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Meyers et al.

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[54] **ANTI-CHOLIC FEEDING DEVICE**

[75] Inventors: **Cornelius B. Meyers**, late of Holland, Mich.; **Ralph J. Miolla, Jr.**, Ft. Lauderdale, Fla.

[73] Assignees: **Ralph J. Miolla, Jr.**, Ft. Lauderdale, Fla.; **Carol J. Vander Hooning**, Holland; **Lois Pasma**, Grandville, both of Mich.; **Herbert Wagemaker, Jr.**, Gainesville, Fla.; part interest to each by said Harold F. Schumacher and Ralph J. Miolla, Jr.

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[52] **U.S. Cl.** ..... **215/11 B**

[51] **Int. Cl.** **A61j 9/04**

[58] **Field of Search** ..... 215/11 D, 11 B, 75; 137/537, 539, 535

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Primary Examiner—Donald F. Norton
Attorney—Price, Heneveld et al.

[57] **ABSTRACT**

Replacement air is introduced to a baby bottle or the like through a ball valve as fluid is removed by sucking. The valve housing is integral and comprised of an elastomeric material. The housing includes a resilient integral rib which urges the ball into a flow blocking position regardless of the orientation of the bottle except during the removal of fluid.

10 Claims, 5 Drawing Figures

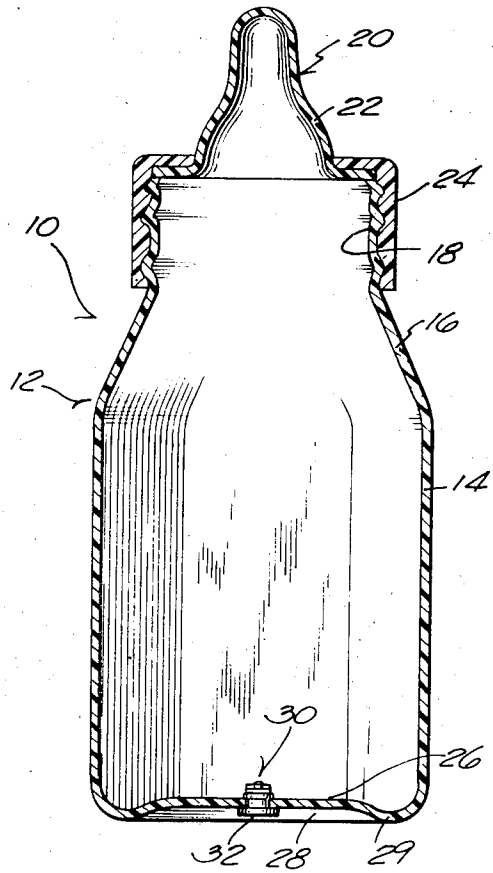


Fig. 1

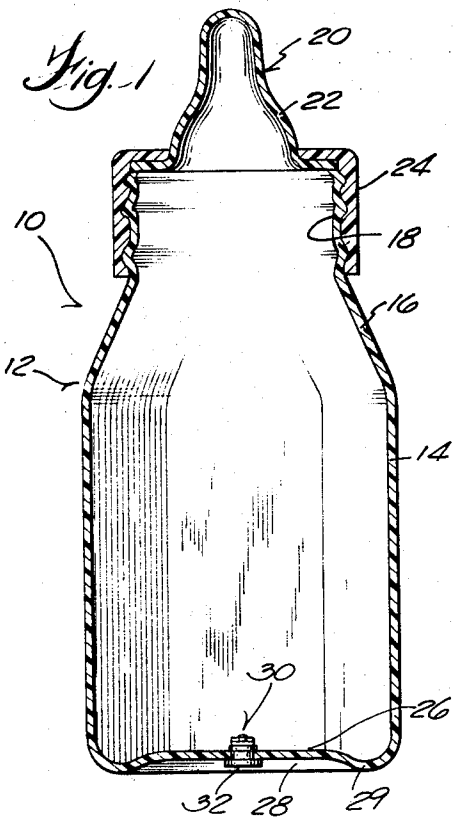
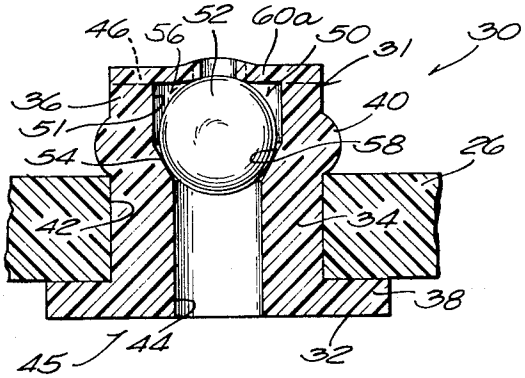


