(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 November 2011 (03.11.2011)

PCT

(10) International Publication Number
WO 2011/137413 A1

(51) International Patent Classification:
A61J 9/00 (2006.01)

(21) International Application Number:
PCT/US2011/034703

(22) International Filing Date:
30 April 2011 (30.04.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/330,263 30 April 2010 (30.04.2010) US

(71) Applicant *(for all designated States except US)*: **MEDICAL INSTILL TECHNOLOGIES, INC.** [US/US]; 201 Housatonic Avenue, New Milford, CT 06776 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **PY, Daniel** [FR/US]; 1 Helena Avenue, Larchmont, NY 10538 (US). **CHAN, Julian** [US/US]; 52 Belair Drive, New Milford, CT 06776 (US). **WILLEY, Jeffrey** [US/US]; 35 Hidden Brook Drive, Brookfield, CT 06804 (US).

(74) Agents: **GIARRATANA, Mark D.** et al.; McCarter & English, LLP, Cityplace I, 185 Asylum Street, Hartford, CT 06103-3495 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) **Title**: READY TO FEED CONTAINER AND METHOD

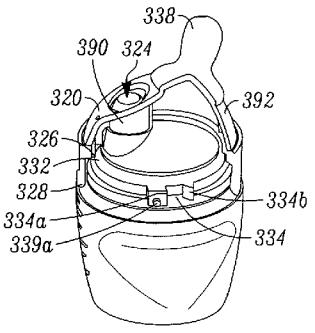

FIG. 23

(57) **Abstract**: A container including a body defining an outflow opening and at least one chamber adapted for storing a product, such as a fat containing liquid product, and a container closure including a primary seal for hermetically sealing the product within the chamber during storage. The container closure includes a sealing member forming a substantially fluid-tight seal between the container closure and the body, and a dispensing member in fluid communication with the chamber. The container closure and body move relative to each other between a first position where the primary seal is seated about the outflow port to hermetically seal the product in the chamber during storage, and a second position where the primary seal is displaced from the outflow port to allow product to pass from the chamber through the outflow port and into dispensing member to dispense the product.

WO 2011/137413 A1

READY TO FEED CONTAINER AND METHOD

CROSS REFERENCE TO PRIORITY AND RELATED APPLICATIONS

[0001] This application claims the benefit under 35 U.S.C. § 119(e) of co-pending U.S. Provisional Application No. 61/330,263 filed April 30, 2010, which is hereby incorporated by reference in their entirety as part of the present disclosure as if fully set forth herein. This patent application contains subject matter that is similar to that disclosed and claimed in co-pending patent application no 12/259,279, filed October 27, 2008, entitled "Ready to Feed Container with Drinking Dispenser and Sealing Member, and Related Method," application no. 12/259,284, filed October 27, 2008, entitled "Liquid Nutrition Product Dispenser with Plural Product Chambers for Separate Storage and Intermixing Prior to Use, and Related Method," and application no. 12/259,290, filed October 27, 2008, entitled "Dispenser with Plural Product Chambers for Separate Storage and Intermixing of Products Prior to Use, and Related Method," all of which claim the benefit of U.S. provisional patent application serial no. 60/983,153, filed October 26, 2007, entitled "Ready to Feed Container with Drinking Dispenser and Sealing Member, and Related Method," all of which are hereby incorporated by reference in their entirety as part of the present disclosure as if fully set forth herein.

FIELD OF THE INVENTION

[0002] The present invention relates to dispensers having sealed chambers, including dispensers having plural chambers for storing separate products, and more particularly, to such dispensers that store aseptically filled products and allow intermixing of such products prior to use, and to related methods.

BACKGROUND INFORMATION

[0003] Drinking containers are used to store and dispense a variety of products. The containers are sterilized, filled, hermetically sealed, and then stored for consumer use. To seal the product within the container, thermoplastic elastomer ("TPE") seals are most often employed. One of the drawbacks of such TPE seals is that they can be difficult to use with fat containing liquid products, such as infant or baby formulas, or other milk-based or low acid

products. For example, many such TPE materials contain leachables that can leach into the fat containing product, or otherwise can undesirably alter a taste profile of the product.

