DEVICE AND METHOD FOR PREVENTING THE DEGRADATION OF A CONSUMABLE LIQUID

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ABSTRACT

A sealing device for reducing the degradation of a consumer liquid within a container. The sealing device includes an inflation source, a bladder, and a flexible tubing connecting the inflation source to the bladder. The bladder is configured to reside on a surface of the consumable liquid and has a first state and a second state. In the first state, the bladder is configured to enter the container. In the second state, the bladder forms a seal with the container at the search of the consumable liquid.
DEVICE AND METHOD FOR PREVENTING THE DEGRADATION OF A CONSUMABLE LIQUID

RELATED APPLICATION

[0001] The present application claims the benefit of U.S. Application Ser. No. 61/333,872, filed on May 12, 2010, the disclosure of which is hereby incorporated herein by reference, in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a device and method of preventing the degradation of a consumable liquid and, more particularly, to the oxidation of a bottle of consumable liquid.

BACKGROUND OF THE INVENTION

[0003] Some consumable liquids, such as wine or carbonated beverages, often suffer a loss of quality, taste, and composition due to oxidation. Oxidation is generally a chemical reaction in which oxygen and/or other elements in the air impregnate the consumable liquid, rendering it unpalatable to a consumer. Manufacturers of consumable liquids understand this process and implement several procedures to preserve the quality of the consumable liquid until it is ready to be consumed. For example, manufacturers will select a suitably sized and shaped container for the consumable liquid so that the container is mostly filled with the consumable liquid with little-to-no air space within the container above the consumable liquid. Additionally, manufacturers may include a seal at an opening of the container, with or without pressurizing the air within the air space that is residing between the consumable liquid and the seal.

[0004] However, there exists the problem of preserving the quality of the consumable liquid after the container has been opened and at least a portion of the consumable liquid remains. Several conventional devices and methods have been developed to reduce and/or prevent the oxidation of consumable liquids after the container has been opened. For example, one conventional method includes placing a cover or seal over an opening of the container of the consumable liquid. However, the air space is still present in that container. In fact, the volume of the air space increases after at least a portion of the consumable liquid is removed from the container. The increased volume of air space furthers the process of oxidation and the degradation of the consumable liquid.

[0005] Another conventional method includes freezing the consumable liquid after the container has been opened and the consumable liquid has been initially exposed and/or partially consumed. However, this method is also undesirable as it takes considerable time for the consumable liquid to be thawed or otherwise unfrozen. Furthermore, the freezing and thawing process may lead to degradation of the consumable liquid through mechanisms other than oxidation.

[0006] Still another conventional method includes transferring the consumable liquid to a smaller container. However, this method requires the user to maintain a supply of containers of various sizes. Moreover, an exact match of any particular container to the amount of consumable liquid is rarely, if ever, achieved.

[0007] Another conventional method includes replacing the air within the air space of the container with an inert gas and/or evacuating the air from the air space with a pump. In the former, air is introduced into the container during the time it takes to remove the source of the inert gas from the opening of the container and placement of the seal. The former method also does not allow the user to visually inspect or otherwise determine whether that air within the air space of the container has been fully displaced. In the latter method, a vacuum is unattainable, particularly with vacuum pumps available for consumer use. Thus, it is inevitable that significant amounts of air will remain within the container.

[0008] Therefore, there remains a need for a device and method of preserving consumable liquids that overcomes the above-mentioned deficiencies of the conventional methods.

SUMMARY OF THE INVENTION

[0009] The present invention overcomes the foregoing problems and other shortcomings, drawbacks, and challenges of preventing the degradation of a consumable liquid. While the invention will be described in connection with certain embodiments, it will be understood that the invention is not limited to these embodiments. To the contrary, this invention includes all alternatives, modifications, and equivalents as may be included within the spirit and scope of the present invention.

[0010] According to one embodiment of the invention, a sealing device is described. The sealing device is configured to reduce the degradation of a consumable liquid within a container and includes an inflation source, a bladder, and a flexible tubing connecting the inflation source to the bladder. The bladder is configured to reside on a surface of the consumable liquid and has a first state and a second state. In the first state, the bladder is configured to enter the container. In the second state, the bladder forms a seal with the container at the surface of the consumable liquid.