Fig. 2



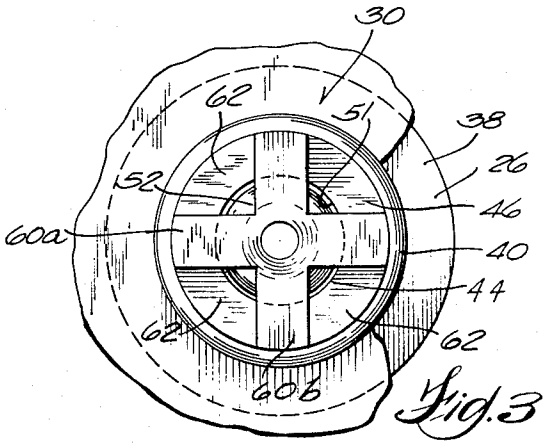


Fig. 3

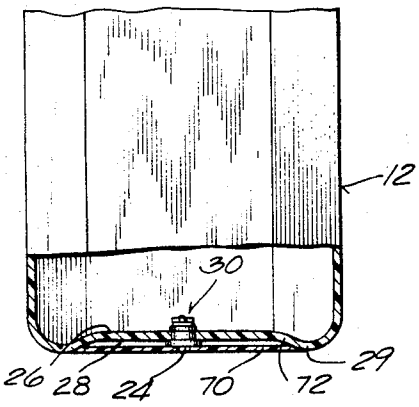


Fig. 5

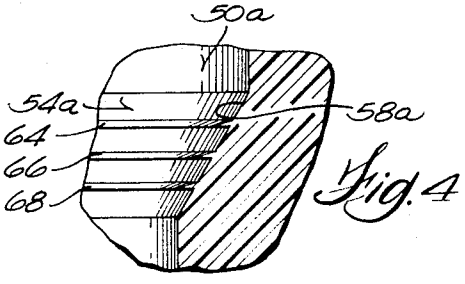


Fig. 4

Inventor

By

Attorney

ANTI-CHOLIC FEEDING DEVICE

BACKGROUND OF THE INVENTION

This invention relates to containers incorporating a means for permitting the entry of replacement air into the interior thereof as fluid is withdrawn. More particularly, the invention relates to an anti-cholic device particularly adapted for use in the feeding of infants.

Conventional baby bottles are comprised of a glass or plastic container having a nipple affixed to the top thereof. A problem long recognized in bottle feeding infants is that created when the air pressure within and without the container is not equalized as milk is drawn through the nipple by the infant. Predictable results are nipple collapse and/or air bubbling of the milk. The swallowing of air by the infant being fed either because of a collapsed nipple or because of air entrapment in the milk usually results in gaseous discomfort to the infant and, in extreme cases, may lead to serious feeding problems.

Although the problem has been recognized for some time, a satisfactory solution has not materialized. The prior art is replete with various proposals which among others include the utilization of a collapsible bag within the container or the provision of a valve in the container wall. Those devices which utilize a bag which collapses as the milk is withdrawn from the bottle having been generally successful in reducing substantial air intake of the infant, but unfortunately have proven to be quite expensive and bothersome to fill as well as presenting a sterilization problem in certain instances.

