cover.
3. The container of claim 1 wherein the venting cover is slidably attached to the cover.
4. The container of claim 1 wherein the venting cover is removably attached to the cover.
5. The container of claim 1 wherein the venting cover is circular.
6. The container of claim 1 wherein the venting cover is rectangular.
7. The container of claim 1 wherein the engagement portion is a central engagement portion.
8. The container of claim 1 wherein the engagement portion of one cover engages with the engagement portion of a cover of another container.
9. The container of claim 1 wherein the venting cover is of a lower durometer material than the material of the cover.
10. The container of claim 1 wherein the central engagement portion has a large hole and one or more smaller holes.
11. A container comprising:

   a cover having

   a first closure portion, said first closure portion being seallingly engageable with a second closure portion of a base so that when said first closure portion and said second closure portion are engaged with each other, said cover and said base define a substantially sealed storage area;

   a central engagement portion; and

   a circular venting cover rotationally attached to the engagement portion; and

   the base having

   a bottom;

   a peripheral sidewall extending from said bottom;

   an open top; and

   said second closure portion.
12. The container of claim 11 wherein the venting cover is removably attached to the cover.
13. The container of claim 11 wherein the central engagement portion of one cover engages with the central engagement portion of a cover of another container.
14. The container of claim 11 wherein the venting cover is of a lower durometer material than the material of the cover.
15. The container of claim 11 wherein the central engagement portion has a large hole and one or more smaller holes.