[0011] According to another embodiment of the invention, a sealing device is described for reducing the degradation of a consumable liquid within a container. The sealing device includes a collapsible bladder and an actuator. The collapsible bladder has an expanded state and a collapsed state. The actuator transitions the collapsible bladder between the expanded and collapsed states. When the bladder is in the collapsed state, the bladder is configured to enter the container. In the expanded state, the bladder is configured to form a seal with the container at the surface of the consumable liquid.

[0012] In yet another embodiment of the invention, a method of preserving a consumable liquid within a container is described. The method includes inserting an expandable bladder through an opening of the container. The expandable bladder is directed to a surface of the consumable liquid within the container and expanded so as to form a seal with an inner surface of the container at the surface of the consumable liquid.

[0013] The above and other objects and advantages of the present invention shall be made apparent from the accompanying drawings and the description thereof.

BRIEF DESCRIPTION OF THE FIGURES

[0014] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with a general description of the invention given above, and the detailed description of the embodiments given below, serve to explain the principles of the invention.
FIG. 1 is a perspective view of a container of a consumable liquid, wherein at least a portion of the consumable liquid has been removed from the container.

FIG. 2 is a disassembled perspective view of a sealing device in accordance with one embodiment of the invention.

FIGS. 2A-2B illustrate inflation sources for use with the sealing device of FIG. 2 in accordance with alternate embodiments of the invention.

FIGS. 3A-3C are side-elevational views partially in cross-section of one exemplary method of using the sealing device of FIG. 2 in accordance with one embodiment of the invention.

FIG. 4 is a perspective view of the container of FIG. 1 with the sealing device of FIG. 2 configured to preserve the portion of consumable liquid remaining within the container.

FIGS. 5A and 51 are cross-sectional views of a cup for use with a sealing device in accordance with various embodiments of the invention.

FIGS. 6A-6E are perspective views partially in cross-section of compressible bladders in accordance with alternative embodiments of the invention configured to preserve the portion of consumable liquid remaining within the container.

FIG. 7 is a cross-sectional view of an inflation source in accordance with another embodiment of the invention.

DETAILED DESCRIPTION

Turning now to the figures, and in particular to FIG. 1, a container 10 of a consumable liquid (“liquid” 12) is shown. The container 10 may be a conventional bottle used for transporting liquids, such as wine, carbonated beverages, oils, liquor, gelatinous food stuffs, or other liquids 12. Accordingly, the container 10 includes at least one wall 14, a bottom 16, and an opening 18. The at least one wall 14 and bottom 16 enclose a volume 20 for holding the liquid 12, which is inserted into the volume 20 via the opening 18.

As is shown, a seal (not shown) of the container 10 that was positioned by the manufacturer for shipment of the container 10 has been removed and at least a portion of the liquid has been removed and/or consumed. As a result, the volume 20 within the container 10 is largely comprised of air space 22 in addition to the liquid 12.

Turning now to FIG. 2, a sealing device 24 in accordance with one embodiment of the invention is illustrated as a disassembled state. The disassembled state may be useful for purposes of transport (such as after purchase) and/or storage of the sealing device 24. The sealing device 24 includes an inflation source 26 having a valve 28 that is configured to be pneumatically coupled to a first end 30 of a flexible tube 32. A second end 34 of the tube 32 is configured to be pneumatically coupled to an inflatable bladder 36 via a connector 38.

The inflation source 26 may be, as illustrated in FIG. 2, a pump bulb that is compressible and configured to expel a volume of air (or gas) through an opening 40 with each successive compression. Conventional pump bulbs 26 may be used, including those constructed from a generally polymeric material that is sufficiently rigid so as to return to an expanded state ready for subsequent compression. However, it may be advantageous to construct the pump bulb 26 from a material that is highly expandable, non-allergenic, and highly sustainable material, such as a guayule-based rubber or like material.