Previously proposed devices embodying a valve structure in the container have not been particularly successful for several reasons. One drawback has been the failure of the valves to positively seal the container when it was not in use. Where the bottle is filled in the home, leakage is an annoying problem and can be serious in terms of sanitation. Whre the bottle is filled at a central location for commercial distribution, however, the problem is magnified because of shelf life, distribution, overall sanitation and the like. A second improtant disadvantage of existing proposals is the inability in many cases to assure immediate closure of the valve when the child stops sucking unless the bottle is in an upright position. When this happens, small amounts of milk will on occasion seep into the back side of the valve and even though no leakage is ascertained, slight contamination and clogging is developed. Over a period of time, this can become a serious problem both with respect to the operation of the valve and the sanitation thereof. Existing proposals which attempt to overcome this problem have had varying amounts of success. However, in all cases, the valve mechanism has been too complex and involved in manufacture. A basic drawback to all the proposals embodying the valve structure in the container has been their expense.

Thus, there is a need in this art for a device which permits the introduction of replacement air into a container as fluid is removed therefrom. More importantly, there is a need for such a device which immediately closes the inlet passageway when removal of the fluid ceases regardless of the orientation of the container. Finally, there is a need for a device of the type described which can be economically manufactured.

SUMMARY OF THE INVENTION

A container such as a bottle utilized for feeding infants fluid generally includes a removable cover member containing a feeding nipple permitting infants to extract the fluid by sucking. In accordance with the invention, a valve means including a valve housing with a flow passageway therethrough is secured in one of the walls of the container so that the passageway communicates between the interior and exterior of the container. The valve is movable between an opened position wherein replacement air is permitted into the container as fluid is extracted therefrom and a closed position wherein flow into or out of the container through the valve is prevented. The housing includes means integral therewith urging the valve into the closed position regardless of the orientation of the container except when fluid is being removed by sucking.

In accordance with more narrower aspects of the invention, the valve housing is comprised of an integral elastomeric material and includes a chamber forming a part of the passageway. A ball valve is confined within the chamber for movement against a seat formed therein to block flow through the passageway and a position removed from the seat to permit flow therethrough. A resilient means integral with the housing extends across the passageway for constant engagement with the ball to urge it against the seat. The resiliency permits removal of the ball from the seat when fluid is removed from the container by sucking. The valve housing includes an inner and outer spaced shoulder, the latter being squeezable through an aperture in the container thereafter expanding to retain the housing in a fixed position. The elastomeric material squeezes around the aperture to provide a seal between the housing and container to prevent leakage of fluid through the aperture. In yet another narrower aspect of the invention, the valve means is positioned in the bottom of the container which bottom is recessed upwardly to permit the insertion of a cap over the valve which cap adds additional sealing assurance.

The valve means provided by the invention can be mass produced in a mold and provides significant cost reduction over existing proposals since the entire mechanism is comprised of two parts, the housing and ball. The utilization of a resilient means which urges the ball on the valve seat regardless of the orientation of the container assures complete cessation of flow into or out of the container through the valve passageway except during removal of the fluid by sucking. By utilizing an elastomeric material such as silicone rubber, which material is autoclavable, the container and valve can be completely sterilized after each use.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a cross sectional view of a feeding device constructed in accordance with the teachings of this invention;

FIG. **2** is a fragmentary, cross-sectional view illustrating the novel valve mechanism and its sealing relationship to the container body;

FIG. **3** is a fragmentary plan view of the interior bottom wall of the container;

FIG. **4** is a fragmentary, cross-sectional view illustrating an alternative seat portion of the valve; and

FIG. **5** is a fragmentary, cross-sectional view similar to FIG. **1** illustrating an alternative embodiment utiliz-

ing a sealing cap in accordance with the teachings of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a novel feeding device 10 which comprises a bottle 12 having generally cylindrical sidewalls 14, a frusto-converging neck section 16 and a threaded top 18. A nipple assembly 20 is conventional and includes a nipple 22 secured to bottle 12 by means of a threaded attachment ring 24. Ring 24 seals nipple 22 to top 18 to permit removal of fluids within bottle 12 by sucking. The bottom wall 26 of container 12 is recessed upwardly to form a pocket 28 between the exterior surface of bottom 26 and an annular surface 29 upon which the bottle rests in an upright position.

