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(54) **AIR PURGING LID**

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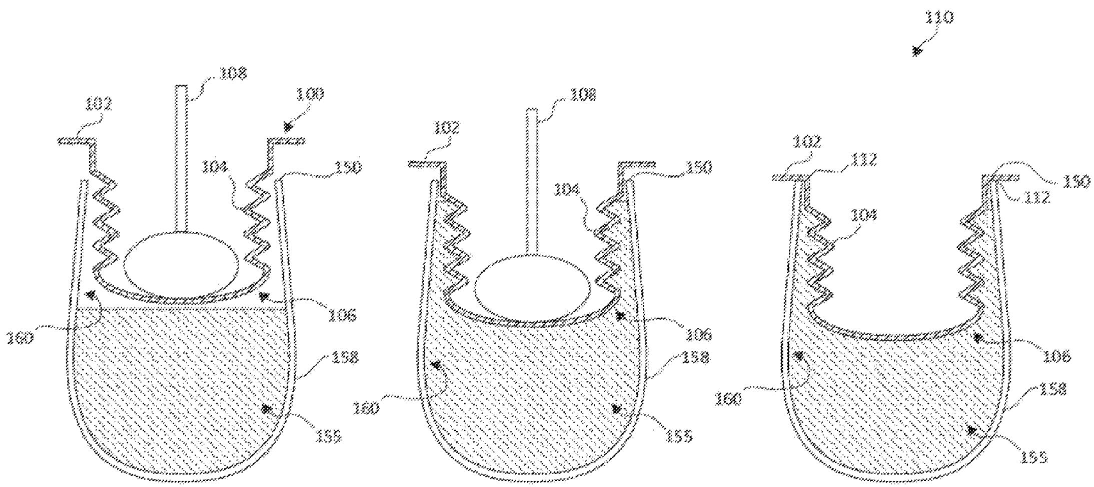
(57) **ABSTRACT**

A lid, having an opening area encased by one of the variety of shaped sidewalls with a flexible ribbed portion extending downwardly to one of the variety of shaped bases is provided for completely purging of atmospheric gases out of a container upon installation so as to eliminate head space by forming an airtight barrier with the container and the lid. A lid rim, having an inside portion connected to the top of the one of the variety of shaped with the flexible ribbed portion and an outside portion is provided for seating the lid to the container. The dome shaped base is connected to the bottom of the one of the variety of shaped side walls forming a circular base of the lid.



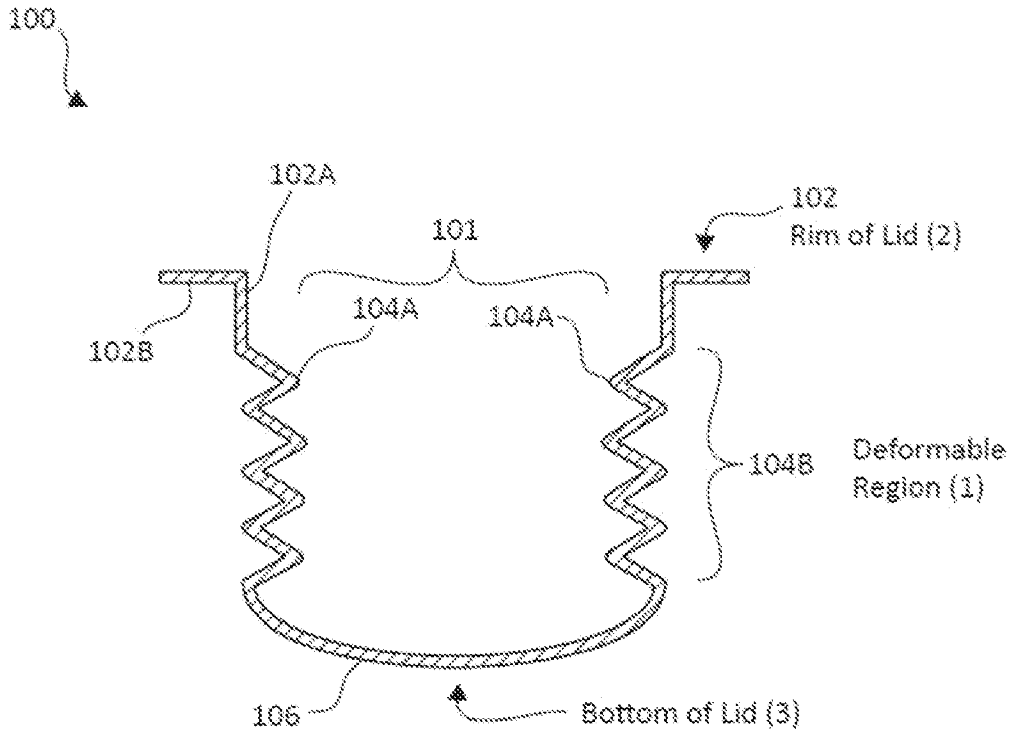

100
102A
101
102
Rim of Lid (2)
102B
104A
104A
104B
Deformable
Region (1)
106
Bottom of Lid (3)

FIG. 1A

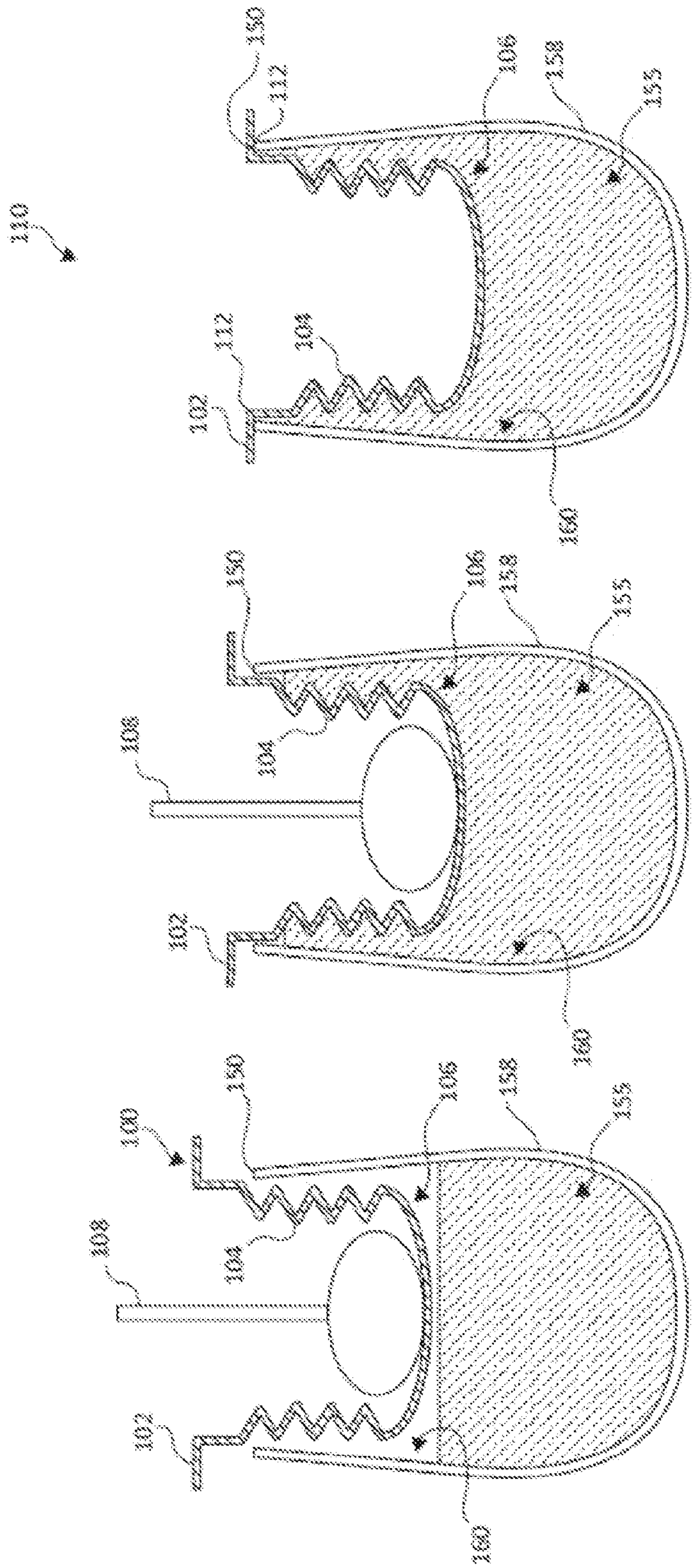
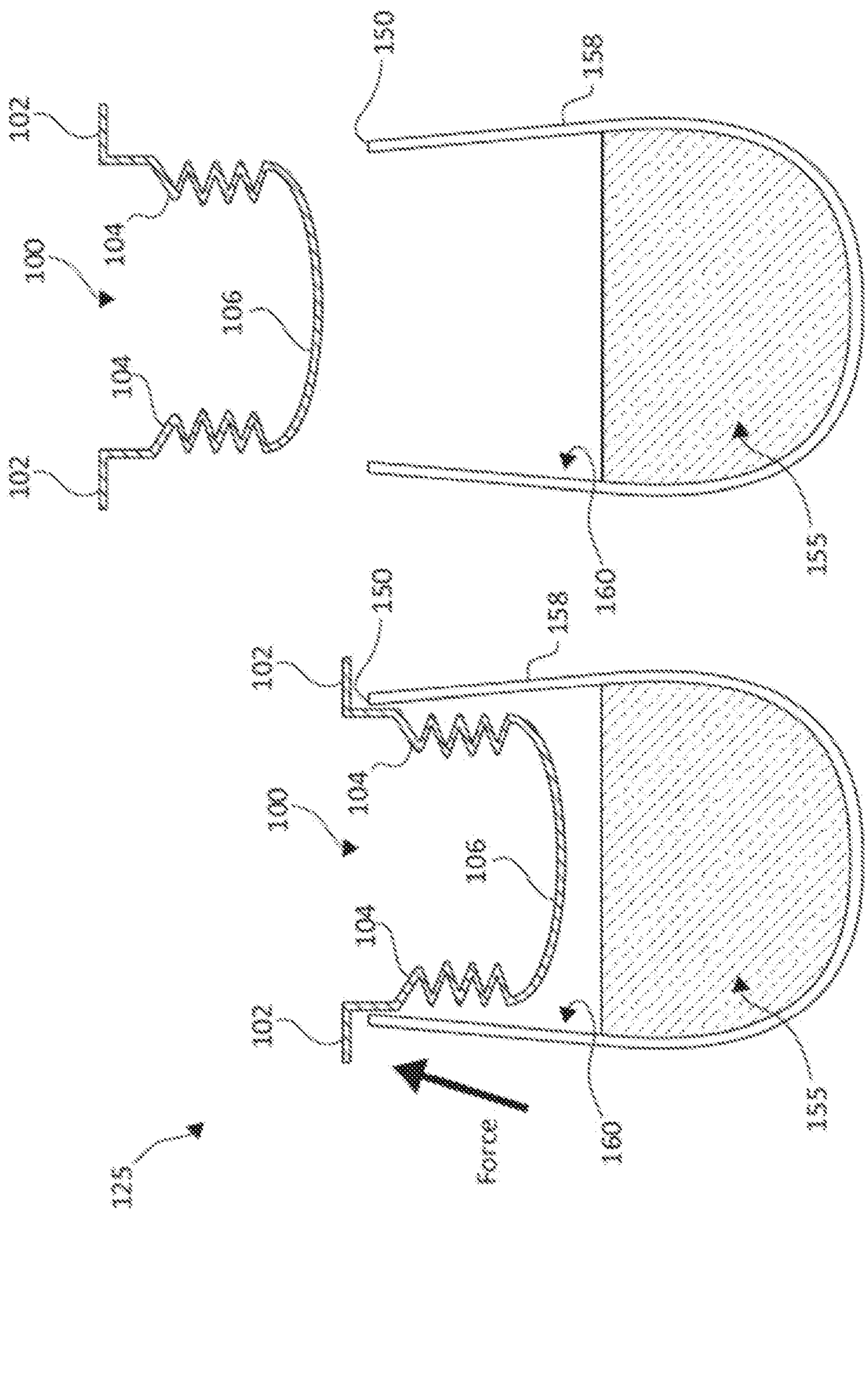


FIG. 1B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Force

FIG. 1C

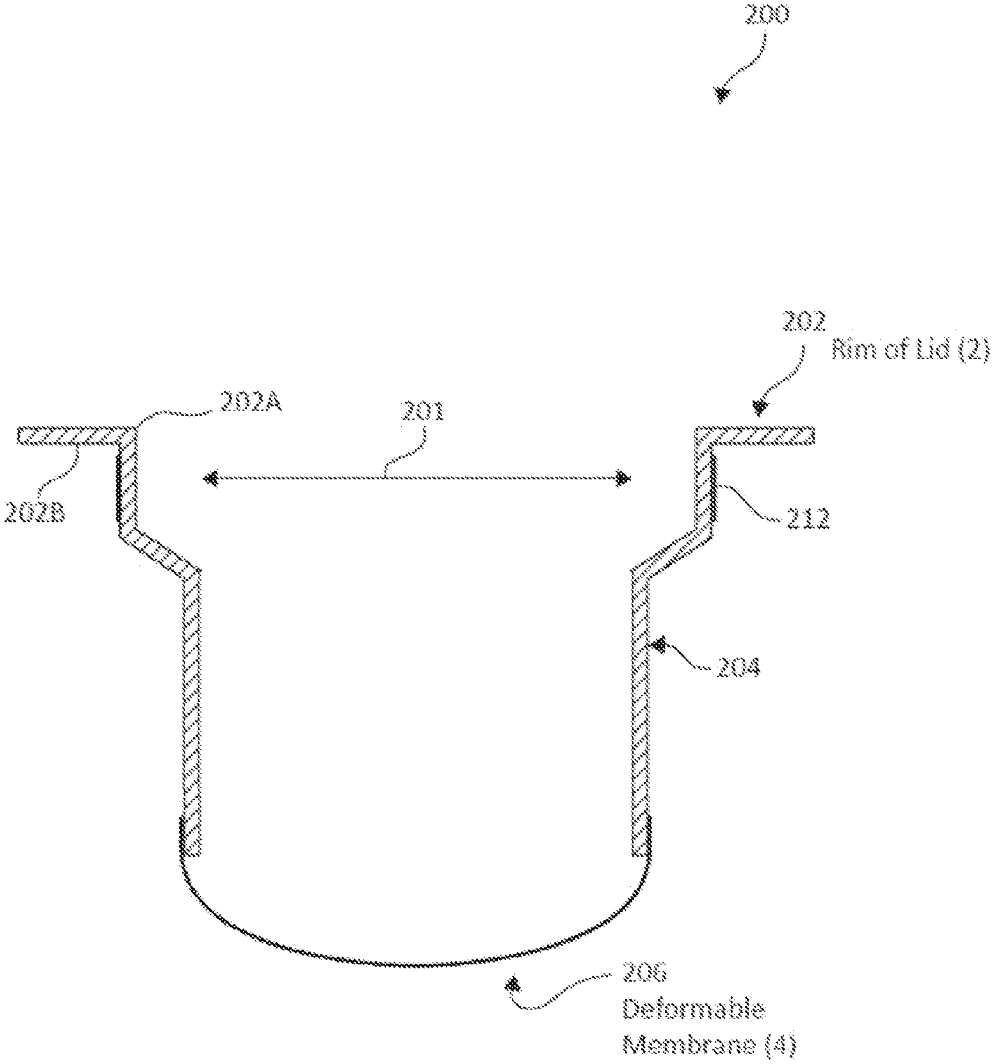
200
202
Rim of Lid (2)
202A
201
202B
212
204
206
Deformable
Membrane (4)