In some embodiments, the pump bulb 26 may include a novelty shape that is associated with the liquid 12 to be preserved. For exemplary purposes only, if the liquid to be preserved is wine, the pump bulb may be shaped as a cluster of grapes, or if the liquid to be preserved is a carbonated beverage (such as an orange flavored soda pop), then the pump bulb may be shaped as a wedge of an orange. However, these novelty shapes are not necessary to the function of the pump bulb and the invention should not be so limited to a particular shape as described or illustrated herein.

The valve 28 coupled to the opening 40 of the pump bulb 26 is configured to couple the flexible tube 32 to the pump bulb 26. In some embodiments, the valve 28 may include a pressure release 42 having an open state and a closed state. The pressure release 42 may be constructed from a metallic, plastic, or other suitable materials and may include a screw-type or push button operation. In the closed state, each compression of the pump bulb 26 forces the expelled air through the opening 40 in the pump bulb 26, through the pressure release 42 and the valve 28, and into the flexible tube 32; in the open state, the expelled air from each compression of the pump bulb 26 may be otherwise diverted away from the flexible tube 32.

It would be readily understood that alternative embodiments of inflation sources 26 may also be used. For example, FIG. 2A illustrates a self-contained pressurized gas source, such as a cylinder 50 of compressed air, which may be coupled to the flexible tubing 32 (FIG. 2) via a tank regulator 52. The cylinder 50 and the regulator 52 may be any suitable commercially-available tank and regulator 52 known to those of ordinary skill in the art. The cylinder 50, which is sealed to prevent premature release of compressed air from the cylinder 50, may be coupled to the regulator 52 when the user desires to preserve the consumable liquid 12, in a way that breaches the seal and allows compressed air to enter the regulator 52. Thus, the cylinder 50 may be a single-use device. In other embodiments, the cylinder 50 and the regulator 52 may include a valve (not shown) that enables multiple uses of the same cylinder 50 of compressed air.

In yet another alternative embodiment, and as shown in FIG. 2B, the inflation source 26 may be an air pump 54 that is configured to be coupled to the flexible tube 32 (FIG. 2). The air pump 54 may be any suitable commercially-available air pump that is externally powered, such as via an electric plug (not shown) to an electrical outlet (not shown) or may be battery-powered and thus portable. The source (not shown) may include a switch (not shown) for activating the air pump 54.

Returning again to FIG. 2, the flexible tubing 32 may be constructed with any tube-like shape having a passageway extending through the tube 32 between the first and second ends 30, 34 so as to allow the passage of air or compressed gas therethrough. While any rubber or polymeric material may be used, the flexible tube 32 may be constructed from the guayule-based rubber or like material suitable for use with food and beverage products.

Referring still to FIG. 2, the inflatable bladder 36 is described with some detail. The inflatable bladder 36 may be a balloon-like device having a deflated state and an inflated state. In a deflated state, as shown in FIG. 2, the inflatable bladder 36 is configured to have a narrow profile so that it may slide through the opening 18 of the container 10 with relative ease. Thus, the cross-sectional dimension of the inflatable bladder 36 in the deflated state need only be less than the...
diameter, or other cross-sectional dimension, of the opening 18. In an inflated state, which is shown in FIG. 4, the inflatable bladder 36 may be substantially spheroid in shape. Accordingly, the spheroid inflated state may have a dimension, positioned within a plane 60 extending transversely through the inflatable bladder 36 that substantially matches a cross-sectional dimension of the volume 20 within the container 10. For example, the spheroid inflated state may have a diameter, which is maximal within the plane 60, that substantially matches the inner cross-sectional diameter of the container 10. It would be readily understood that, while not shown, an inflation bladder have an elliptical or oval-shaped inflated state may be appropriate for a container having an oval cross-sectional shape. Accordingly, other shapes and sizes of the inflation bladder may be used.

[0033] The inflatable bladder 36 may be constructed of various elastic polymeric materials, and it may be advantageous to construct the inflatable bladder from a guayule-based rubber material. In still other embodiments, the inflatable bladder may be constructed from a natural rubber, latex, MYLAR, YULEX, VYTEX, polyisoprene synthetic rubber or other like material.