Referring now additionally to FIGS. 2 and 3, the valve assembly, indicated generally by the reference numeral 30, is affixed to container 12 on the lower surface or bottom 26. The overall profile of valve assembly 30 is designed such that its lowermost surface 32 of valve assembly 30 does not extend to the lowermost plane formed by annular surface 29. This permits normal vertical support of bottle 12 when positioned on a flat surface such as a countertop or the like. In fact, it is preferably spaced from the plane of annular surface 29 as shown in FIG. 1 to permit the utilization of a sealing cap 70 which will be described in more detail hereinafter.

Valve assembly 30 (FIG. 2) is comprised of a housing 31 and ball 52. The housing includes a central cylindrical body section 34 terminating in an upper section 36 and a lower enlarged cylindrical section 38. Upper section 36 includes an enlarged annular shoulder section 40 which projects radially beyond the outer surface of the upper and central cylindrical sections 34 and 36. The lower section 38 of housing 31 defines a lower shoulder which is spaced from upper shoulder 40 a distance approximately equal to the thickness of bottom wall 26. An aperture 42 is provided in bottom wall 26 and due to the flexibility of housing 31 to be described hereinafter, the diameter of upper shoulder 40 contracts to permit its passage through aperture 41. The resilient characteristics of housing 31 causes shoulder 40 to expand to its original configuration after its contracted passage through aperture 42 to retain valve assembly 30 in a fixed position relative to bottom wall 26 as a result of the peripheral portions of aperture 42 being disposed between annular shoulders 38 and 40. By spacing shoulders 38 and 40 a distance approximately equal to the thickness of bottom wall 26, and dimensioning the diameter of central cylindrical body section 34 to provide a tight wedge fit with the sides of aperture 42, the valve housing is sealed in aperture 42 to prevent leakage of any fluid contained within container 12 between the aperture sides and valve housing surface. Any remaining tendency toward leakage of this type may be obviated by utilizing a small amount of non-toxic glue or by heat sealing the housing to the bottle.

Valve housing 31 includes a central passageway 44 extending completely through the housing from its lower surface 32 to its upper surface 46. Passageway 44 communicates between the interior and exterior of the container to permit the flow of replacement air into container 12 as fluid is extracted through nipple 22. The upper section 36 of valve housing 31 includes a chamber having an enlarged cross-section relative to the lower portion 45 of passageway 44. Chamber 50, however, forms a part of passageway 44, and is adapted to receive a sphere or ball 52 (preferably stainless steel) which likewise has a diameter exceeding the lower portion of passageway 44. Chamber 50 is comprised of a ball receiving seat portion 54 which when in receipt of ball 52 closes valve assembly 30 to prevent flow through passageway 44. Chamber 50 also includes a non-seat portion 56 which receives ball 52 in a non-seated position to permit flow through passageway 44 around ball 52.

Seat portion 54 includes an annular inclined face 58 forming the transistion between the lower portion 45 of passageway 44 and the upper enlarged chamber wall 51 of chamer 50. With the diameter of ball 52 exceeding that of the lower portion, when the ball is engaged on surface 58, flow through passageway 44 is prevented. The diameter of ball 52 however is less than the greater diameter of chamber 50 so that when ball 52 is removed from seat portion 54 into non-seat portion 56, flow of air around ball 52 through passageway 44 is permitted to replenish the evacuation of fluid from container 12 by sucking.

Ball 52 is confined within chamber 50 by a pair of rib-like members 60*a* and 60*b* which are integrally formed as part of upper end 46 of valve housing 31. Preferably, ribs 60*a* and 60*b* traverse each other at right angles and are integral with each other at their point of traverse. Although ribs 60*a* and 60*b* are positioned across the upper opened end of passageway 44, they are dimensionally narrow with respect to their length to form pie-shaped openings 62 (FIG. 3) permitting free flow through passageway 44 when ball 52 is positioned in non-seat portion 56.