FIG. 2A

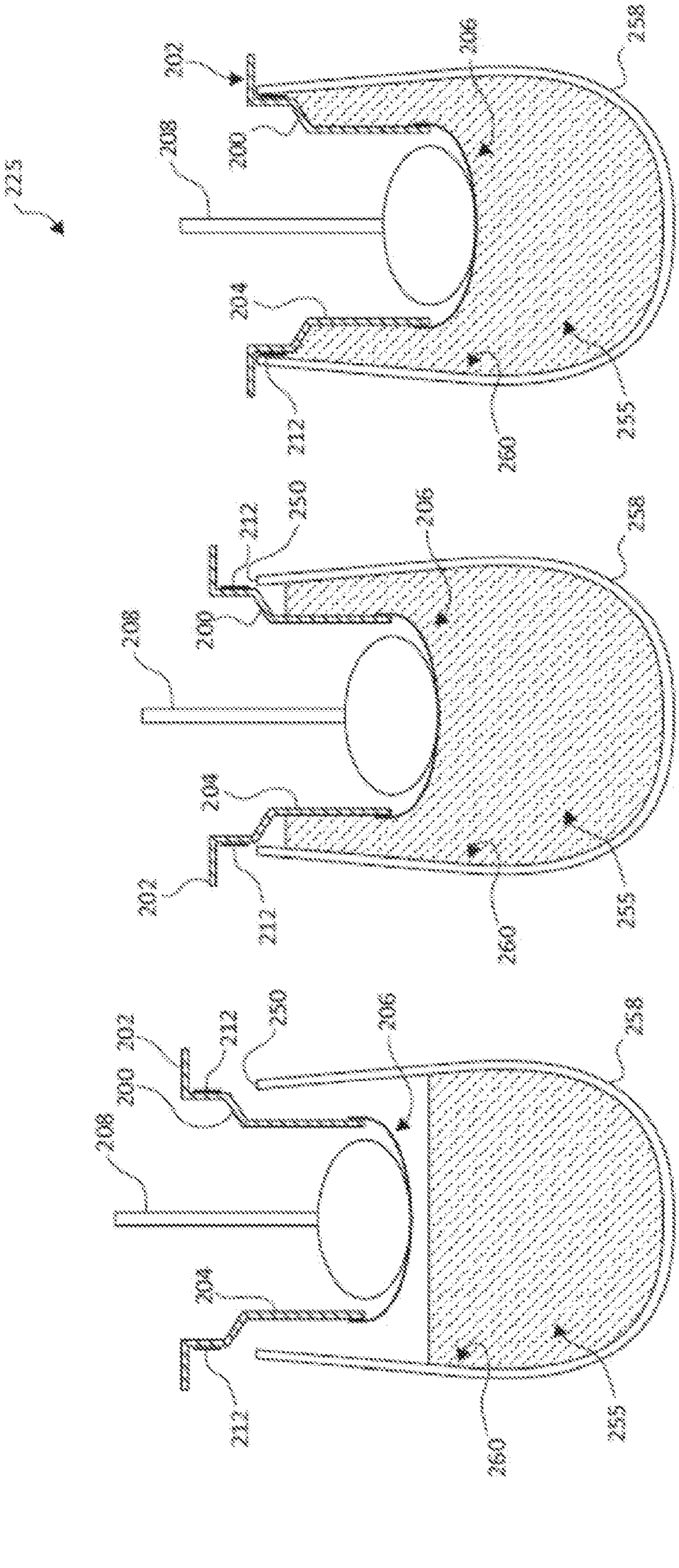

FIG. 2B

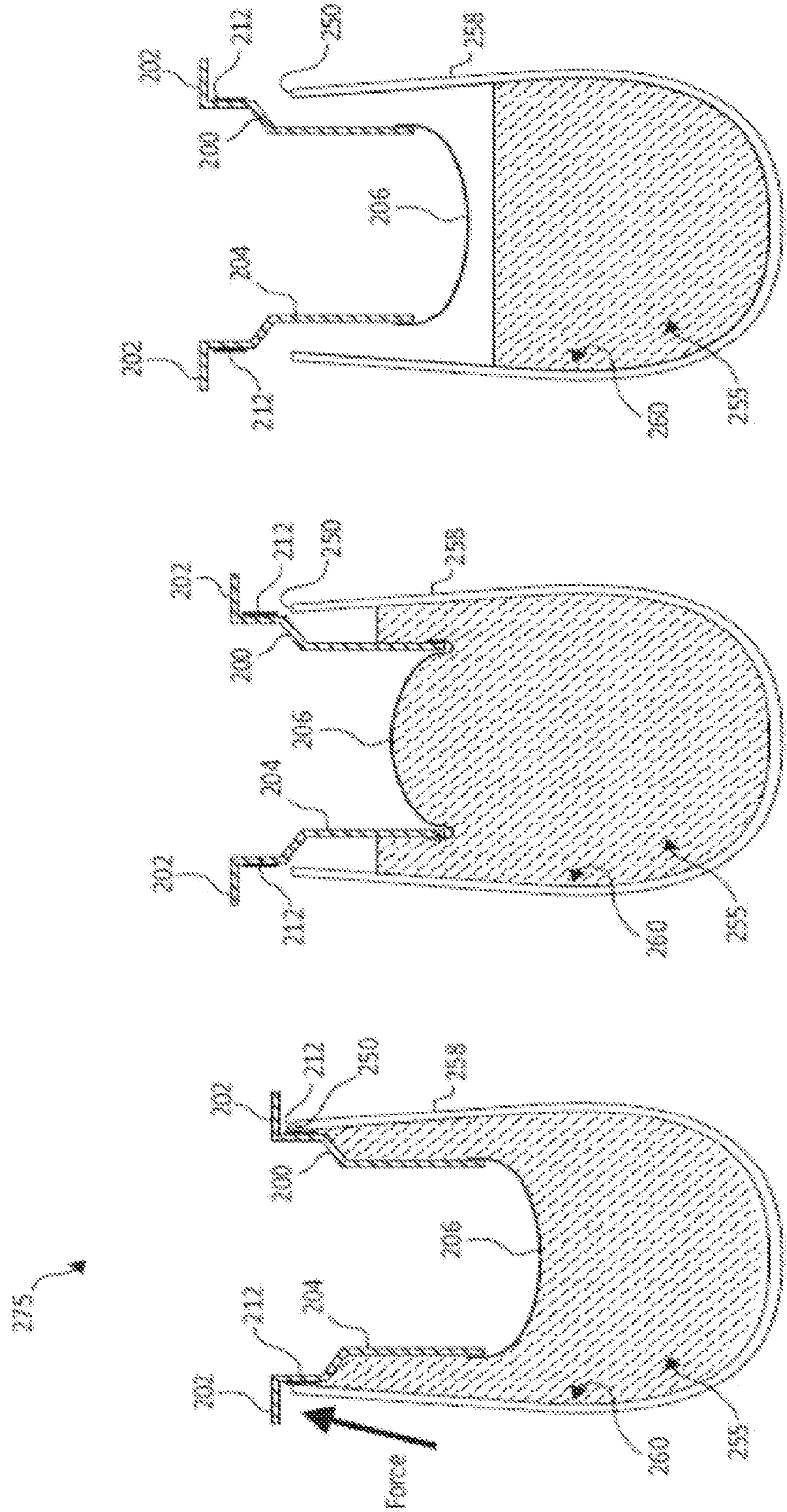

FIG. 2C

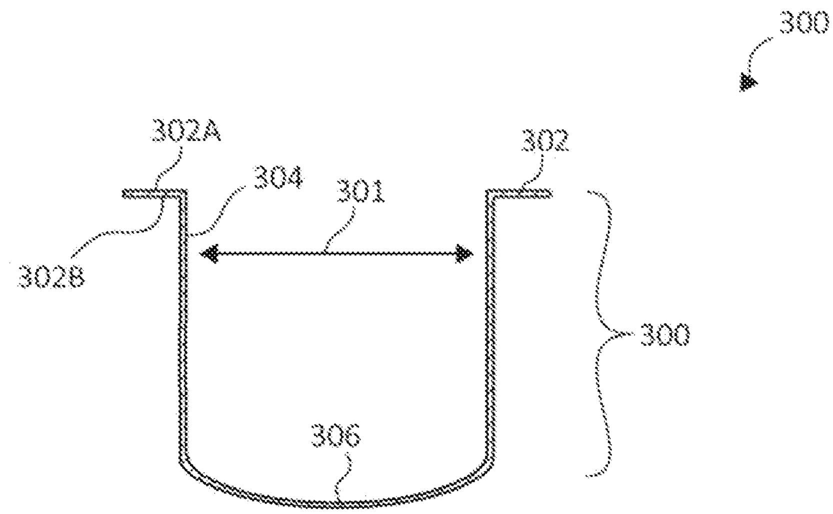

FIG. 3A

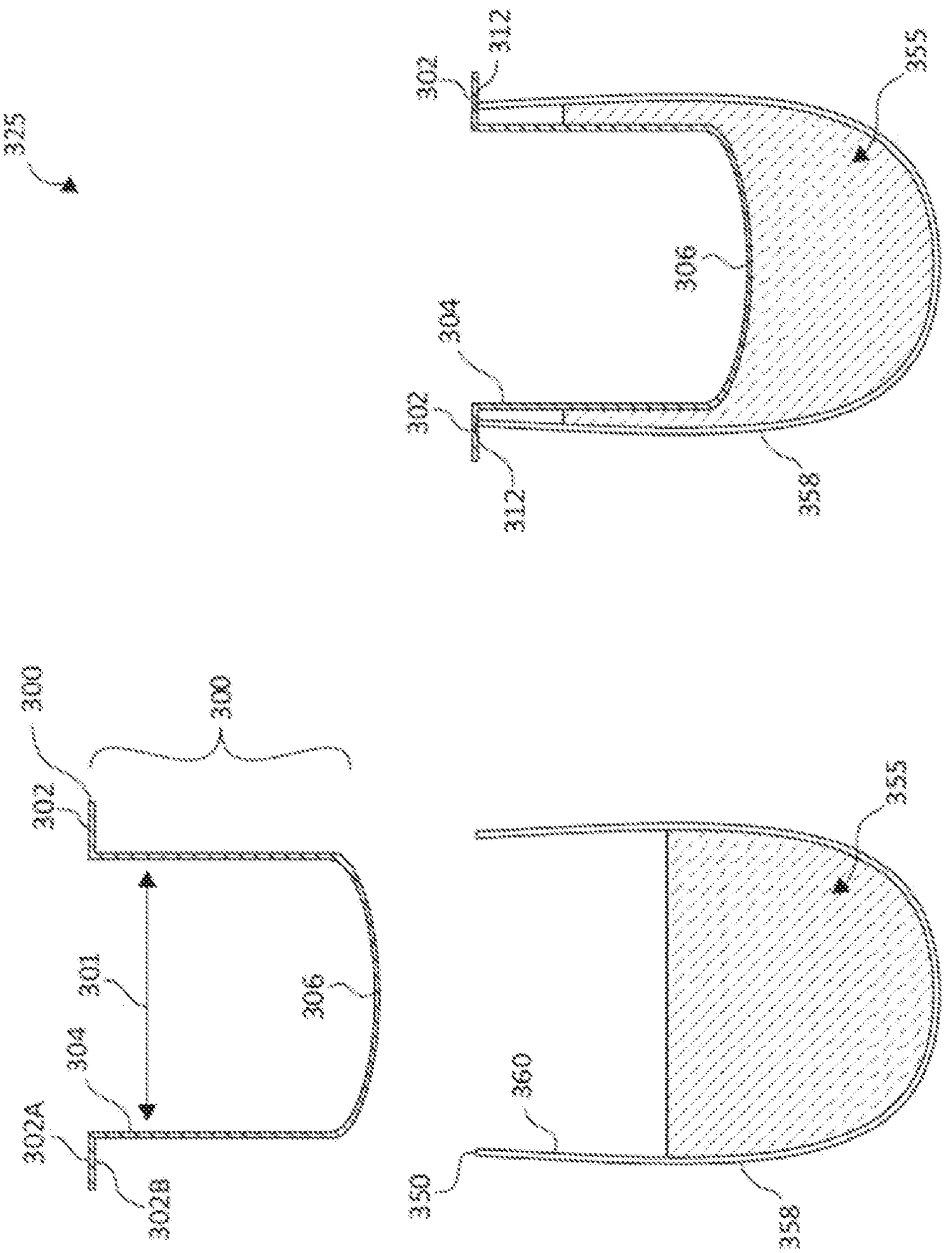
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FIG. 3B