[0034] Further, while not required, the pump bulb 26 and/or the inflatable bladder 36 may be manufactured to be a color that is similar to the liquid to be preserved. For example, the pump bulb 26 and the inflatable bladder 36 may be a dark red or purple color for red wines, while the pump bulb 26 and the inflatable bladder 36 may be a light yellow or greenish color for white wines.

[0035] The connector 38 is shaped and sized to be received by an opening 62 of the inflatable bladder 36 and to extend between the second end 34 of the flexible tube 32 and the inflatable bladder 36. In some embodiments, the connector 38 may be permanently coupled to the opening 62 of the inflatable bladder 36 or to the second end of the flexible tube 32.

[0036] Referring now to FIGS. 3A-3C, one exemplary method of using the sealing device 24 is described in greater detail. As shown in FIGS. 3A and 3B, the sealing device 24 is assembled and the inflatable bladder 36 in the deflated state is inserted through the opening 18 of the container 10 holding the liquid 12, respectively. The inflatable bladder 36, in its deflated state, is lowered into the volume 20 of the container 10 until the inflatable bladder 36 resides on a surface 64 of the liquid 12. Then, as shown in FIG. 3C, the user may repeatedly actuate the pump bulb 26 so as to expel air from the pump bulb 26. Because the pressure release 42 is in the closed position, the air enters the flexible tube 32 and ultimately the inflatable bladder 36. With successive compressions of the pump bulb 26, the fluidic-pressure within the inflatable bladder 36 increases and applies an outwardly-directed force to the inside surfaces of the inflatable bladder 36. Accordingly, the inflatable bladder 36 expands to the inflated state. The user continues increasing the fluidic-pressure by further compressing the pump bulb 26 until an outer surface of the inflatable bladder 36 touches the inside surface of the container 10, thereby creating an air-tight seal at the surface 64 of the liquid 12.

[0037] When the user desires to further consume or otherwise dispose of the liquid 12, the pressure release 42 may be opened. In this way, the air within the inflatable bladder 36 may be expelled from the inflatable bladder 36 and the fluidic-pressure within the inflatable bladder 36 decreases. With sufficient pressure release, the inflatable bladder 36 returns to a deflated state and is easily removed from the surface 64 of the liquid 12 and from the volume 20 within the container 10 via the opening 18 of the container 10.

[0038] Turning now to FIG. 5A, an alternate embodiment of the sealing device 24 is described. As shown, the sealing device 24 may further include a cap 70 having a top portion 72 and a cylindrical portion 74 extending away from the top portion 72. The cap 70 is configured to cover the opening 18 of the container 10 while the sealing device 24 is in use. The cap 70 may be moveable along the flexible tube 32 so that the proper amount of tube 32 may be positioned within the volume 20 of the container 10 and to accommodate any portion of liquid 12 within the container 10 (i.e., a nearly full container versus a nearly empty container) and/or any size or shape of container 10. In use, when the inflatable bladder 36 (FIG. 4) is in the inflated state, the cap 70 may slide along the flexible tube 32 and loosely sit at the opening 18 such that the top portion 72 resides above the opening 18 and the cylindrical portion resides loosely within the opening 18.

[0039] FIG. 5B illustrates yet another embodiment of the cap 80 also configured to cover the opening 18 of the container 10 while further sealing the container 10. In this embodiment, the cap 80 may be constructed from a plastic or rubber material and includes a top portion 82 and cylindrical portion 84 extending away from the top portion 84. A compression fitting 96, such as a plurality of flexible ribs, may be coupled to the outer surface of the cylindrical portion 84. The compression fitting 86 may be sized and shaped to accommodate all standard bottle sizes. Like the cap 70 of FIG. 5A, the cap 80 is configured to slide along the length of the flexible tube 32. In use, once the inflatable bladder 36 (FIG. 4) is inflated, the cap 80 may slide along the flexible tube 32 to the opening 18 of the container 10. The cap 80 is then pressed into the opening 18 such that the compression fitting 86 seals the opening 18 of the container 10.