Ribs 60*a* and 60*b* provide two important and separate functions. Firstly, they act as keepers to confine ball 52 within chamber 50. Secondly, they are arranged to urge ball 52 against seat 58 regardless of the orientation of container 12. As a result of the elastomeric composition of housing 31 which includes ribs 60*a* and 60*b*, the ribs permit movement of ball 52 into non-seat portion 56 as a result of the pressure differential acting on ball 52 caused by sucking on nipple 22. That is, during sucking, the pressure within container 12 is reduced relative to the ambient pressure which pressure differential causes slight stretching of the rib members and movement of ball 52 into non-seat portion 56 to permit flow of replacement air through passageway 44. As replacement air flows into container 12, the pressure differential is maintained only by further sucking. Therefore, as soon as removal of fluid from container 12 ceases upon the cessation of sucking, the pressure differential approaches zero and the resilient characteristic of ribs 60*a* and 60*b* immediately urge ball 50 to back into seat section 54. A preferred form of achieving the bias on ball 52 by ribs 60*a* and 60*b* is to dimensionally limit the longitudinal distance of chamber 50 so that when ball 52 is placed therein, it projects beyond the outer end 46 of chamber 50 even when seated against surface 58. By extending ribs 60*a* and 60*b* across end 46, they will thus be flexed outwardly at all times regardless of the position of ball 52 within chamber 50. Hence, the resiliency of ribs 60*a* and 60*b* constantly urge ball 52 against seating surface 58. The utilization of a pair of ribs 60*a* and 60*b* has been found to urge ball 52 centrally with respect to passageway 44 although it

will be appreciated that a single rib will function adequately.

The force generated on ball **52** by the resilient characteristic of ribs **60***a* and **60***b* adequately seals ball **52** against surface **58** under normal conditions. A preferred alternative is shown in FIG. **4** wherein surface **58***a* is shown having a plurality of inwardly projecting annular flange portions **64, 66** and **68.** The flanges are spaced axially along incline seating surface **58** and have a diverging cross section to form a plurality of flexible and resilient lips for receiving ball **52** when seated against surface **58***a*. The utilization of one or more lips or flanges such as shown in FIG. **4** increases the area of sealing contact surface between seat portion **54***a* of chamber **50***a* thereby increasing the effect of the seal.

The preferred elastomeric composition of valve housing **31** has been alluded to previously. The composition has been found to provide extremely good sealing characteristics as well as providing a material from which the valve housing can be formed in a mass-produced economical fashion. The resilient characteristic permits the valve housing to be quickly and efficiently squeezed into the aperture in the container bottom for immediate expansion of shoulder **40** once it is inserted. In addition, it permits formation of the valve housing without requiring the insertion of ball **52** until it is formed. The resilient and flexible characteristics of the housing permits insertion of ball **52** through the lower portion of passageway **44** even though the diameter significantly exceeds that of the lower portion. Thus, the entire valve assembly is essentially comprised of two elements, housing **31** and ball **52.** The movement of ball **52** includes some rotational movement as the valve is operated which almost completely eliminates any tendency of clogging in seat portion **54.** Since ball **52** is comprised preferably of stainless steel, and is the only non-elastomeric element in the valve assembly, the valve is not subject to clogging or deterioration by any chemical reaction with the lactic acid present in milk. Silicone rubber has been found to provide the desired flexible and resilient characteristics and is autoclavable to permit complete sterilization of the container and valve after each use. There exists, additionally, other suitable materials as will be readily appreciated by those skilled in the art.

Referring now to FIG. **5,** an alternative arrangement is shown wherein feeding device **10** in addition to valve assembly **30** includes a cover **70** positionable within pocket **28** without interfering with the normal vertical support of bottle **12** when resting on a flat surface such as a countertop or the like. Cover **70** provides alternative and additional insurance for proper sealing between valve assembly **30** and bottom wall **26** of container **12.** Cover **70** is preferably in the form of a relatively flat disc having a diameter permitting its placement in pocket **28** with its peripheral edges fitting against the incline portion **72** of pocket **28** which causes bottom portion **26** to be recessed from the lowermost surface **29.** The overall combined thickness of cover **70** and shoulder portion **38** of valve housing **31** is approximately equal to the depth of pocket **28** so that cover **70** does not project beyond the lowermost plane defined by support surface **29.** Cover **70** includes an opening **74** which is aligned with passageway **44** when cover **70** is positioned in pocket **28** to permit free flow of replacement air through valve assembly **30.** Cover **70** is preferably affixed along its entire periphery to incline surface **72** by an appropriate adhesive or electronic weld.