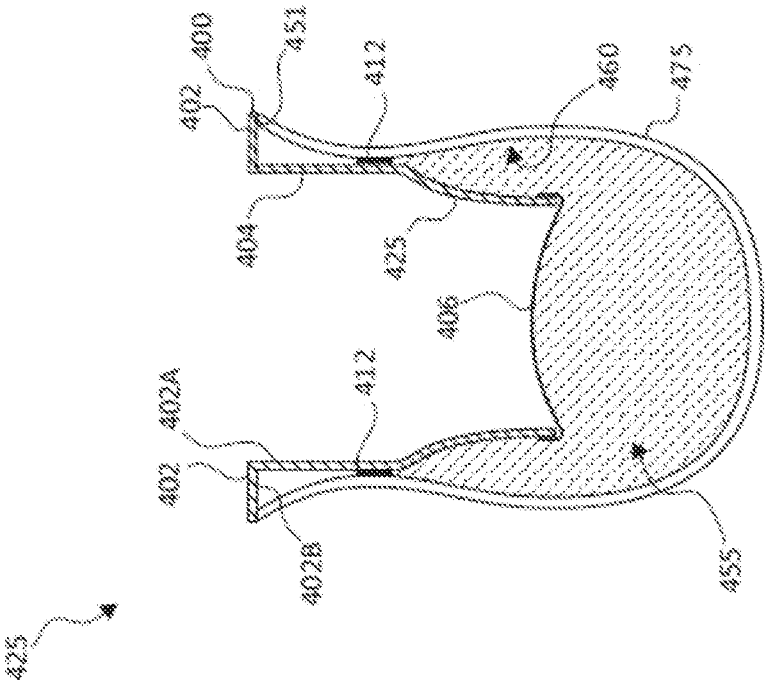
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FIG. 4B

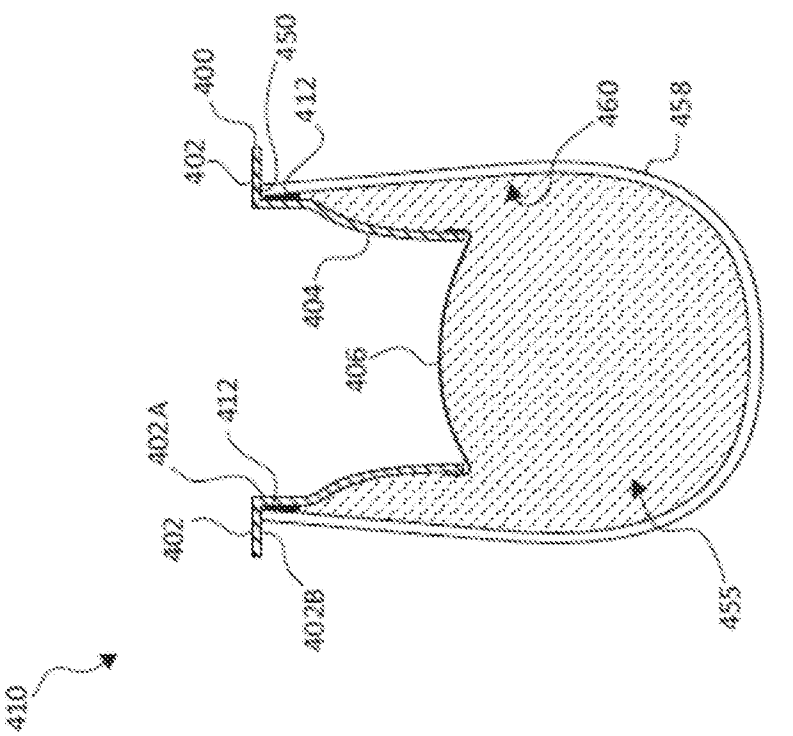
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FIG. 4A

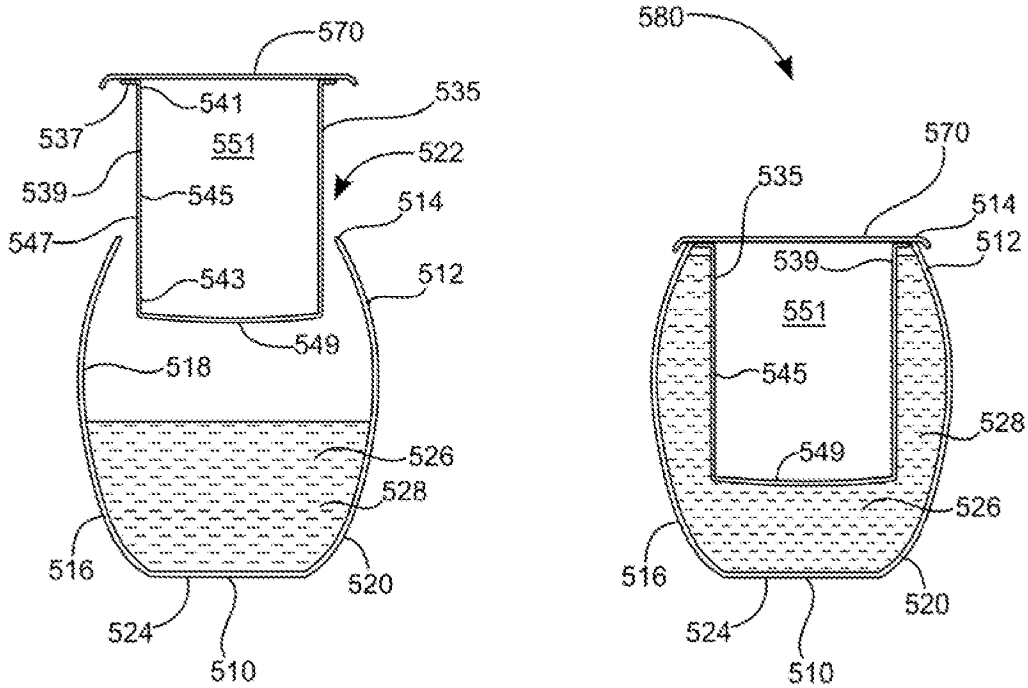
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FIG. 5A

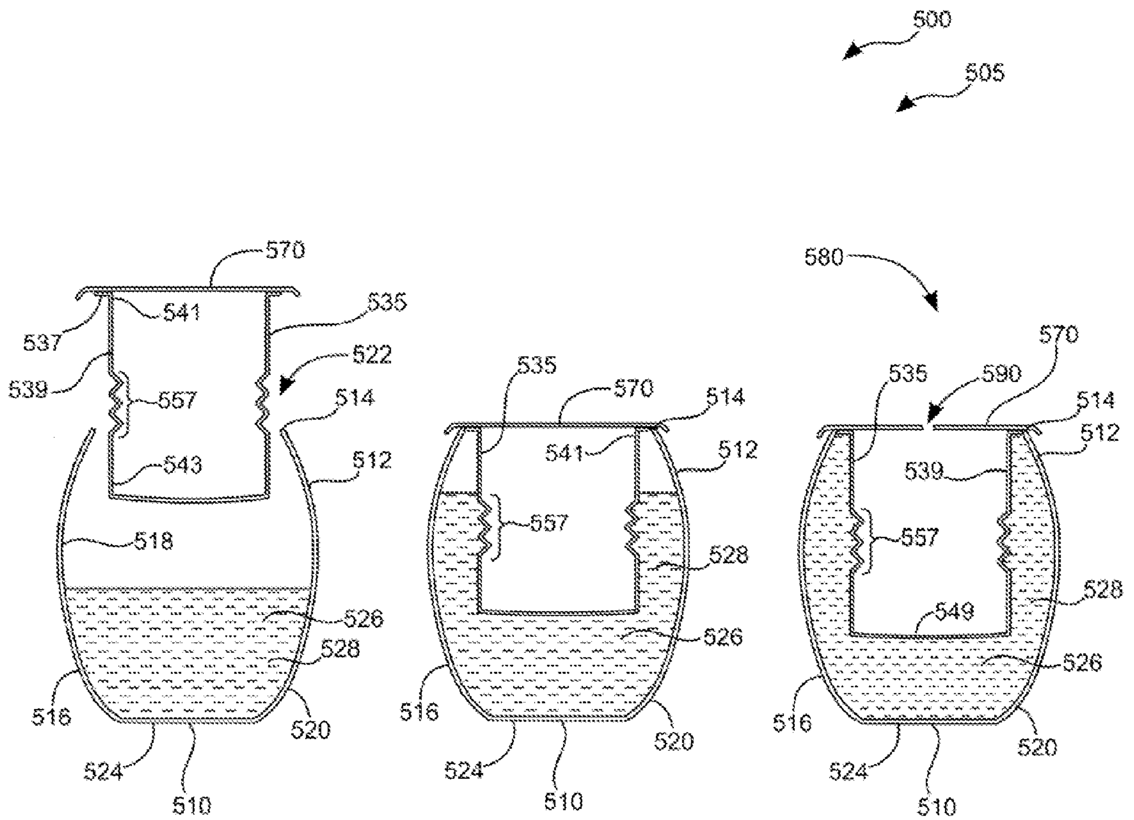
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FIG. 5B

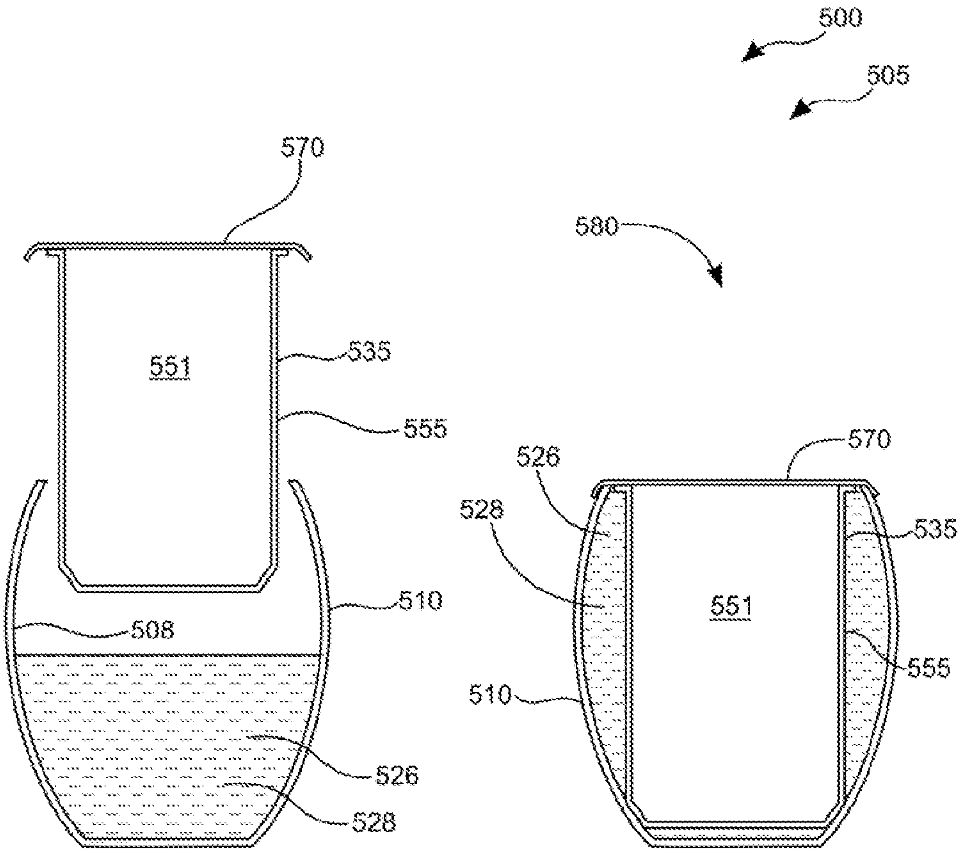
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FIG. 5C

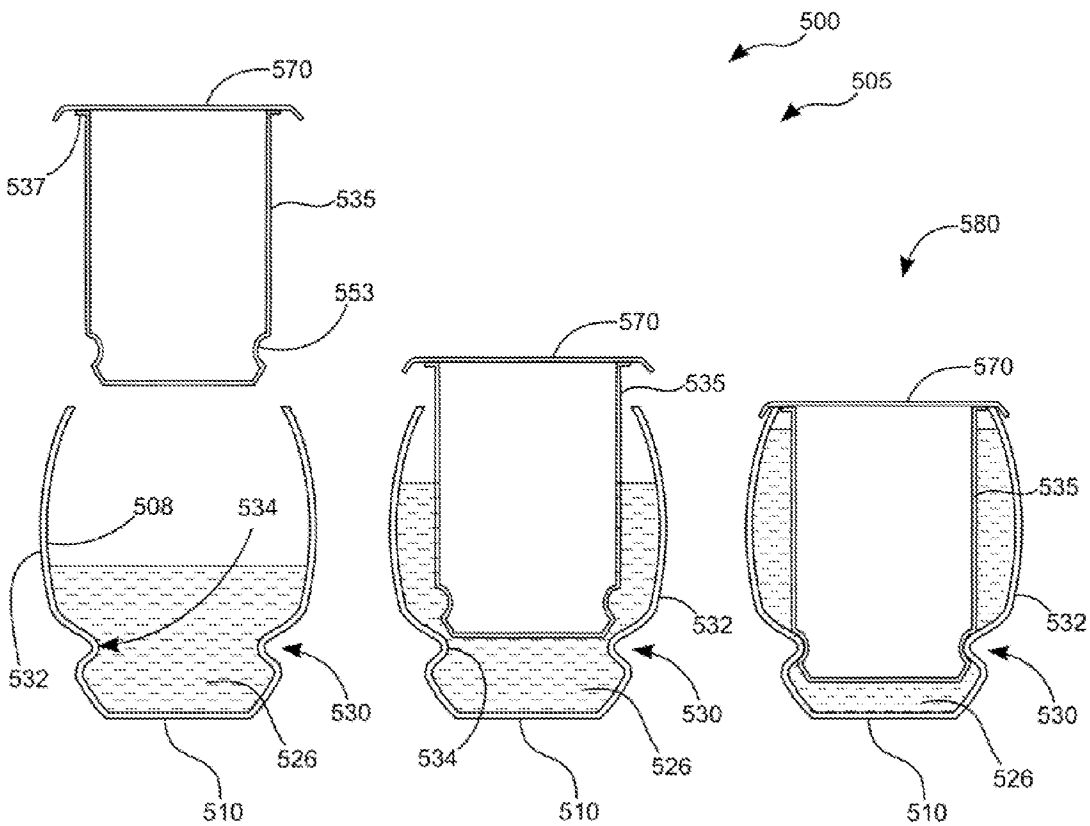
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FIG. 5D