[0040] FIGS. 6A-6F illustrate various alternative embodiments of inflatable bladders, all within the scope of the invention. While various specific embodiments are shown, the invention should not be limited to only those inflation bladder shapes that are specifically illustrated.

[0041] FIG. 6A illustrates one alternative embodiment of a compressible bladder 90 having an O-ring shape that is configured to form a seal around the inside perimeter surface of the container 10. The O-ring shaped compressible bladder 90 may be comprised of a solid, compressible material forming an outer tube portion 92 that is generally circular in its resting state. A thin elastic-type film 94 may span within the tube portion 92. An actuator 96, illustrated herein as one or more rods, may be coupled to either of the tube portion 92 or the elastic film 94, and may extend proximally away from the compressible bladder 90. In use, and according to one embodiment, the compressible bladder 90 is compressed, or otherwise folded, to a dimension that is sufficiently small to enter the opening 18 in the container 10. After the compressible bladder 90 is within the volume 22 of the container 10, the compressible bladder 90 expands to its unconstrained, O-ring shape, which may seal against an inner surface of the container 10. The user may then apply a downwardly-directed force onto one or more rods 96 to advance the compressible bladder 90 to the surface 64 of the liquid 12. To remove the compressible bladder 90, one of the one or more rods 96 may be directed downwardly such that the compressible bladder 90 is tilted within the volume 22 of the container 10. The
compressible bladder 90 may then be pulled proximally to the opening 18 (FIG. 1) of the container 10 and pulled through the opening 18 (FIG. 1).

[0042] In an alternate embodiment, though not shown, the O-ring shape of the compressible bladder 90 is coupled to the flexible tube 32 (FIG. 4), as described previously. Accordingly, the compressible bladder 90 is inserted into the container 10 in a deflated state and then inflated as described above. Because only the O-ring shape of the compressible bladder 90 need be inflated, inflation of the compressible bladder 90 would need less air (or successive compressions of the pump bulb 26) to seal the liquid 12 at its surface 64.

[0043] In FIG. 6A, another embodiment of a compressible bladder 100 that is similar to the compressible bladder of FIG. 6, but that includes an umbrella shape is shown. Accordingly, the umbrella shape may include a plurality of ribs 102 having an elastic or rubber covering 104 that covers an outer surface of the plurality of ribs 102 and is configured to form a seal at the surface 64 of the liquid 12. A tube 106 extends away from the ribs 102 and film 104 and is coupled to the ribs 102 by way of collapsible stretchers (not shown) that extend to a runner (not shown) that slides with respect to the tube 106. A natural rubber or like material may cover the ribs 102, the collapsible stretchers, and runner so as to protect the internal mechanical workings of the compressible bladder 100.

[0044] In use, the compressible bladder 100 operates in a manner that is similar to an umbrella. That is, the compressible bladder 100, in a closed state, is lowered into the container 10 and to the surface 64 of the liquid 12. The compressible bladder 100 would then be moved to an open state from an external mechanism (not shown) that would slide the runner downwardly along the tube 106, which radially expands the collapsible stretchers and forces the plurality of ribs 102 outwardly until the film 104 contacts the inner surface of the container 10. Removing the compressible bladder 100 would include reversing the operation such that the runner is advanced upwardly along the tube 106 (i.e., toward the opening 18 of the container 10), which releases the collapsible stretchers and plurality of ribs to the closed state.

[0045] Turning now to FIG. 6C, yet another embodiment of a compressible bladder 110 that is similar to the compressible bladder 90 of FIG. 6A, is shown. Accordingly, similar parts are labeled within similar reference numerals.

[0046] In this particular embodiment, three rods 96' are shown and that are coupled directly to the outer tube 92'. The three rods 96' are configured to be retracted and extended with respect to a tube 112 in order to compress, or otherwise collapse, the outer tube 92' to a dimension that allows the outer tube 92' to be inserted through the opening 18 of the container 10. The rods 96' may also be used to position the outer tube 92' within the volume 20 of the container 10, to advance the compressible bladder 110 to the surface 64 of the liquid 12, to position the collapsible bladder 110 within the container 10, and to remove the collapsible bladder 110 as was described above.