Although more than one embodiment has been shown and described in detail, it will be obvious to those having ordinary skill in this art that the details of construction of the particular embodiments shown may be modified in a great many ways without departing from the unique concepts presented. It is, therefore, intended that the invention is limited only by the scope of the appended claims rather than by particular details of construction shown, except as specifically stated in the claims.

We claim:

1. In an anti-cholic feeding device for infants having a walled container adapted to receive a feeding nipple permitting infants to extract fluid contained therein by sucking and a valve means permitting the entry of air into the container to replace fluid extracted through the nipple, the improvement comprising: a one-piece valve housing having an air passageway extending therethrough, said housing extending through one of the walls of said container and being secured thereto such that said passageway communicates between the interior and exterior of said container, said housing having a walled chamber adapted to receive a movable sealing member within and forming a part of said passageway, said chamber including a member-receiving seat portion for sealingly receiving said member when said feeding device is not in feeding use and a non-seat portion into which said member is movable when said device is in feeding use; a movable sealing member positioned and confined within said chamber, said member, in conjunction with said seat portion preventing leakage of fluid from said device through said passageway when said device is not in feeding use, said sealing member having a cross-sectional width less than the cross-sectional spacing of the walls of said non-seat portion thereby permitting the flow of air into said container around said member when said device is in feeding use; and means formed with an integral with said housing in constant flexed engagement with said sealing member for resiliently urging said sealing member into said seat portion during non-use regardless of the orientation of said container, said means extending across said passageway bu defining openings to permit air flow therethrough, said means yielding to permit said sealing member to move into said non-seat portion upon the instigation of sucking through said nipple to permit the flow of replacement air through said passageway and openings, said valve housing being resiliently expandable to permit insertion of said sealing member into said chamber through said passageway.

2. The device according to claim **1** wherein said walled container has an aperture therein and wherein said housing has an outer shoulder adpated to seat entirely against said walled container around said aperture, said housing further including a inner shoulder spaced from said outer shoulder approximately the thickness of said walled container, said inner shoulder being diametrically larger than said aperture and resilient for passage through said aperture and thereafter expanding to retain said housing in a fixed position with said container, said inner and outer shoulder providing a seal between said housing and container.

3. The device according to claim **1** wherein said means urging said sealing member is comprised of a resilient rib-like member extending across said passage-

way, said rib-like member being formed as one-piece with said valve housing of the same material.

4. The device according to claim 3 wherein said means for urging said sealing member against said seat portion includes a pair of said rib-like members, each of said ribs being formed as one-piece with said housing, said ribs traversing each other and being integral with each other at their points of traverse.

5. In a walled container having a valve means for permitting entry of air into the container as the fluid contained therein is expelled, the improvement comprising: a one-piece integral valve housing comprised of an elastomeric material and having an air passageway extending therethrough, said housing extending through one of the walls of said container and being secured thereto such that said passageway communicates between the interior and exterior of said container, said housing having a chamber adapted to receive a movable sealing member within and forming a part of said passageway, said chamber including a member-receiving seat portion for sealingly receiving said member when said container is not expelling fluid and a non-seat portion into which said member is movable when said container is expelling fluid; a movable sealing member positioned and confined within said chamber; and means formed with and integral with said housing for resiliently urging said sealing member into said seat portion to block flow through said passageway when fluid is not being withdrawn from said container by sucking, said means extending across said passageway and defining openings to permit air flow through said means, said means being resiliently expandable to permit movement of said seating member into said non-seat portion to permit flow through said passageway to equalize the pressure in said container when fluid is withdrawn, said valve housing being resiliently expandable to permit insertion of said sealing member into said chamber through said passageway.