[0004] Another disadvantage of prior art drinking containers is that the TPE seals cover an undesirably large portion of the inner surface area where the product is stored, which increases the product's exposure to TPEs and further contributes to the difficulty in storing fat containing liquid products, such as infant or baby formulas, or other milk-based or low acid products.

[0005] A further drawback of prior art drinking containers, particularly containers for storing fat containing liquid products, such as infant or baby formulas, or other milk-based or low acid products, is that in order to drink or otherwise dispense the product, the screw cap or other type of closure must first be removed from the open mouth of the container. Then, the product is poured into a different container, such as a baby bottle having a nipple, or a container closure having a nipple is screwed onto the open mouth of the container. These procedures not only can be inconvenient and time consuming, but can lead to spillage and/or contamination of the product.

[0006] Another drawback of prior art drinking containers and methods of filling such containers is that the containers may not provide the desired level of safety with respect to asepsis.

[0007] Another drawback of prior art drinking containers is that they do not offer the desired level of convenience with respect to the preparation and feeding, or provide a relatively simple intuitive functionality.

[0008] Another drawback of prior art drinking containers is that the containers may not provide the desired level of comfort to a feeding infant in comparison to natural breast feeding and can contribute to incidents of otitis, i.e. ear infections caused by fluid build-up in the middle ear attributed in some cases to negative pressures generated by the infant during bottle feeding and/or colic. Yet another drawback is such containers can, during tooth development, contribute to orthodontic conditions such as tooth misalignments.

[0009] Another drawback of prior art drinking containers is that after the containers are filled and sterilized, the containers must be sealed and capped in separate stages, effectively reducing manufacturing throughput and increasing manufacturing costs.

[0010] Yet another drawback of prior art drinking containers is that is that once the containers are filled with product, the filled containers must undergo aseptic processing, such as

retort sterilization, where heat is applied to the product, which in turn, can negatively affect the product formulation.

[0011] Another drawback of some prior art dispensers, such as dispensers for storing and dispensing food and beverage products, is that they do not allow for separate products, or components or ingredients of products, such as beverages and dietary and nutritional supplements, to be stored in the dispensers in separate chambers and intermixed shortly prior to use. As a result, such dispensers either do not allow for products containing certain desired combinations of ingredients, or provide products of lower quality than otherwise desired when products with certain combinations of ingredients are stored therein.

[0012] Accordingly, it is an object of the present invention to overcome one or more of the above-described drawbacks and/or disadvantages of the prior art.

SUMMARY OF THE INVENTION

[0013] One advantage of the present invention is that the first liquid product and second product or additive can be aseptically filled in separate chambers that are hermetically sealed relative to each other, and thus prevented from intermixing during storage. Then, when ready for dispensing, the first and second chambers can be placed in fluid communication with each other to intermix the products and dispense the intermixed products. This is particularly advantageous for products that cannot or should not be intermixed during storage, such as probiotic supplements or other additives, and infant formulas or other base liquid products.

[0014] Other objects and advantages of the present invention and/or of the currently preferred embodiments thereof will become more readily apparent in view of the following detailed description of the currently preferred embodiments and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. 1 is a top perspective view of a first embodiment of a container of the present invention.

[0016] FIG. 2 is a side view of the container of FIG. 1.

[0017] FIG. 3 is a top view of the container of FIG. 1.

[0018] FIG. 4A is a cross-sectional view of the container of FIG. 1.

[0019] FIG. 4B is a cross-sectional view of the container if FIG. 1 showing an additional storage chamber.

[0020] FIG. 5A is a top perspective view of the container of FIG. 1 with the container closure removed.

[0021] FIG. 5B is a side view of the container of FIG. 5A.

[0022] FIG. 6A is a side perspective view of the container of FIG. 1 with a portion of the container closure removed and showing the container closure in a first position.

[0023] FIG. 6B is a side perspective view of the container of FIG. 1 with a portion of the container closure removed and showing the container closure in a second position.

[0024] FIG. 7A is an exploded, side perspective view of the container of FIG. 1.

[0025] FIG. 7B is an exploded, side view of the container of FIG. 1.

[0026] FIG. 8 is a front view of a second embodiment of a container of the present invention.

[0027] FIG. 9 is a cross-sectional view of the container of FIG. 8.

[0028] FIG. 10A is a side view of the container of FIG. 8.

[0029] FIG. 10B is a top view of the container of FIG. 8.