[0047] FIGS. 6D-6E illustrate still another embodiment of an inflatable bladder 114, having a sleeve 115a of sealing rubber surrounding a central tube 116. The sleeve 115a rests on top of a ring 117. A plunger 118 residing above the sleeve 115a and moveable along the length of the tube 116 may be advanced downwardly, thereby causing the sleeve 115a to expand radially outwardly to a ring 115b that substantially covers the ring 117 and forms a seal with the container 10.

[0048] FIG. 7 illustrates another embodiment of an inflation source 120. In particular, the inflation source 120 may include a thumb-style mechanical pump having a thumb tab 122 extending proximally from a holder 124. Accordingly, the user holds the holder 124 between two or more fingers while the user's thumb actsuates the thumb tab 122. Successive compressions of the thumb tab 122 inflate an inflation bladder, which may be any embodiment within the scope of the invention.

[0049] Various embodiments of a device and method for preventing the degradation of a consumable liquid have been described and may be used to reduce and/or prevent the degradation and/or oxidation of gelatinous materials, solid materials, or gaseous materials. Moreover, one having ordinary skill in the art will appreciate that embodiments of the invention may be used in other shaped containers and should not be limited to the particular shaped container illustrated or described herein.

[0050] While the present invention has been illustrated by a description of various embodiments, and while these embodiments have been described in some detail, they are not intended to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. The various features of the invention may be used alone or in any combination depending on the needs and preferences of the user. This has been a description of the present invention, along with methods of practicing the present invention as currently known. However, the invention itself should only be defined by the appended claims.

What is claimed is:

1. A sealing device for reducing the degradation of a consumable liquid within a container, the sealing device comprising:
   an inflation source;
   a bladder configured to reside on a surface of the consumable liquid within the container, the inflatable bladder having a first state and a second state; and
   a flexible tubing connecting the pump to the inflatable bladder,
   wherein the bladder in the first state is configured to enter the container and in the second state forms a seal with the container at the surface of the consumable liquid.

2. The sealing device of claim 1, wherein the inflation source is one of a pump bulb, a compressed air source, or an air pump.

3. The sealing device of claim 1, wherein the inflation source further comprises:
   a pressure release configured to retain a fluidic-pressure within the bladder and the flexible tubing.

4. The sealing device of claim 1, wherein the bladder includes a balloon or an outer tube.

5. A sealing device for reducing the degradation of a consumable liquid within a container, the sealing device comprising:
   a collapsible bladder having an expanded state and a collapsed state; and
   an actuator coupled to the collapsible bladder and configured to transition the collapsible bladder between the expanded and collapsed states,
   wherein the bladder in the collapsed state is configured to enter the container and in the expanded state forms a seal.
with the container at the surface of the consumable liquid.

6. The sealing device of claim 5, wherein the actuator includes one or more rods extending away from the collapsible bladder.

7. A method of preserving a consumable liquid within a container, the method comprising:
   inserting an expandable bladder through an opening and into the container;
   directing the expandable bladder to a surface of the consumable liquid within the container; and
   expanding the expandable bladder so as to form a seal with an inner surface of the container at the surface of the consumable liquid.

8. The method of claim 7, wherein the expandable bladder is inflatable and expanding the expandable bladder further comprises:
   pumping air into the expandable bladder.

9. The method of claim 8, wherein pumping air into the expandable bladder includes actuating a pump bulb, releasing air from a cylinder of compressed air, or activating an air pump.

10. The method of claim 7, wherein the expandable bladder is compressible and the method further comprises:
    compressing the expandable bladder to a first, collapsed state so as to direct the expandable bladder through the opening; and
    releasing the expandable bladder to a second, extended state to form the seal.

11. The method of claim 10 further comprising:
    releasing the seal by collapsing the expandable bladder; and
    removing the expandable bladder from the volume within the container.