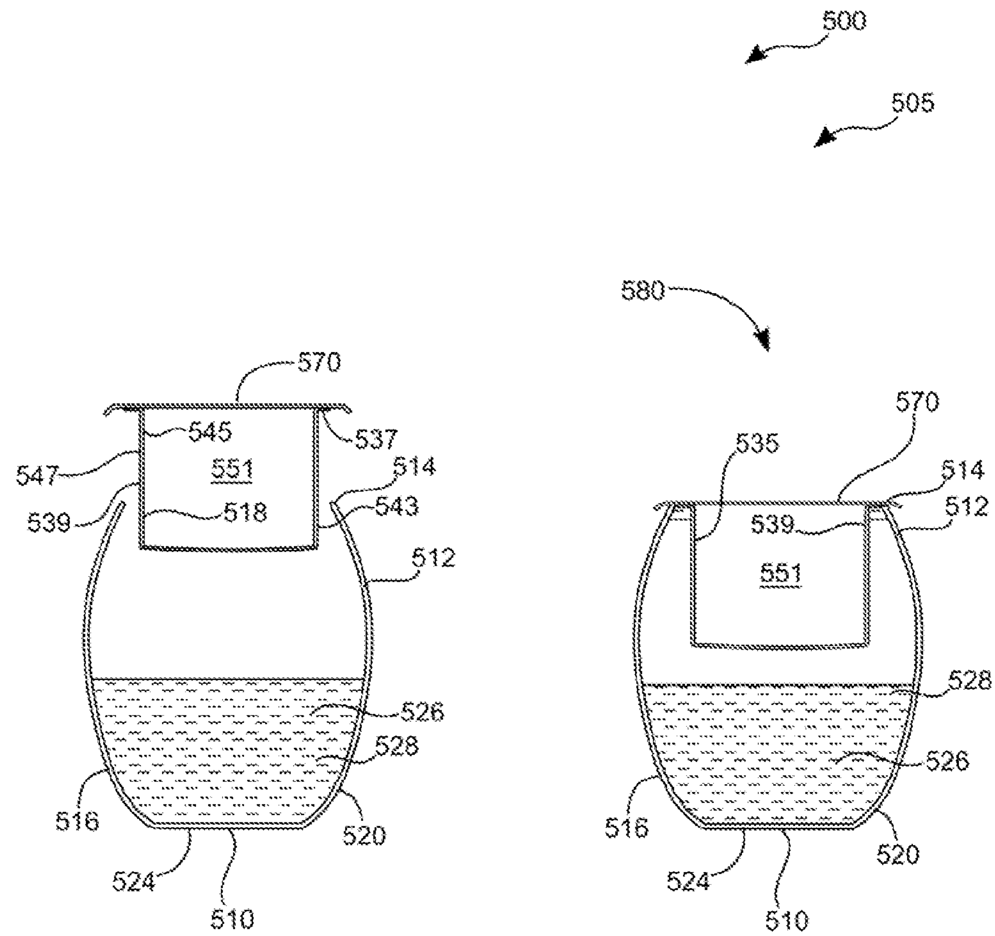
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FIG. 5E

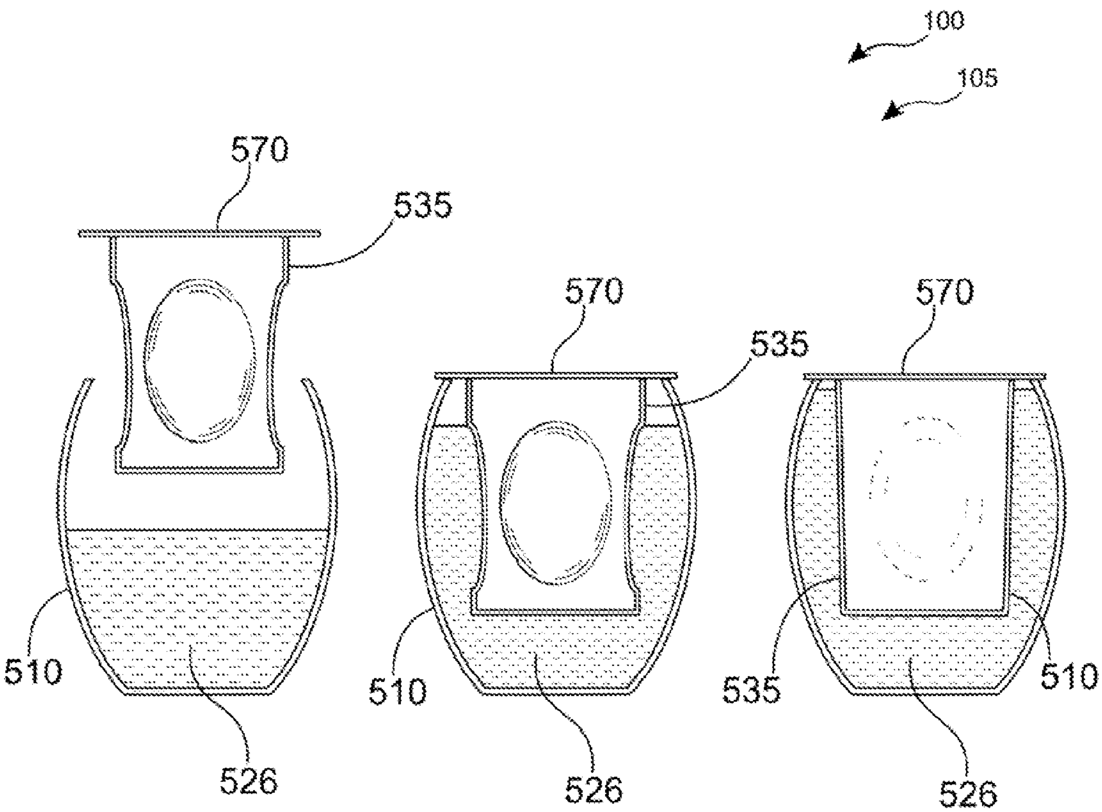

FIG. 6

AIR PURGING LID

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application is a Continuation-in-Part (CIP) related to and claims priority from pending non-provisional U.S. patent application Ser. No. 13/545,481 filed Jul. 10, 2012 which application is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates in general to a container lid, and more particularly to a lid device for purging air of out of a container holding a liquid.

DESCRIPTION OF THE RELATED ART

[0003] Many production and distribution companies are striving to develop more complex and sophisticated packaging mechanisms for securing consumable liquids, such as wine and other beverages. Many of these packaged beverages to be sold and distributed throughout the world need a greater shelf life. Certain beverages, such as wine, require the consumable liquid be protected from atmospheric gases to preserve the inherent qualities and characteristics of the wine. As such, a need exists for an air purging lid for protecting the liquid from atmospheric gases.

BRIEF SUMMARY OF THE INVENTION

[0004] Many liquids spoil over time when exposed to oxygen and/or other atmospheric gases, and therefore, must be stored in airtight storage containers that minimize the presence of oxygen and other atmospheric gases. However, a need exists for a solution where a lid forms an airtight seal with a suitable container and purges the atmospheric gases out of the container during the installation process, while simultaneously accommodating thermal expansion and contraction of stored fluid, allowing for a range of fill levels of the container, and immediately lowers the fluid level when the seal between the lid and the container is broken.

[0005] Accordingly, various device and method embodiments for a lid device are provided. In one embodiment, by way of example only, a lid, having an opening area encased by one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalk) with a flexible ribbed (e.g., accordion shaped) portion extending downwardly to a dome (convex) shaped base, is provided for completely purging air out of a container upon installation so as to eliminate head space by forming an airtight barrier with the container and the lid. A lid rim, having an inside portion connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) and an outside portion for sealing the lid to the container, is also provided. The one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with the flexible ribbed portion and dome shaped base are submerged within the stored fluid when installed on a container. The flexible ribbed portion of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) are elongated as necessary from its relaxed state during the installation of the lid to displace enough stored fluid such that the stored fluid rises along the inside walls of the container to purge out all of the atmospheric gases without the fluid flowing over the container's rim. With the lid sealed in place, the flexible ribbed portion of the cylindrical sidewall relaxes and returns partially to a point or original contraction, thereby causing a negative pressure at the surface of the liquid.

[0006] The flexible ribbed portion of the cylindrical sidewalls allows for the lid to elongate and contract while submerged within the stored fluid to accommodate the stored fluid's thermal contraction and expansion. Once the lid is airtight sealed to the container the atmospheric pressure maintains the force against the lid to hold it in its elongated configuration to maintain the fluid level against the rim of the lid with close to zero headspace. Once the airtight seal is broken the negative pressure within the container equalizes with the atmospheric pressure allowing the lid to contract along its flexible ribbed portion, which causes the fluid level to drop from the rim of the container to a predetermined full level.

[0007] In other embodiments, the air purging insert and liquid container system may comprise a container and lid assembly having a container with a shaped container sidewall having a top edge and a bottom portion, and an inner surface and an outer surface, a top opening area and a container bottom, an air purging insert having a top flange, an insert sidewall having a top side and a bottom side, an interior surface and an exterior surface, a shaped base, and a lid seal member.

[0008] The three basic components of the container and lid. assembly are the container, the air purging insert, and the lid seal member which are each separate objects structured and. arranged to cooperatively function together to purge a substantial amount (or all) of atmospheric gas from the container between the inner surface of the shaped container sidewall and surrounding the air purging insert, and between the lid seal member and the surface of a contained liquid, to minimize an oxidation process and lengthen a shelf-life of the liquid within the container. The shaped container is structured and designed to be generally circular with inwardly converging walls to the top opening, taking a slight globular shape, but may be cylindrical, square, triangular, cone, or any number of other shapes in other embodiments.

[0009] The shaped container, in these particular embodiments, preferably comprise a wide-mouth container for use with non-carbonated, and non off-gassing liquids (such as wine for example), and have a sidewall that curves inwardly toward the top opening area to facilitate reducing the surface area of the liquid exposed to entrapped atmospheric gases. The inner surface and the outer surface of the shaped container sidewall are formed integrally and substantially parallel planar to each other with slight variations at the base exterior. Preferably, the container is constructed of disposable material but may be constructed of non disposable material when a longer shelf life is desired. The container bottom integrally joins the bottom portion of the shaped container sidewall and is deposed substantially perpendicular and sized to hold about one glass of wine.

[0010] The air purging insert is concentrically placed within the container with the flange of the air purging insert flush with the top edge of the container so that the atmospheric gases are purged when the product is assembled and in a storage condition. The air purging insert is structured and designed in certain embodiments to contain dry comestibles such as packaged crackers and cheese while the container simultaneously contains the beverage so that peeling the lid seal member from the shaped container removes the air purging insert with the dry comestibles still sealed inside. The lid seal member can then be peeled away from the flange of the air purging insert to expose the dry comestibles providing a snack with a beverage in disposable packaging. In most embodiments, the exterior surface of the air purging insert does not contact the inner surface of the container, but in one embodiment, the air purging insert has beveled edges on the outer periphery of the shaped base for contacting the inwardly curving inner surface of the container near the bottom when the maximum insertion depth of the air purging insert is reached into the beverage. In this embodiment, the air purging insert is prevented from movement relative to the container during transport, and may have a larger inner volume for holding dry foods.

[0011] In another embodiment where the air purging insert contacts the inner surface of the shaped container, the container has a horizontally deposed indentation around the outer circumference causing an inward protrusion around the inner circumference of the shaped container sidewall. The inward protrusion, in this embodiment is designed so that a horizontal groove around the exterior circumference of the insert sidewall can be snapped onto the inward protrusion of the inner surface of the shaped sidewall to hold the air purging insert in place, and that it can be installed first prior to filling the container with a liquid so that the air purging insert doesn't become 'buoyant'.

[0012] The air purging insert may have a longitudinal cross-section profile-shape using one of multiple different configurations selected from a group consisting of a straight, circular, square, rectangular, triangular, V-shaped, L-shaped, polygram shaped, cone shaped, angled, curved, hexagonal, concave, convex, elliptical, and frustoconical shape. In a preferred embodiment, the insert sidewall of the air purging insert comprises a flexible ribbed portion. In this embodiment, the insert sidewall of the air purging insert is contracted when in a relaxed state and slightly extended while in a product storage condition. The insert sidewall of the air purging insert is structured and arranged to mechanically maintain a negative atmospheric pressure while being completely submerged within the beverage in a product storage condition. Extending the length of the air purging insert by straightening the ribbed portion to a tensioned state and then allowing it be become relaxed after sealing the lid seal member causes a negative atmospheric pressure to be maintained. It should be noted, as with the above embodiments, that other packaging methods such as using a vacuum packaging or bottling method, or first purging the container with an inert gas such as carbon dioxide or nitrogen so that the heavier inert gas is displaced as the liquid level rises while the air purging insert is installed, may also be used in conjunction to the mechanically maintained atmospheric negative pressure within the container.

[0013] The insert sidewall of the air purging insert displaces the amount of liquid needed to raise the fluid level within the container to purge the atmospheric gases out during installation by forming an airtight barrier within the container and lid assembly. The insert sidewall may be substantially or fully submersed in the contained liquid and there may be either a small amount of headspace or no headspace, depending on the embodiment. Either way, the gas to liquid contact surface is at least very small. A small amount of headspace may be allowed for uses where thermal expansion is a consideration and the air purging insert is non-deformable.

[0014] The top flange of the air purging insert has an upwardly facing flat surface that is integrally formed with the top side of the insert sidewall. The top flange upper surface may have an adhesive-like seal or may be constructed of heat sensitive material that readily bonds with other like materials when heat is applied. The bottom side of the insert sidewall is perpendicularly deposed and integral with the shaped base such that the air purging insert is able to prevent the beverage within the container from leaking into the inner volume of the air purging insert. The shaped base preferably also comprises a slight downwardly convex shape so that atmospheric gases arc unable to be trapped beneath the shaped base daring installation of the air purging insert and sealing of the lid seal member to the top edge of the container. The shaped base is preferably non-deformable and thermal expansion is accommodated either using the embodiment having the ribbed portion of insert sidewall, or by allowing a small amount of headspace for this purpose.

[0015] In one embodiment, the air purging insert has a shortened height and is not submersed in the beverage when installed, and the contained liquid is not displaced to remove the headspace. Only a volume of atmospheric gas equivalent to the volume of the air purging insert is purged. This embodiment preferably is used with beverages that are less readily oxidized from the allowed headspace.