[0030] FIG. 11 is a bottom perspective view of the container closure of the container of FIG. 8.

[0031] FIG. 12 is a side perspective cross-sectional view of the container of FIG. 8.

[0032] FIG. 13A is a top-side perspective view of the container of FIG. 8 with the sealing member attached.

[0033] FIG. 13B is a top-side perspective view of the container of FIG. 8 with the sealing member removed.

[0034] FIG. 14A is a side perspective view of the container of FIG. 8 with a portion of the container closure removed and showing the container closure in a first position.

[0035] FIG. 14B is a side perspective view of the container of FIG. 8 with a portion of the container closure removed and showing the container closure in a second position.

[0036] FIGS. 15A-C are top-side perspective views of the container of FIG. 8 during the filling stages.

[0037] FIGS. 16A-B are top-side perspective views of the container of FIG. 8 during the laser resealing stages.

[0038] FIGS. 17A-F is a somewhat schematic illustration of an example of a method of filling, sealing and opening the containers of the present invention.

[0039] FIGS. 18A-F are side perspective and cross-sectional views of nipple variations.

[0040] FIG. 19 is top front perspective view of a third embodiment of a container of the present invention.

[0041] FIG. 20 is top rear perspective view of the container of FIG. 19.

[0042] FIG. 21 is top view of the container of FIG. 19.

[0043] FIG. 22 is side view of the container of FIG. 19.

[0044] FIG. 23 is a side perspective view of the container of FIG. 19 with a portion of the container closure removed and showing the container closure in a first position.

[0045] FIG. 24 is a side perspective view of the container of FIG. 19 with a portion of the container closure removed and showing the container closure in a second position.

[0046] FIG. 25A is a cross-sectional side view of a portion of the container of FIG. 19.

[0047] FIG. 25B is an enlarged portion of the container as shown in FIG. 25A.

DETAILED DESCRIPTION OF THE INVENTION

[0048] In FIGS. 1-5, a container embodying the present invention is indicated generally by the reference numeral 10. The container 10 comprises a body 12 defining a chamber 14 for receiving a product or substance, and a container closure 20 including a peripheral gripping portion 22, and a sealing portion or secondary sealing member 26 (FIG. 4) extending about the periphery of the container closure and forming a substantially fluid-tight seal between the container closure and the body 12 to prevent leakage. The secondary sealing member 26 is received by at least one secondary annular groove 32 on the body 12 to effectuate the seal. In one embodiment, the secondary sealing member 26 is an elastomeric gasket; however, it should be noted that the secondary sealing member 26 can take on any of numerous forms and be made from any of numerous materials that are currently known, or that later become known, and are capable, for example, of forming a substantially fluid tight seal between the container closure 30 and container body 12. The container closure 20 further includes a securing portion or connecting flange 28 for movably securing the container closure 20 to the body 12 such that the container closure 20 and body are able to move relative to each other when secured together. In the illustrated embodiment, and by reference to FIGS. 4A and 7A-B, the container closure 20 and

body 12 are snap fit together whereby the connecting flange 28 engages a primary annular groove 30 in the body 12; further, the container closure 20 and body rotate relative to each other. As may be recognized by those of ordinary skill in the pertinent art based on the teachings herein, the container closure 20 may be secured to the body 12 in any of numerous other ways that are currently known, or that later become known, such as by a threaded fit. For example, either the container closure or body can include one or more raised portions that are received within one or more recessed portions of the other for securing them together. Additionally, at least one of the container closure 20 and body 12 may move relative to the other in any of numerous other ways that are currently known, or that later become known, such as substantially vertically along the central or other axis of the container 10. Once the container closure 20 is secured to the container 10, the chamber 14 is sealed forming an empty sealed chamber.

[0049] In addition, the container 10 may include any desired number of sealed empty chambers, including, for example, a first chamber 14 for receiving one or more first liquid components, and a second chamber 15 for receiving one or more second liquid components, as shown in FIG. 4B. In some such embodiments, the first and second chambers are initially sealed with respect to each other to maintain the first and second liquid components separate from each other during, for example, the shelf life of the product. Then, when the product is ready to be dispensed or used, the container includes a mechanism or feature to allow the first and second chambers to be placed in fluid communication with each other to allow mixing of the first and second liquid components at the time of use, or shortly before use.