6. The improvement according to claim 5 wherein said passageway includes a first portion extending from the exterior of said container to said chamber, said chamber having a diameter exceeding that of said first portion, said seat portion including an annular wall interconnecting said chamber to said first passageway portion, said seating member comprising a ball-shaped element urged for seating engagement against said annular wall to prevent flow of air through said passageway when seated thereon, said means for urging said ball against said seating portion comprising a resilient rib-like member extending across said passageway and anchored on each end, said member extending across the end of said passageway opening into said container for engagement with said ball-shaped element to urge said seating member in said seat portion, said ball-shaped element to urge said seating member in said seat portion, said ball-shaped element having a diameter less than the diameter of said chamber to permit flow through said passageway when said ball-shaped element is positioned in said non-seat portion.

7. The device according to claim 5 wherein said container is generally cylindrical in shape, said valve means being disposed in one of the extremities of said container comprising the base of said container, the base of said container being recessed inwardly to form a pocket for receipt of said housing so that when said housing is positioned in said extremity, said housing is spaced from the lowermost plane of said base, said improvement further including a cover positionable across said base within said recess, said cover being fixed to said base to provide an additional seal between said housing and said container, said cover having one surface generally flush with the lowermost plane of said base and the opposite surface engaged with said housing, said cover having an opening therethrough which is aligned with said passageway when affixed to said base.

8. The improvement according to claim 5 wherein said seat portion includes an annular wall interconnecting said chamber to said first passageway portion, said annular wall being inclined relative to said first portion and chamber and including at least one annular flange projecting inwardly toward the axis of said passageway, said annular flange forming a continuous lip being resiliently depressible by said sealing member toward said first passageway portion to increase the contact surface between said ball and seat portion to facilitate positive seating.

9. In a walled container having a valve means permitting the entry of air into the container to replace fluid extracted therefrom, the improvement comprising: a valve housing having an air passageway extending therethrough, said housing extending through one of the walls of said container and being secured thereto such that said passageay communicates between the interior and exterior of said container, said walled container having an aperture therein, said valve housing having an outer shoulder adapted to seat entirely against said walled container around said aperture providing a seal between said housing and container, said container having a general cylindrical shape, said valve means disposed in one extremity, said one extremity comprising the base of said container and being recessed inwardly to form a pocket for rceipt of said housing so that once said housing is positioned in said one extremity, said housing does not project into the lowermost plane of said base; said housing when positioned in said one extremity being spaced from the lowermost plane of said base, said device further including a cover positionable across said base within said recess, said cover being fixed to said base to provide an additional seal between said housing and said container, said cover having one surface generally flush with the lowermost plane of said base and the opposite surface engaged with said outer shoulder, said cover having an opening therethrough which is aligned with said passageway when affixed to said base.

10. In a walled container having a valve means permitting the entry of air into the container to replace fluid extracted therefrom, the improvement comprising: a valve housing having an air passageway extending therethrough, said housing extending through one of the walls of said container and being secured thereto such that said passageway communicates between the interior and exterior of said container, said housing having a walled chamber adapted to receive a ball-shaped sealing member movably confined within said chamber and forming a part of said passageway, said chamber including a seat portion for receiving said sealing member when said container is not in use and a non-seat portion into which said sealing member is movable when said device is in use; said sealing member in conjunction with said seat portion and said non-seat portion preventing leakage of fluid from said device through said passageway when said device is not

in use but permitting flow of air into said container when said device is in use, said passageway including a first portion extending from the exterior of said container to said chamber, said chamber having a diameter exceeding that of said first portion, said seat portion including an annular wall inclined relative to said first portion and chamber, said annular wall including at least one annular flange porjecting inwardly toward the axis of said passageway, said annular flange forming a continuous lip being resiliently depressible toward said first passageway portion to increase the contact surface between said ball and seat portion to facilitate positive seating and means for resiliently urging said sealing member into said seat portion during non-use regardless of the orientation of said container, said member yielding to permit said sealing member to move into said non-seat portion upon the instigation of removal of fluid from said container to permit the flow of replacement air through said passageway.

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