[0016] The lid seal member is structured and arranged to be concentrically sealed first to the top flange of the air purging insert having at least one comestible located within the inner volume of the air purging insert, and secondly to the top edge of the container with the contained beverage. The lid seal member may comprise a foil sheet slightly larger in size and shape than the top edge of the container and provides a contact surface for adhering to the top edge of the container. The lid seal member may also be constructed of plastic or any other suitable material that is moisture resistant. In the embodiment having the flexible ribbed portion of the insert sidewall, the lid seal member may comprise a perforation for equalizing the pressure in the inner volume of the air purging insert with the exterior ambient pressure to allow the flexible ribbed portion to account for thermal expansion and assist in maintaining a negative pressure within the container.

[0017] In the embodiment having the flexible ribbed portion of the insert sidewall when the lid seal member is unsealed from the top edge of the container, the fluid level is immediately lowered to a predetermined level below the top edge of the container as the flexible ribbed portion contracts to a relaxed state, reducing displacement of the liquid and avoiding spillage. The air purging insert, in most embodiments, is designed to function together with the shaped container sidewall and lid seal member to reduce liquid surface area by displacing the amount of liquid needed to raise the level of the liquid in the container to eliminate headspace and purge the atmospheric gases via assembly of the container having a measured amount of liquid therein, the air purging insert, and the lid seat member in combination, and forms an airtight barrier. The surface area of the liquid that is exposed to the residual headspace is reduced to the annular area between the shaped container sidewall of the container and the insert sidewall of the air purging insert. The surface area is reduced by an amount equal to the cross sectional area of the air purging insert in the region of the level of the liquid. Both the head space (residual volume) and liquid surface area exposed to the head space are reduced.

[0018] A method of manufacturing the air purging insert and liquid container system is also disclosed herein and may comprise molding a container having a shaped container sidewall extending downwardly and outwardly to about a midpoint of the container height and then curving downwardly and inwardly to the shaped base, providing an opening in the container located at the top edge of the container sidewall which forms the perimeter for the opening, providing a flat container bottom formed integrally with the container sidewall molding an air purging insert having a top flange formed integrally with a top side of the insert sidewall that extends downwardly to the bottom side of the insert sidewall, providing a shaped base integrally formed with the bottom side of the insert sidewall and structured to prevent entrapment of an atmospheric gas from beneath the shaped base, and providing a lid seal member having a slightly larger size and shape than the top edge of the shaped container sidewall having a concentrically located perforation for equalizing pressure within the inner volume of the insert sidewall and the exterior atmospheric pressure.

[0019] The method of manufacturing may further provide the steps of filling the container with a non-carbonated liquid beverage to a predetermined level, placing a packaged comestible into the inner volume of the air purging insert, concentrically sealing the top flange of the air purging insert to the lid seal member, placing the container having the non-carbonated liquid beverage into an enclosure for sealing, inserting the air purging insert with the attached lid seal member into the liquid beverage until the lid seal member contacts the top edge of the container thereby displacing the liquid beverage upwardly between the inner surface of the container and the exterior surface of the air purging insert to substantially eliminate headspace and thereby purging the atmospheric gas from within the container, and concentrically sealing the outer margin of the lid seal member to the upper edge of the container.

[0020] In addition to the foregoing exemplary method embodiment, other exemplary system and apparatus embodiments are provided and supply related advantages. The foregoing summary has been provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter. The claimed subject matter is not limited to implementations that solve any or all disadvantages noted in the background.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] In order that the advantages of the invention will be readily understood, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments that are illustrated in the appended drawings. Understanding that these drawings depict embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through, the use of the accompanying drawings, in which:

[0022] FIG. **1**A demonstrates a cross-section of an embodiment of the present invention.

[0023] FIG. **1**B demonstrates cross-sections of an embodiment of the present invention with a depressor acting on a portion of the embodiment.

[0024] FIG. **1**C demonstrates cross-sections of an embodiment of the present invention in native and exploded form.

[0025] FIG. **2**A demonstrates a cross-section of an embodiment of the present invention.

[0026] FIG. **2**B demonstrates cross-sections of an embodiment of the present invention with a depressor acting on a portion of the embodiment.

[0027] FIG. **2**C demonstrates cross-sections of an embodiment of the present invention under differing

[0028] stress situations.

[0029] FIG. **3**A demonstrates a cross-section of an embodiment of the present invention with a depressor acting on a portion of the embodiment.

[0030] FIG. **3**B demonstrates cross-sections of an embodiment of the present invention in native and exploded form.

[0031] FIG. **4**A demonstrates a cross-section of an embodiment of the present invention.

[0032] FIG. **4**B demonstrates a cross-section of an embodiment of the present invention.

[0033] FIG. **5**A demonstrates cross-sections of an embodiment of the present invention in native and exploded form.

[0034] FIG. **5**B demonstrates cross-sections of an embodiment of the present invention in native, stressed/expanded and exploded form.

[0035] FIG. **5**C demonstrates cross-sections of an embodiment of the present invention in native and exploded form.

[0036] FIG. **5**D demonstrates cross-sections of an embodiment of the present invention in native and exploded forms.

[0037] FIG. **5**E demonstrates cross-sections of an embodiment of the present invention in native and exploded form.

[0038] FIG. **6** demonstrates cross-sections of an embodiment of the present invention in native and exploded form.

[0039] The various embodiments of the present invention will hereinafter be described in conjunction with the appended drawings, wherein like designations denote like elements.

DETAILED DESCRIPTION

[0040] Many liquids spoil over time when exposed to oxygen and/or other atmospheric gases, and therefore, must be stored in airtight storage containers that minimize the presence of oxygen and other atmospheric gases. For example, during the aging of wine, if a wine is not protected from both microbial spoilage and oxygen at all times it is likely to spoil. Protecting wine usually involves maintaining proper sulfur dioxide (SO_2) levels and keeping containers full. Typically, containers for fluids, that are to be protected from atmospheric gases, maintain a space between the top surface of a stored fluid and the underside of the lid of the container (e.g., headspace) at a reduced pressure with respect to the container's ambient environment. This air space (e.g., headspace) must be maintained to accommodate thermal expansion of the fluid to prevent the lid from being blown off of the container, or to prevent the container from rupturing.

[0041] To minimize the amount of atmospheric gases trapped within the container during the fluid's bottling/packaging process, a lid is typically installed during a gas evacuation and/or displacement process. This is typically achieved by dispensing an inert gas into the space between the fluid and the lid as the lid is installed and/or by performing the lid installation operation within a vacuum chamber. For example, the headspaces in wine is purged by use of an inert gas to effectively remove the oxygen to greatly increases the amount of protection. However, it is nearly impossible to remove all atmospheric gases from the space maintained between the fluid and the container lid. Typically, tall slender containers are preferred to short wider containers because fluids stored in taller slender containers have less exposed surface area to the entrapped atmospheric gases. In the case of wine, the oxygen uptake depends on the surface area exposed to oxygen and the exposure time. The rate of oxidation increases as the exposed surface area increases. As the rate of oxidation increases the shelf life of the wine decreases before the wine spoils.

[0042] Often times, the containers themselves are used for consuming the beverages. Since the space between the lid and the fluid is minimized, to reduce the amount of entrapped atmospheric gases, the container is typically filled such that the fluid level is in close proximity to the rim of the container. However, this increases the likelihood that the beverage will spill when opened by a consumer. In addition, in the case where wine is served in a single use drinking container, having the fluid level near the rim of the container, once the lid is removed, makes it difficult for the user to swirl the wine in the glass so as to allow the wine to breathe and to increase the surface area of the wine to smell the wine's various aromas. In these cases it is desirable to have a greater distance between the top surface of the fluid and the rim of the container.

[0043] Because lids are required to maintain a space between the fluid and the lid to accommodate thermal expansion, and because the lid installation process is typically performed in a vacuum chamber, a pressure differential exists between the inside of the container and its external environment. This pressure differential may pull atmospheric gases into the container over time. The oxygen uptake by a fluid depends on the surface area of the fluid exposed to the oxygen and the exposure time. As a result, tall slender containers are preferred for these fluids as opposed to short, wide containers, since taller, more slender containers result in the fluid having less exposed surface area to the space above. In order to accommodate the pressure differential of the lid and containers, both the container and lid walls must be thick enough to withstand the resultant pressures to prevent failure. This may drive up the weight and material usage, and thus increase the costs of the container and lid. p In contrast, and to address these inefficiencies, the illustrated embodiments, as will be described below, provide a solution that purges all air out of the container upon installation while leaving little to no headspace above the stored fluid. In one embodiment, an airtight barrier is formed with the container and the lid. The lid has an opening area (e.g., wide or narrow) that encased by one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) extending downwardly to one of the variety of shaped bases. The base may be a flexible membrane and/or an elastic membrane base. Alternately, the base may also have a rigid convex shape that is not deformable under various amounts of negative pressure.

[0044] It should be noted that throughout the description provided herein, the sidewalls may also be cone shapes, rectangular shaped, hexagonal, concave, convex, spiral, triangular, elliptical, and/or a variety of shapes and sizes based upon the variety of types of containers. For example, in one embodiment, the sidewalls may take on the form of a cone shape and may have either a flexible ribbed portion or the sidewalls may be completely rigid, for being adapted and used in a particular container for eliminating the headspace of the fluid within that particular type of container. In another embodiment, the sidewalls may be cylindrically shaped sidewalls having a flexible ribbed portion (e.g., the accordion shaped) and/or the cylindrically shaped sidewalls may be completely rigid or semi-rigid.

[0045] A lid rim is provided and has an inside portion connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) and an outside portion for sealing the lid to the container. A flexible membrane base, or a base made of another material having one of a variety of shapes and sizes, may be connected to the bottom of one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) and forms a circular base of the lid. In some embodiments, the flexible membrane base accommodates thermal expansion and contraction. The lid may completely purge air out of a container upon installation in some embodiments, so as to eliminate headspace by forming an airtight barrier with the container and the lid, but in other embodiments, may leave a small amount of headspace to allow for thermal expansion. The lid may change shape to accommodate thermal expansion and contraction of the stored fluid. Thus, the lid is uniquely designed for achieving an airtight seal with a suitable container and purges ail atmospheric gases out of the container when installed, while accommodating thermal expansion/contraction of the stored fluid. When installed on rims of circular shape, lid may include an extended beyond the lid concentric perimeter to allow for easier grip/handling. When the lid is installed on a rim of other shapes, i.e. a square/rectangular shape, triangular shape, etc., the lid may include tabs associated with each straight edge of rim to allow for easier grip and removal of lid in conjunction with this invention.

[0046] Moreover, the lid may be designed to function with a variety of container shapes and sizes for use with different types of liquids or semi-solid foods. The lid can be designed to accommodate any predetermined fluid level within a given container and still purge all of the atmospheric gases out of the container when installed without the increasing the risk of entrapping atmospheric gases. A configuration of the lid with one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with a flexible ribbed portion can accommodate multiple fluid levels within a container with the aid of an installation tool which is used to elongate the lid by a variable amount such that the depth in which the lid is submerged into the fluid displaces the necessary amount of fluid needed to purge the atmospheric gases out of the container. The lid purges all atmospheric gases out of the container, which are not dissolved in the fluid, when installed. The lid purges all atmospheric gases out of the container whether the operation is performed within a vacuum or if an inert gas is dispensed to displace the atmospheric gases. The lid can accommodate both thermal expansion and contraction of the stored fluid under a wide range of temperatures.

[0047] When the seal between the lid and the container is broken or cracked, the pressure is equalized between the inside of the container and its ambient environment allowing the ribbed portion of the cylindrical walls to return to their relaxed, retracted state or allowing the one of the variety of shaped bases of the lid to deform, both of which allow the fluid level along the sides of the container to immediately drop, and thus reduces the chance of the fluid spilling on the consumer, The use of the lid results in a minimal pressure differential between the inside of the container and the lid's external environment. Therefore, volatile gases, dissolved in the fluid, are less susceptible to being pulled out of solution, and the rate of diffusion of atmospheric gases into the container is minimized.

[0048] In one embodiment, a lid, having an opening area encased by one of a variety of shaped sidewalls (e.g., cylindrically shaped sidewalls) with a flexible ribbed portion extending downwardly to one of a variety of shaped bases, is provided for completely purging of atmospheric gases out of a container upon installation, so as to eliminate head space by forming an airtight barrier with the container and the lid. The lid rim, having an inside portion is connected to the top of one of the variety of shaped sidewalls (e.g., cylindrically shaped sidewalls) with the flexible ribbed portion and an outside portion for sealing the lid to the container. The one of the variety of shaped bases is connected to the bottom of one of the variety of shaped sidewalls (e.g., cylindrically shaped sidewalls), having the flexible ribbed portion, and forms a circular base of the lid for facilitating the purging of the atmospheric gases out of the container.

[0049] The one of the variety of shaped sidewalls (e.g., cylindrically shaped sidewalls), having the flexible ribbed portion, is provided for accommodating thermal expansion and for manipulating the lid from a relaxed state to an elongated state while being submerged into a liquid to displace an amount of fluid needed to raise the fluid level such that the lid purges all of the atmospheric gases out of the container. It should be noted that the variety of shaped sidewalls may be comprised and designed to have a variety of structural types, including but not limited to, rigid, semi-rigid, flexible, u-shape, c-shape, accordion shape, V-shape, concave, convex, spiral shaped (e.g., spring like structure), and/or other type of structure types according to the container type. For example, in one embodiment, by way of example only, the sidewalls may be completely rigid, semi-rigid, or flexible and cone shaped, or the sidewall may be cylindrically shaped having a flexible ribbed portion that comprises all or part of the cylindrically shaped sidewalls. With the flexible ribbed sidewalls, the lid may accommodate complete and/or partial purging of the atmospheric gases out of a container upon installation so as to either eliminate or minimize headspace by forming an airtight barrier with the container and the lid or provide for a small void that is intentionally left between the fluid's top surface and the lid rim.