[0050] The body 12 further defines an outflow port or opening 16 in fluid communication with the chamber 14. The outflow port 16 is typically circular, but can take on any shape or configuration; in one embodiment, the outflow port 16 has a raised periphery 18. A dispensing member 38 of the container closure 20 defines an outlet aperture 40 that is selectively connectable in fluid communication with the chamber 14 via the outflow port 16. The dispensing member 38 dispenses the product from the container 10 and can take on any of numerous different configurations that are currently known, or that later become known, such as a nipple (shown in the illustrated embodiment), a drinking spout (not shown), a drinking spout including a one-way check valve (not shown), wherein the check valve opens under negative pressure to allow the product to exit the outlet aperture, or a push-pull cap or sports bottle cap (not shown), wherein the outlet aperture is closed when the cap is in a retracted push position and

the outlet aperture is open when the cap is in an extended pull position. As may be recognized by those of ordinary skill in the pertinent art based on the teachings herein, the dispensing member 38 can take on additional configurations that are currently known, or that later become known for dispensing products or substances from containers.

[0051] To hermetically seal the product in the chamber 14 of the container 10, the container closure 20 employs a primary seal 24 or, in one embodiment, a stopper or septum, which is seated about and/or overlies the outflow port 16 when the closure is in the first position. As noted above, the container closure 20 is movable relative to the body 12 off the container. In the illustrated embodiment, the container closure 20 and body 12 rotate relative to each other along the longitudinal axis of the container 10 between a first position (FIG. 6A) where the primary seal 24 is seated about the outflow port 16 to hermetically seal the outflow port and thus the product in the chamber 14 during storage, and a second position (FIG. 6B) where the primary seal is displaced from the outflow port to allow product to pass from the chamber 14, in the illustrated embodiment, through the outflow port 16 and into the outlet aperture 40 to dispense the product. In one embodiment, the hermetic seal is created by the application of positive pressure asserted by the container closure on the primary seal 24 when the primary seal is in the first position. However, it should be noted that the primary seal 24 can be configured and/or positioned about and/or within the outflow port 16 to create a hermetic seal without the application of positive pressure, for example, by way of an interference fit between the primary seal and outflow port. For ease of use, the movement of the container closure 20 and body 12 relative to each other is configured such that when the second position is achieved, the container closure 20 and body will remain in the second position to prevent the primary seal 24 from sealing the outflow port 16 until moved back into the first position if so desired. To improve the flow of the product from the chamber 14 through the outlet aperture 40 in the dispensing member 38, a vent aperture 42 is provided in the container closure 20 to place the closure chamber in fluid communication with the ambient atmosphere.

[0052] In an embodiment of the invention, and as shown in broken lines in FIG. 6A, the container closure 20 includes a sealing member 44 that is movable between a first position (FIG. 6A) sealing at least one of the dispensing member 38 and vent aperture 44, and a second (break away) position (FIG. 6B) opening at least one of the dispensing member 38 and vent aperture 44 to thereby allow product in the storage chamber 14 to be dispensed therethrough. In the

illustrated embodiment, the sealing member 44 is connected to the dispensing member 38 and vent aperture 44 at at least one frangible portion, and in one embodiment, three frangible portions (see, for example, sealing member 144 and frangible portions 146 of FIG. 9), which enables the user to break away the sealing member 144 with limited force, while at the same time requiring enough force to prevent accidental break away.