[0050] In the scenario where the lid leaves the small void created by only the partial purging of the atmospheric gases, the lid may be designed such that when it is fully elongated it does not displace enough fluid such that the fluid reaches the lid rim. Therefore the void is maintained between the fluid and the lid rim to effectively ensure no fluid spills out of the container when the lid seal is broken and to allow for thermal expansion. This void can be free of atmospheric gases if the lid installation operation is performed in a vacuum and/or with the aid of an inert gas to displace the gases. This void would be over a minimized surface area of the fluid. Once the seal is broken the elongated flexible ribbed walls contract to lower the fluid level further away from the container's rim.

[0051] Also, as described below, the variety of shaped bases may have a variety of material types. For example, in one embodiment, by way of example only, the base may be comprised of a flexible membrane having the ability to adjust to a variety of shapes and sizes for accommodating thermal expansion.

[0052] In one embodiment, a lid, having an opening area encased by one of a variety of shaped sidewalls with a flexible ribbed portion extending downwardly to a substantially dome shaped base, is provided for completely purging atmospheric gases out of a container upon installation so as to eliminate head space by forming an airtight barrier with the container and the lid. A lid rim, having an inside portion connected to the top of the one of the variety of shaped sidewalls with the flexible ribbed portion and an outside portion for sealing the lid to the container, is also provided. The substantially dome shaped base is connected to the bottom of the one of the variety of shaped sidewalls, with the flexible ribbed portion forming a circular base of the lid, for facilitating the purging of the atmospheric gases out of the container. The one of the variety of shaped sidewalls, having, the flexible ribbed portion for manipulating the lid from a relaxed state to an elongated state while being submerged into a liquid to displace an amount of fluid needed to raise the fluid level such that the lid purges all of the atmospheric gases out of the container, is also provided for accommodating thermal expansion.

[0053] In one embodiment, a lid, having an opening area encased by one of a variety of shaped sidewalls extending downwardly to a substantially dome shaped base, is provided for reducing a surface area of a fluid exposed to entrapped gas within a container upon installation so as to minimize head space. A lid rim, having an inside portion connected to the top of the one of the variety of shaped sidewalls and an outside portion, is also provided for sealing the lid to the container. The substantially dome shaped base is connected to the bottom of the one of the variety of shaped sidewalls, for forming a circular base of the lid.

[0054] In one embodiment, if any gases are entrapped within the container, the entrapped gases may be contained between a region of the lid and container such that the gases only come in contact with a very small surface area of the fluid. The lid accommodates thermal expansion and contraction of the fluid to prevent the container from rupturing.

[0055] As mentioned previously, in the case of wine, the oxygen uptake depends on the surface area exposed to oxygen and the exposure time. The rate of oxidation increases as the exposed surface area increases. As the rate of oxidation increases, the shelf life of the wine decreases before it spoils. Thus, the lid of the present invention allows for extending the shelf life of the wine by purging the air out of the container at the time of installations.

[0056] Turning now to FIG. **1**A, an exemplary air purging lid device **100** having one of a variety of shaped bases (e.g., a domed shaped base.) and one of a variety of shaped sidewalls having an inner and an. outer portion (e.g., cylindrical shaped sidewalls) with a flexible ribbed portion for extending and contracting the sidewalls in the fluid for accommodating one of thermal expansion and atmospheric pressure while being partially or completely submerged in the fluid. In FIG. **1**A, a lid **100** has an opening area **101** that is encased by one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A with a flexible ribbed portion **104**B extending downwardly to one of the variety of shaped bases (e.g., a domed shaped base) **106**. (It should be noted that in FIG. **1**A, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A and the flexible ribbed portion **104**B are represented respectively with **104**A and **104**B for purposes of illustrating the flexible ribbed portion **104**B of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A. However, FIGS. **1**B-C are simply labeled as **104** to include the flexible ribbed portion **104**B as part of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A. In other words, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A of FIG. **1**A may include the flexible ribbed portion **104**B in both FIGS. **1**B-C, but is only listed generally as **104**.)

[0057] The lid **100** displaces a fluid by forcing the fluid up along the outside of the sidewalls **104**A and a container up to a lid rim **102** thereby eliminating the headspace. The lid rim **102** is provided and has an inside portion **102**A connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A and an outside portion **102**B for sealing the lid to the container. (It should be noted that the lid rim **102** may be one continuous piece with the one of the variety of shaped, sidewalls (e.g., cylindrical shaped sidewalls) **104**A or may be detachable from the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A based upon users preference and need to fit, attach, and seal/bond to the required beverage container).

[0058] The lid rim **102**, as well as other parts of the lid **100**, may be flexible and/or pliable for forming and securing the lid to the container. The lid rim **102** may be L-shaped, straight, curved, angled, and/or formed to a variety of geometric shapes or positions for being secured to a variety of container shapes and sizes. The lid rim **102** may be shaped and constructed for "snapping" the lid onto the container for securing the lid **100** to the container. Moreover, the lid rim **102** may include one of a variety of adhesive type materials, which allows for the lid **100** to be sealed and/or secured to a container. The adhesive type materials may include, but are not limited to, drying, pressure, contact, hot, heat seal, reactive/non-reactive, natural, and or synthetic type adhesives. For example, the lid rim **102** may have a sticky, glue like substance that is applied to the underneath portion of the lid rim **102**, and a user or machine may press or form the lid rim **102** to the container with the glue or adhesive material attaching (e.g., bonding/sealing) the lid rim **102** to the container. Moreover, the use of a snapping design of the lid rim **102** may be used in conjunction with the adhesive material for both "snapping" and sealing the lid **100** and the lid rim **102** to the container. The lid **100** may also included threads for twisting the lid **100** onto a container and the threads may be located and designed on a portion of the lid rim **102** and/or the one of the variety of shaped sidewalls (e.g.. cylindrical shaped sidewalls) **104**A.

[0059] The one of the variety of shaped bases (e.g., a domed shaped base and/or flexible membrane base) **106** is connected to the bottom of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A and forms a circular base of the lid **100**. It should be noted that the one of a variety of shaped bases (e.g., a domed shaped base) **106** may be one continuous piece with the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A or may be a detachable from the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A based upon users preference and need to fit, attach, and seal/bond to the required beverage container). The ribbed portion **104**B of the sidewalls **104**A allows for the contraction and elongation of the lid **100** about the longitudinal axis of the container to accommodate thermal expansion and contraction, respectively, of the stored fluid in the container.

[0060] The one of the variety of shaped bases (e.g., a domed shaped base) **106** prevents gas from being trapped underneath the lid **100** by having a substantially convex or dome shape while being submerged in fluid within the container. The dome shaped base **106**, as well as the entire lid **100**, provides for zero permeability to oxygen (e.g., the permeability including that of the dome shaped base **106**, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with the flexible ribbed portion **104**B of the lid **100** and of the junction zone between the lid **102** and a container). The zero permeability makes it possible to conserve a wine or other liquid in the long term, preferably more than ten months, without exceeding a tolerable quantity of oxygen. To do this, the cylindrical sidewalls with the flexible ribbed portion **104**B of the lid **100**, the dome shaped base **106**, and other parts of the lid device **100** are made of a material that is not permeable or practically not permeable to oxygen in the long term.

[0061] If a user requires any part of the lid **100**, including the one of the variety of shaped bases (e.g., a domed shaped base) **106**, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with the flexible ribbed portion **104**B, and/or the rim of the lid **102** to not be entirely "zero permeable", the one of the variety of shaped bases (e.g., a domed shaped base) **106**, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A with the flexible ribbed portion **104**B, and/or the lid rim **102** of the lid **100** must have a very low overall permeability, after the lid **100** has been installed onto a container, with a permeability of not more than 10 cubic centimeters per square meter per 24-hour period ($cm^3/m^2/24$ h), so as to conserve a wine or fluid for at least ten months. However, if it is not required to store the wine/liquid for more than ten months, based upon a users preference and need, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with the flexible ribbed portion **104**B of the lid **100**, the one of the variety of shaped bases (e.g., a domed shaped base) **106**, and other parts of the lid device **100** may be greater than or less than the 10 cubic centimeters per square meter per 24-hour period ($cm^3/m^2/24$ h), for conserving a wine or fluid, for a required period of lime.

[0062] The flexible ribbed portion **104**B of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A may be only a predetermined length of the entire sidewalls **104**A or the one of the variety of shaped, sidewalls (e.g., cylindrical shaped sidewalls) **104**A maybe designed entirely with a flexible ribbed shape **104**B. The one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **104**A may be designed and suited according to a users preference. The flexible ribbed portion assists the lid **100** in purging the atmospheric gases out of the container by extending into the fluid by a predetermined length according to a users preference when the lid rim **102** makes contact with the container. For example, the flexible ribbed portion allows for manipulating the lid **100** from a relaxed state to an elongated state while being submerged into a liquid. Thus, the lid purges out all of the air out of a container upon installation, so as to eliminate headspace by forming an airtight barrier between the container, the liquid inside the container, and the lid **100**. In other words, when the lid **100** is installed, the surface level of the fluid is contacting, every portion of the lid **100** and the container, with all of the gas/air removed between the lid and the container.

[0063] The lid **100**, lid rim **102**, the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with the flexible ribbed portion **104**B, and the one of the variety of shaped bases (e.g., a domed shaped base) **306** may be comprised of a variety of materials, such as plastic, carbon fibers, polyurethane material, fibrous materials, rubber materials, glass, elastic materials, flexible materials (e.g., a flexible membrane), cork, metallic materials and/or other material or combination of materials known in the art, which are suitable for such an application. Each portion of the lid **100** may be made of the same material or each identified part of the lid **100** may be constructed of a different material, which is suitable for such an application.

[0064] FIG. **1**B illustrates an exemplary installation process **110**, using an installation tool, of an air purging lid device having one of the variety of shaped bases (e.g., a domed shaped base) and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with a flexible ribbed portion in which aspects of the present invention may be realized. The lid **100** may be placed above the container **158** that is filled with a predetermined about of fluid (e.g., wine) **155**. An installation tool **108** may be used to elongate the lid **100** from its relaxed state and hold it in this position during the installation of the lid **100** so that the lid **100** displaces the appropriate amount of the fluid **155** such that the fluid **155** is at or near the rim of the container **150** at the time the rim of the lid **102** makes contact with the rim of the container **150**. As the lid **100** is lowered into a container **158** and submerged into the fluid **155**, the displaced fluid **155** rises on up along the inner portion **160** of the container **158** and purges the air/gases entirely out of the container **158**. The base **106** is shaped to prevent air/gases from being trapped underneath the lid **100** and facilitate the purging of air/gases out of the container **158**. Once the lid is lowered to an appropriate depth (e.g., the users desired preference based on the type of container and the level of fluid **155**), the lid rim **102** makes contact with the rim of the container **150** and is bonded and sealed **112** to the container rim **150**. The installation tool **108** is then removed. If the installation procedure is performed in a vacuum, once it is removed from the vacuum and exposed to atmospheric pressure the lid **100** may elongate allowing the fluid **155** to fill any voids within the container **158**.

[0065] Referring now to FIG. **1**C illustrating an exemplary removal process **125** of a seated air purging lid device having one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with a flexible ribbed portion in which aspects of the present invention may be realized. To remove the lid **100**, an upward force is applied to one end of the lid **100**, more specifically to the lid rim **102**. The seal (see FIG. **1**B **112**, the seal point) may be broken using upward force to break the seal between the lid **100** and the rim of the container **150**. If the lid **100** has threads, the act of twisting the lid breaks the seal **112** of the lid **100** and the container **158**. Once the seal between the rim of the container **150** and the lid rim **102** is broken, the pressure within the container **158** equalizes with that of its ambient environment. The lid **100** retracts to the lid's **100** original, shape, and thus, reduces the amount of fluid **155** the lid **100** displaces within the container **158**. The fluid **155** level on the inner side **160** of the container **158** drops in the container **158**. The retraction of the lid's **100** shape is achieved by employing a flexible ribbed portion in the lid's sidewalls. The fluid **155** level along the inside portion **160** of the container **158** is lowered away from the rim of the container **150**. This allows the liquid to be lowered down the glass (e.g., container) in a controlled fashion without spilling the liquid over the rim of the container **150**.

[0066] FIG. **2**A illustrates an additional exemplary air purging lid device **200** having a flexible membrane base and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with a seal directly beneath a lid rim in which aspects of the present invention may be realized. In FIG. **2**A, a lid **200** has an opening **201** area that is encased by a one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **204** extending downwardly to a flexible membrane base **206**. The opening area is simply the area between cylindrical walls, including from the top of the lid rim **202** and the bottom of the lid **200**. As is further illustrated in FIG. **2**A and also illustrated below in FIG. **2**B, the lid rim **202** is provided and has an inside portion **202***a* connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **204** and an outside portion **202***b* for sealing the lid **200** to the container.

[0067] The lid rim **202** may be L-shaped, straight, curved, angled, and/or formed to a variety of positions for being secured to a variety of container shapes and sizes. Moreover, the lid **200** may include a seal **212** that is pre-attached to the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **204** prior to the installation of the lid **200**. The seal **212** may be of a variety of adhesive or compressible type materials, which allows for the lid **200** to be sealed to a container. The adhesive type materials may include, but are not limited to, drying, pressure, contact, hot, heat, seal, reactive/non-reactive, natural, and or synthetic type adhesives. The compressible type materials may include, but are not limited to, rubbers, silicones, cork, natural, and or synthetic type compressible materials. The seal **212** allows for the lid **200** to seal immediately upon installation and making contact with the container **200**.

[0068] The flexible membrane base **206** is connected to the bottom of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **204** and forms a circular base of the lid **200**. The flexible membrane base **206** accommodates thermal expansion and contraction. The flexible membrane base **206** prevents gas from, being trapped underneath the lid **200** by having a substantially convex shape while being submerged in fluid **255** within the container **250** with the aid of an installation tool **208** maintaining the convex shape (see FIG. **2**B). The flexible membrane **206** may deform to a concave shape once the seal **212** engages the container while the lid **200** is submerged in the fluid **255** (see FIG. **2**B) until the lid rim **202** makes contact with the container **258** (see FIG. **2**B).

[0069] FIG. **2**B illustrates an additional exemplary installation process **225**, using an installation tool, of an air purging lid device having a flexible membrane base and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) in which aspects of the present invention may be realized. An installation tool **208** may be used to hold the flexible membrane base **206** in a convex configuration. As the lid **200** is lowered into a container **258**, the flexible membrane **206** and the lid walls **204** displace the fluid **255** and force the fluid **255** upwards along the sides of the inside walls **260** of the container **258**, which purges the air/gases entirely from the container **258**. The lid **200** remains partially submerged in the stored fluid **255** after the lid is installed. The lid **200** is submerged into the stored fluid **255** with the flexible membrane **206** held, in a dome shape by the installation tool **208** such that, if any gases are entrapped during the installation process, the gases are forced into a small annular shaped volume near the perimeter of the lid rim **202** and the container's **250** rim, such that only a very small surface area of the fluid **255** would be left exposed to the entrapped gases, thus slowing the process of oxidation.

[0070] At this point, the lid **200** may be sealed to the container **258** as the seal **212** on the lid **200** engages the container **258** inner walls **260**. In order to minimize the pressure differential within the container **258** with respect to the lid's **200** external environment, and also to accommodate any thermal expansion or contraction of the fluid **255** inside of the container **258**, while the lid. **200** is installed/sealed, the flexible membrane **206** of the lid **200** deforms such that the volume of the fluid **255** being contained by the lid **200** and the container **258** increases or decreases as needed. The lid **200** may be installed onto the container **258** with or without the aid of a vacuum chamber and with or without the use of an inert gas to displace the atmospheric gases. In other words, a variety of installation and/sealing methods may be employed to secure the lid **200** to the container **258**. In addition, the lid **200** may be dimensioned to interface with a wide variety of container **258** shapes and sizes and accommodate a wide range of desirable fluid **255** levels within a given container **258**. The lid **200** may be secured to the container **258** by heat-sealing, adhesive bonding, threading, or press fitting. If the configuration of the lid **200** uses a seal **212** and is not bonded to the container **258**, the lid may be pressed into the container **258** and held in place by the compressed seal **212**.

[0071] FIG. **2**C illustrates an exemplary removal process of a sealed air purging lid device **275** having a flexible membrane base and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) in which aspects of the present invention may be realized. To remove the lid **200**, the seal may be broken using upward force on the lid **200** to move the seal **212** past the container rim **250**. Once the seal between the rim of the container **250** and the lid seal **212** is broken, the pressure within the container **258** equalizes with that of its ambient environment and the flexible membrane **206** of the lid **200** inverts from a convex to a concave shape, and thus, reduces the amount of fluid **255** the lid displaces within the container **258**. The fluid **255** level along the inside portion **260** of the container **258** is lowered away from the rim of the container **250** in a controlled fashion without spilling the liquid over the rim of the container **250** when the lid **200** is removed from the container **258**. As the fluid **255** is lowered downward and away from the lid rim **202**. The flexible membrane base **206** is able to adjust from the convex shape to a concave shape while being removed from the container **250**. This adjustment results from the pressure of the fluid **255** pushing upwards on the flexible membrane **206** while the fluid **255** is being lowered down along the inner side **260** of the container **258** and the waits **204** of the lid **200**. Upon the lid **200** being completely removed from the container **258**, the flexible membrane base **206** retracts back to the convex position, which is the natural resting state of the flexible membrane.

[0072] FIG. **3**A illustrates an additional exemplary air purging lid device having one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) with a rigid dome shaped base in which aspects of the present invention may be realized. FIG. **3**A illustrates the additional exemplary air purging lid device **300** having a rigid dome shaped base **306** and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** in which aspects of the present invention may be realized. In an alternative embodiment, the air-purging device maintains its shape when installed in the container **358** (see FIG. **3**B) rather than having a deformable membrane or a flexible ribbed shaped portion of the cylindrical walls. The lid **300** has an opening area **301** that is encased by one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** extending downwardly to one of the variety of shaped, bases (e.g., a domed shaped base) **306**. The lid **300** displaces a fluid by forcing the fluid up along the outside of its sidewalls **304** and the container towards the lid rim **302** thereby minimizing the headspace. The lid rim **302** is provided and has an inside portion **302**A connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** and an outside portion **302**B for sealing the lid to the container. (It should be noted that the lid rim **302** may be one continuous piece with the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** or may be detachable from the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** based upon users preference and need to fit, attach, and seal/bond to the required beverage container).

[0073] The lid rim **302**, as well as other parts of the lid **300**, may be flexible and/or pliable for forming and securing the lid to the container. The lid rim **302** may be L-shaped, straight, curved, angled, and/or formed to a variety of geometric shapes or positions for being secured to a variety of container shapes and sizes. The lid rim **302** may be shaped and constructed for "snapping" the lid onto the container for securing the lid **300** to the container. Moreover, the lid rim **302** may include one of a variety of adhesive type materials, which allows for the lid **300** to be sealed and/or secured to a container. The adhesive type materials may include, but not limited to, drying, pressure, contact, hot, heat seal, reactive/non-reactive, natural, and or synthetic type adhesives. For example, the lid rim **302** may have a sticky, glue like substance that is applied to the underneath portion of the lid rim **302**B, and a user or machine may press or form the lid rim **302** to the container with the glue or adhesive material attaching (e.g., bonding/sealing) the lid rim **302** to the container. Moreover, the use of a snapping design of the lid rim **302** may be used in conjunction with the adhesive material for both "snapping" and sealing the lid **300** and the lid rim **302** to the container. The lid **300** may also included threads for twisting the lid **300** onto a container and the threads may be located and designed on a portion of the lid rim **302** and/or the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304**.

[0074] FIG. **3**B illustrates an additional exemplary installation process **325** of an air purging lid device having a rigid, dome shaped base and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) in which aspects of the present invention may be realized. The lid **300** has an opening area **301** that encased by one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** extending downwardly to rigid dome shaped base **306**. Once the lid is lowered to an appropriate depth (e.g., the users desired preference based on the type of container and the level of fluid **355**), the underside of the lid rim **302***b* makes contact with the rim **350** of the container **358** and is bonded and sealed **312** to the container rim **350**. The lid **300**, when installed, displaces a fluid **355** by forcing the fluid **355** up along the side of the vertical sidewalls **304** of the lid **300** and the inside walls **360** of the container **358**. The resultant level of the fluid **355** when the lid **300** is fully installed in the container **358** is approximately hallway up the lid's **300** cylindrical walls **304**. The resultant fluid **355** surface area exposed to the open space within the container **358** is minimized. The resultant void between the fluid's **355** top surface and the lid **300** rim **302** accommodates any thermal expansion of the fluid. The lid rim **302** is provided and has an inside portion **302***a* connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** and an outside portion **302***b* for sealing the lid to the container rim **350**. The lid rim **302**

may be L-shaped, straight, curved, angled, and/or formed to a variety of positions for being secured to a variety of container **358** shapes and sizes. The rim **302***b* of the lid **300** may employ a variety of adhesive type materials, which allows for the lid **300** to be sealed to a container **358**. The adhesive type materials may include, but are not limited to, drying, pressure, contact, hot, heat seal, reactive/non-reactive, natural and or synthetic type adhesives.

[0075] The vertical one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **304** is rigid and maintains its form while both being installed and after being sealed onto the container **350**, Thus, the lid **300** reduces the surface area of the stored fluid **355** exposed to any entrapped gas within the container **358**. The lid **300** still purges some of the air out of the container **358** mechanically, but the resultant fluid **355** level, on the sides of the lid, must be kept low enough to prevent it from spilling out of the container **358** when the lid is removed while still maintaining a void capable of accommodating any thermal expansion of the fluid **355**. The bottom, surface may deform slightly.

[0076] Below, FIGS. **4**A-B, the two different exemplary configurations of the lid with a deformable membrane are depicted. In the first configuration (see FIG. **4**A) the seal is near the rim of the container while in the second configuration (see FIG. **4**B) the seal is near the necked region of the container. The configurations shown are for both a flared mouth and a narrow mouth container.

[0077] FIG. **4**A illustrates an exemplary air purging lid device **410** having a flexible membrane base and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls), sealed to a container having a narrow mouth opening in which aspects of the present invention may be realized. As illustrated in FIG. **4**A, a lid **400** has an opening area that encased by a one of the variety of shaped sidewalls (e.g., cylindrical shaped, sidewalls) **404** extending downwardly to a flexible membrane base **406**. The lid **400**, when installed, displaces a fluid **455** by forcing the fluid **455** up along the side of the vertical sidewalls **404** of the lid **400** and the inner walls **460** of the narrow mouth container **458** up to a lid rim **402**. The resultant fluid **455** surface area exposed to the open space within the narrow mouth container **458** is minimized. The lid rim **402** is provided and has an inside portion **402***a* connected to the top of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **404** and an outside portion **402***b* for sealing the lid to the rim **450** of the narrow mouth container **458**. The lid rim **402** may be L-shaped, straight curved, angled, and/or formed to a variety of positions for being secured to a variety of narrow mouth container **458** shapes and sizes.

[0078] Moreover, the lid rim **402** may include a seal **412** that is pre-attached to the lid rim **402** prior to the installation of the lid **458**. The seal **412** may be of a variety of adhesive and/or compressive type materials, which allows for the lid **400** to be sealed to the narrow mouth. container **458**. The seal **432** is near the rim of the narrow mouth container **458** and the lid rim **402**. The flexible membrane base **406** is connected to the bottom of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **404** and forms a circular base of the lid **400**. The flexible membrane base **406** accommodates thermal expansion and contraction. The flexible membrane base **406** prevents gas from being trapped underneath the lid **400** by having a substantially convex shape while being submerged in fluid **455** within the narrow mouth container **458** with atmospheric pressure maintaining the convex shape. The flexible membrane **406** may adjust to a concave shape while being submerged in the fluid **455** until the lid rim **202** makes contact with the narrow mouth container **450**. The vertical/one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **404** is rigid and maintains its form while both being installed and after being sealed onto the narrow mouth container **458**.

[0079] FIG. **4**B illustrates an exemplary air purging lid device **425** having a flexible membrane base and one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) sealed to a container with a flared mouth opening in which aspects of the present invention may be realized. It should be noted that the ribbed design described herein, such as in FIG. **1**A, may be used, adapted, and/or designed to work for flared mouth container as well as narrow mouth containers and also other type of containers. In short, it should be noted that the various lid designs described herein may be applied and used in a variety of types of containers and the examples described herein are used as examples for illustration purposes only and not as limiting examples.

[0080] As illustrated in FIG. **4**B, a lid **400** has an opening area that encased by a one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **404** extending downwardly to a flexible membrane base **406**. The lid **400**, when installed, displaces a fluid **455** by forcing the fluid **455** up along the side of the vertical sidewalls **404** and a flared month container **475** up to a lid rim **402**. The resultant fluid **455** surface area exposed to the open space within the wide mouth container **475** is minimized. The lid rim **402** is provided and has an inside portion **402***a* connected to the top of the one of the variety of shaped sidewalk (e.g., cylindrical shaped sidewalls) **404** and an outside portion **402***b* for sealing the lid to the flared mouth container **475**. The lid rim **402** may be L-shaped, straight, curved, angled, and/or formed to a variety of positions for being secured to a variety of flared mouth container **475** shapes and sizes. Moreover, the lid rim **402** may include a seal **412** that is pre-attached to the lid rim **402** prior to the installation of the lid **100**. The seal **412** may be of a variety of adhesive and/or compressive type materials, which allows for the lid **400** to be sealed to the flared mouth container **475**. The seal **412** may be located below the container rim **451** such that the seal **412** is compressed against the narrowed portion of the inside walls **460** of the container **475**.

[0081] The flexible membrane base **406** is connected to the bottom of the one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **404** and forms a circular base of the lid **400**. The flexible membrane base **406** accommodates thermal expansion and contraction. The flexible membrane base **406** prevents gas from being trapped underneath the lid **400** by having a substantially convex shape while being submerged in fluid **455** within the flared mouth container **475** with atmospheric pressure maintaining the convex shape. The flexible membrane **406** may adjust to a concave shape while being submerged in the fluid **455** until the lid rim **402** makes contact with the flared mouth container **475**. The vertical/one of the variety of shaped sidewalls (e.g., cylindrical shaped sidewalls) **404** is rigid and maintains its form while both being installed and after being sealed onto the wide mouth container **475**.

[0082] In other embodiments as shown in FIGS. **5**A-**5**C, air purging insert and liquid container system **500** may comprise container and lid assembly **505** having container **510** with shaped container sidewall **512** having top edge **514** and bottom portion **516**, and inner surface **518** and outer surface **520**, top opening area **522** and container bottom **524**, air purging insert **535** having top flange **537**, insert sidewall **539** having top side **541** and bottom side **543**, interior surface **545** and exterior surface **547**, shaped base **549**, and lid seal member **570**.

[0083] The three basic components in the embodiments shown in FIGS. **5**A-**5**C of container and lid assembly **505** are container **510**, air purging insert **535**, and lid seal member **570** which are each separate objects, structured, and arranged to cooperatively function together to purge a substantial amount of (or all) atmospheric gas from container **510** between inner surface **518** of shaped container sidewall **512** and surrounding air purging insert **535**, and between lid seal member **570** and the surface of a contained liquid **526**, to minimize the oxidation process and lengthen the shelf-life of liquid **526** within container **510**. Container **510** is structured and designed to be generally circular with inwardly converging shaped container sidewalls **512** toward top opening area **522**, taking on a slight globular shape, but may be cylindrical, square, triangular, cone, or any number of other shapes in other embodiments. Container **510**, in these embodiments, preferably comprises a wide-mouth container **510** for use with non-carbonated and non off-gassing liquids **526** such as wine, and has shaped container sidewall **512** that curves inwardly toward top opening area **522** to facilitate reducing the surface area of liquid **526** exposed to atmospheric gases. Inner surface **518** and outer surface **520** of shaped container sidewall **512** are formed integrally and substantially parallel planar to each other with slight variations at shaped base **549** exterior. Preferably, container **510** is constructed of disposable material but may be constructed of non disposable material when a longer shelf life is desired. Container bottom **524** integrally joins bottom portion **516** of shaped container sidewall **512** and is deposed substantially perpendicular and sized to hold about one glass of wine.

[0084] In FIG. **5**B, air purging insert **535** is concentrically placed within container **510** with top flange **537** of air purging insert **535** flush with the top edge **514** of container **510** so that the atmospheric gases are purged when the product is assembled and in storage condition **580**. Air purging insert **535** in certain embodiments may be structured and designed to contain dry comestibles such as packaged crackers and/or cheese while container **510** simultaneously contains beverage **528** so that peeling lid seal member **570** from container **510** removes air purging insert **535** with the dry comestibles still sealed inside. Lid seal member **570** can then be peeled away from top flange **537** of air purging insert **535** to expose the dry comestibles providing a snack with beverage **528** in disposable packaging. In FIGS. **5**A, **5**B, and **5**C, exterior surface **547** of air purging insert **535** does not contact inner surface **518** of container **510**, but in FIG. **5**C, air purging insert **535** has beveled edges on the outer periphery of shaped base **549** for contacting the inwardly curving inner surface **518** of container **510** near container bottom **524** when the maximum insertion depth of air purging insert **535** is reached in beverage **528**. In this embodiment, air purging insert **535** is prevented from movement relative to container **510** during transport, and may have a larger inner volume **551** for holding dry foods.

[0085] In another embodiment where air purging insert **535** contacts inner surface **518** of container **510** as shown in FIG. **5**B, container **510** has horizontally a deposed indentation **530** around outer circumference **532** causing inward protrusion **534** around inner circumference **508** of shaped container sidewall **512**. Inward protrusion **534**, in this embodiment, is designed so that horizontal groove **553** around exterior circumference **555** of insert sidewall **539** can be snapped onto inward protrusion **534** of inner surface **518** of shaped container sidewall **512** to hold air purging insert **535** in place, and that it can be installed first prior to filling container **510** with liquid **526** so that air purging insert **535** doesn't become buoyant.

[0086] In FIGS. **5**A-**5**C air purging insert **535** may have a longitudinal cross-section profile-shape using one of multiple different configurations selected from a group consisting of a straight, circular, square, rectangular, triangular, V-shaped, L-shaped, polygram shaped, cone shaped, angled, curved, hexagonal, concave, convex, elliptical, and frustoconical shape. In a preferred embodiment as shown in FIG. **5**B, insert sidewall **539** of air purging insert **535** comprises flexible ribbed portion **557**. In this embodiment, insert sidewall **539** of air purging insert **535** is contracted when in a relaxed state and slightly extended while in storage condition **580**. Insert sidewall **539** of the air purging insert **535** is structured and arranged to mechanically maintain a negative atmospheric pressure while being completely submerged within beverage **528** in a product storage condition **580**. Extending the length of air purging insert **535** by straightening flexible ribbed portion **557** to a tensioned state and then allowing it be become relaxed after sealing lid seal member **570** causes a negative atmospheric pressure to be maintained. It should be noted, as with the above embodiments, that other packaging methods such as using a vacuum packaging or bottling method, or first purging container **510** with an inert gas such as carbon dioxide or nitrogen, may also be used in conjunction to the mechanically maintained atmospheric negative pressure within container **510**.

[0087] Insert sidewall **539** of the air purging insert **535** displaces the amount of liquid **526** needed to raise the fluid level within container **510** to purge the atmospheric gases out during installation by forming an airtight barrier within container and lid assembly **505**. Insert sidewall **539** may be substantially or fully submersed in the contained liquid **526** and there may be either a small amount of headspace as shown in FIGS. **5**A, **5**C, and **5**D or no headspace as shown in FIG. **5**B, depending on the embodiment. Either way, the gas to liquid contact surface is at least very small. A small amount of headspace may be allowed for uses where thermal expansion is a consideration and air purging insert **535** is non-deformable.

[0088] Top flange **537** of air purging insert **535** has an upwardly facing flat surface that is integrally formed with top side **541** of insert sidewall **539**. Top flange **537** upper surface may have an adhesive-like seal or may be constructed of heat sensitive material that readily bonds with other like materials when heat is applied. Bottom side **543** of insert sidewall **539** is perpendicularly deposed and integral with shaped base **549** such that air purging insert **535** is able to prevent beverage **528** within container **510** from leaking into inner volume **551** of air purging insert **535**. Shaped base **549** preferably also comprises a slight downwardly convex shape so that atmospheric gases are unable to be trapped beneath shaped base **549** during installation of air purging insert **535** and sealing of lid seal member **570** to top edge **514** of container **510**. Shaped base **549** is preferably non-deformable and thermal expansion is accommodated either using the embodiment having flexible ribbed portion **557** as shown in FIG. **5**B, of insert sidewall

539, or by allowing a small amount of headspace for this purpose as shown in FIGS. 5A, 5C, 5D, and 5E.

[0089] In FIG. 5E, air purging insert **535** has a shortened height and is not submersed in beverage **528** when installed, and the contained liquid **526** is not displaced to remove the headspace. Only a volume of atmospheric gas equivalent to the volume of air purging insert **535** is purged. This embodiment preferably is used with beverages **528** that are less readily oxidized from the allowed headspace.

[0090] Lid seal member **570** is structured and arranged to be concentrically sealed first to top flange **537** of air purging insert **535** having at least one comestible located within inner volume **551** of air purging insert **535**, and secondly to top edge **514** of container **510** with the contained beverage **528**. Lid seal member **570** may comprise a foil sheet slightly larger in size and shape than top edge **514** of container **510** and provides a contact surface for adhering to top edge **514** of container **510**. Lid seal member **570** may also be constructed of plastic or any other suitable material that is effectively moisture resistant. In FIG. 5B, having flexible ribbed portion **557** of insert sidewall **539**, lid seal member **570** may comprise perforation **590** for equalizing the pressure in inner volume **551** of air purging insert **535** with the exterior ambient pressure to allow flexible ribbed portion **557** to account for thermal expansion and assist in maintaining a negative pressure within container **510**. In FIG. 5B having flexible ribbed portion **557** of insert sidewall **539**, when lid seal member **570** is unsealed from top edge **514** of container **510**, the fluid level is immediately lowered to a predetermined level below top edge **514** of container **510** as flexible ribbed portion **557** contracts to a relaxed state, reducing displacement of liquid **526** and avoiding spillage. Air purging insert **535**, in most embodiments, is designed to function together with shaped container sidewall **512** and lid seal member **570** to reduce liquid **526** surface area by displacing the amount of liquid **526** needed to raise the level of liquid **526** in container **510** to eliminate headspace and purge the atmospheric gases during installation by forming an airtight barrier with container **510** and air purging insert **535** and lid seal member **570**.

[0091] In FIGS. 5A-5E, a method of manufacturing air purging insert and liquid container system **500** may comprise molding container **510** having shaped container sidewall **512** extending downwardly and outwardly to about a midpoint of the container height and thee curving downwardly and inwardly to container bottom **524**, providing an opening in container **510** located at top edge **514** of shaped container sidewall **512** which forms the perimeter for top opening area **522**, providing a flat container bottom **524** formed integrally with shaped container sidewall **512**, molding air purging insert **535** having top flange **537** formed integrally with top side **541** of insert sidewall **539** that extends downwardly to bottom side **543** of insert sidewall **539**, providing shaped base **549** integrally formed with bottom side **543** of insert sidewall **539** and structured to prevent entrapment of atmospheric gas from beneath shaped base **549**, and providing lid seal member **570** having a slightly larger size and shape than top edge **514** of shaped container sidewall **512** having a concentrically located perforation **590** for equalizing pressure within inner volume **551** of insert sidewall **539** and the exterior atmospheric pressure.

[0092] The method of manufacturing may further provide the steps of filling container **510** with a non-carbonated beverage **528** to a pre-determined level, placing a packaged comestible into inner volume **551** of air purging insert **535**, concentrically sealing top flange **537** of air purging insert **535** to lid seal member **570**, placing container **510** having the non-carbonated beverage **528** into an enclosure for sealing, inserting air purging insert **535** with the attached lid seal member **570** into liquid **526** until lid seal member **570** contacts top edge **514** of container **510** thereby displacing liquid **526** beverage **528** upwardly between inner surface **518** of container **510** and interior surface **545** of air purging insert **535** to substantially eliminate headspace and thereby purging the atmospheric gas from within container **510**, and concentrically sealing the outer margin of lid seal member **570** to top edge **514** of the container **510**.

[0093] In yet another embodiment, FIG. **6** depicts an exemplary configuration of the air purging insert and liquid container system **500** wherein the lid seal member is an adhesively attached foil that is sealed to the top edge **514** of container **510** and to the top flange **537** of the air purging insert **535** which, in this embodiment, is an inner core that is deformable having ribbed or dimpled walls. The packaging process works in conjunction with, and compliments this embodiment, which may be done in a pressurized environment such that when the container and lid assembly **505** is moved to ambient pressure outside of the assembly machine that the higher pressure inside the air purging insert **535** causes the ribbed or dimpled insert sidewall **539** to extend outwards. Alternatively, liquid nitrogen or dry ice could be sealed inside the insert sidewall **539** such that when it turns into gas the inside of the lid assembly is at a higher pressure than ambient pressure. This would allow the air purging insert **535** to be installed in container **510** in its extended configuration to mechanically drive out more gas and leave less residual volume than it would if the air purging insert **535** was in its relaxed configuration. Once installed the lid seal member **570** atop the air purging insert **535** would be perforated to allow the pressure in the air purging insert **535** to equalize with the ambient pressure resulting in air purging insert **535** contracting and leaving the pressure lower inside the container **510** than the ambient pressure.

[0094] The ribbed air purging insert **535** design, when installed in the wine container **510** in its relaxed configuration has a clearance from the bottom of container **510** of 0.5 inches. When, the pressure inside the air purging insert **535** is higher than ambient pressure and high enough to offset the buoyancy effect of the liquid, the air purging insert **535** will extend by 0.5 inches or more, if it extends by more than 0.5 inches then it will make contact with the bottom of container **510** before the foil component of the lid seal member **570** makes contact with container **510** top edge **514**. As pressure is applied to the top of the foil part of the lid seal member **570** of the lid during installation, the ribbed core design will contract until the container **510** makes contact with, and is sealed against, the top edge **514** of container **510**. The contact of the shaped base **549** of the flexible ribbed portion **557** with the inner surface **518** of the bottom portion **516** of the container **510** is beneficial since it will result in a constant displacement and resultant level of wine from container **510** to container **510** that is packaged with wine.

[0095] Air purging insert **535** of the container and lid assembly **505** has concave dimples on its insert sidewall **539**. In its relaxed state the insert sidewall **539** of the air purging insert **535** are concave. When installed in the container **510** and the pressure inside the container **510** is lower than the outside of the container **510**, the dimples are pushed outwards by the ambient pressure resulting in the air purging insert **535**

occupying a greater portion of the inner volume **551** pushing the liquid upwards and reducing headspace. When the seal is broken between the lid seal member **570** and the top edge **514** of the container **510** the pressure equalizes and the dimples in the air purging insert **535** return to their relaxed state and become more concave again resulting in the liquid level dropping away from the top edge **514** of the container **510**.

I claim:

1. A container system, for storage of at least one liquid comprising;

a. a cup having a side, bottom, and top defining a volume capacity, said top having an opening, said opening defined by a rim having a circumference and defining an area;

b. an insert having a side, bottom, and top defining an interior portion, said top having an opening, said opening defined by a rim having a circumference less than said cup top rim circumference;

c. whereby said insert is sized smaller than said cup to allow insertion into said cup and thereby displacing a predetermined amount of volume of the cup capacity;

d. a planar lid having an area greater than said cup opening area for simultaneously mating with said cup rim and said insert rim when said insert is placed within said cup, forming an airtight seal with said cup rim;

e. a liquid contained within said cup whereby when said lid is applied, said liquid is excluded from the insert interior portion.

2. The container of claim **1** wherein said lid comprises a pressure equalization perforation.

3. The container of claim **1** whereby said planar lid seal captures a low-pressure within said cup interior portion, relative to said insert interior portion.

4. The container of claim **1** whereby said insert sidewall contains expandable ribs to allow for the expansion of said insert interior portion, thereby increasing the volume of cup capacity displaced by said insert.

5. The container of claim **4** whereby said insert sidewall contains expandable ribs to allow for the contraction of said insert interior portion.

6. The container of claim **4** whereby said expandable ribs expand under the pressure differential when the pressure upon the interior portion of the insert exceeds external pressure.

7. The container of claim **1** whereby said insert does not directly contact said cup while both insert and cup mate with said lid.

8. The container of claim **1** whereby said cup side comprises an angular wall such that said bottom comprises an area less that said cup opening area, and whereby said insert bottom comprises a beveled rim for mating with said cup angular wall.

9. The container of claim **1**. whereby said cup side comprises an indentation situated towards the interior of said cup, and said insert comprises a complimentary indentation for snapping said insert into said cup indentation.

10. The container of claim **9** whereby said complimentary indentations when mated prevent said insert from moving upwardly due to buoyancy pressure when the volume of said insert, when placed within said cup and displacing a volume of said liquid, weighs less than the volume of liquid displaced.

11. The container of claim **1** whereby at least a portion of said insert is submerged into the liquid contained within said cup.

12. The container of claim **11** whereby when said lid is placed over the cup rim and insert rim, said insert is impermeable and sealed to prevent said liquid from entering said insert interior portion.

13. The container of claim **1** whereby:

said insert side comprises at least one dimple;

said dimple having

at least a first outwardly extended mode whereby said insert interior portion is at a maximum volume; and

at least a second inwardly extended mode whereby said insert interior portion is at a minimum volume.

14. The container of claim **1** whereby said liquid forms a surface within said cup, and a volume space is defined within said liquid surface, said cup side, said insert side and said lid, whereby said volume space is filled with a gas.

15. The container of claim **14** whereby said gas substantially comprises carbon dioxide.

16. The container of claim **14** whereby said gas substantially comprises nitrogen gas.

17. A method of storing a liquid within a container comprising the steps of:

a providing a cup for holding said liquid within the interior of the cup;

b. inserting an insert whereby said liquid is excluded from the interior of said insert, the insert occupying volume of the interior of the cup;

c. placing a liquid within the cup;

d. sealing the container with a lid by mating the lid with rims of both the cup and insert.

18. The method of claim **17** further comprising the step of filling the remainder of the cup interior with an inert gas.

19. The method of claim **17** whereby the step of sealing comprises the step of creating a low pressure cavity in the unfilled portion of the cup.

20. The method of claim **19** whereby said step of creating a low pressure cavity further comprises the step of expanding the volume of the insert.

21. The method of claim **17** further comprising the step of inserting a dry article within the interior of the insert.

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