[0053] As can be seen, in the illustrated embodiment, the dispensing member 38 is a nipple positioned off center with respect to the central or longitudinal axis of the container 10. Positioning the nipple in this manner is by itself, or in combination with the vent aperture 44, advantageous in decreasing incidents of otitis in bottle feeding infants and young children by reducing negative pressure generated during sucking, which in turn, reduces harmful fluid build-up in the inner ear. More specifically, as can be seen, the nipple 38 is positioned off center, and the elongated axis of the nipple is oriented at an acute angle relative the central, elongated or longitudinal axis of the container. Preferably, the acute angle of the nipple relative to the longitudinal axis of the container is within the range of about 8° to about 45°, and in the illustrated embodiment, the acute angle is about 28°. As can be seen, the overall length of the nipple, and the acute angle of the nipple, are such that the distal or free end of the nipple does not extend laterally outside the outer diameter of the closure. In addition, the vent aperture 42 is laterally spaced relative to the nipple 38, and in the illustrated embodiments, is located substantially on the diametrically opposite side of the closure relative to the nipple. One advantage of this configuration of the nipple and vent aperture is that during dispensing, an air pocket develops within the closure adjacent to the vent aperture 42 that substantially prevents any liquid from flowing into the vent aperture during dispensing, allows any air within the chamber to vent through the vent aperture, and substantially prevents the air from venting through the nipple and otherwise causing, for example, a baby to suck air through the nipple. Accordingly, the eccentrically mounted nipple, and the vent aperture laterally spaced from the nipple, substantially prevents the formation of a vacuum within the nipple, the fluid dispensed through the nipple, or within the mouth of a baby sucking on the nipple. Further, because of the laterally spaced location of the vent aperture, the liquid does not block the vent aperture during dispensing, and thus does not give rise to undesirable cavitations within the nipple, the liquid or the mouth of a baby sucking on the nipple. As can be seen, the secondary sealing member 26 and nipple 38 are formed integral with each other from a first material, while the primary seal 24

is formed of a second material different than the first material. As may be recognized by those of ordinary skill in the pertinent art based on the teachings herein, the primary seal 24, nipple 38 and secondary sealing member 26 can be formed of the same material, and/or can be formed integral with each other, such as by co-molding.

[0054] Referring to FIGS. 18A-F, various nipple configurations are shown, all of which represent different embodiments of the dispensing member 38. In FIGS. 18A-B, a round nipple 60 having an approximately round shaped tip 62 and a generally cylindrical stem 64 is shown. The nipple 60 is maintained in a single position during both storage and use. In FIGS. 18C-D, a second nipple configuration is shown. In this configuration, the nipple 70 has an approximately oval shaped tip 72 and a partially tapered generally cylindrical stem 74. The nipple 70 is a bi-stable nipple movable between two positions: a retracted position, wherein the nipple 70 remains at least partially retracted within the closure 20 during storage and/or non-use, and an extended position (or ready to feed position) wherein the nipple remains at least partially extended during use for dispensing the product. In the retracted position, a portion 75 of the stem 74 is inverted and self-stabilizing, allowing the nipple 70 to remain in the retracted position until the user engages the nipple and moves the nipple into the extended position. In the extended position, the portion 75 of the stem 74 is brought to a non-inverted position and, is again, self-stabilizing, allowing the nipple 70 to remain in the extended position until the user engages the nipple and moves the nipple into the retracted position if so desired. The nipple 70 defines at least one flex joint 78 which allows the nipple 70 to move between the two positions. In FIGS. 18E-F, a third nipple configuration is shown. In this configuration, the nipple 80 has an approximately round shaped tip 82 and a partially tapered generally cylindrical stem 84. The nipple 80 is a stretchable nipple that can be stretched between a recessed position, wherein the nipple 80 remains at least partially recessed within the closure 20 during storage and/or non-use, and an extended or stretched position wherein the nipple extends from the outer surface 21 of the container closure. The nipple 80 can dispense product in any position; i.e. whether the nipple is partially recessed, fully or partially stretched or any position therebetween. Each of the above-described nipples 60, 70, 80 defines a respective outlet aperture 66, 76, 86 for dispensing product therethrough and is in fluid communication with storage chamber 14 (FIG. 4A) or at least one of the storage chambers 14, 15 if multiple storage chambers are present (FIG. 4B). It should be noted that the shapes, profiles and sizes of the nipples 60, 70, 80 including the tips 62, 72, 82 and stems 64, 74,

84 can take on any of numerous shapes, profiles, sizes and combinations thereof that are currently known, or that later become known; for example, the nipple 60 can have a substantially oval-shaped tip 62 and a somewhat tapered stem 64, the nipple 70 can have a substantially round tip 72 and a generally cylindrical, non-tapered stem 74, etc. to customize the nipple for the comfort of the child.

[0055] In a currently preferred embodiment of the present invention, the product contained within the storage chamber 14 is a fat containing liquid product. The fat containing liquid product may be any of numerous different products that are currently known, or that later become known, including without limitation infant or baby formulas, growing-up milks, milks, creams, half-and-halfs, yogurts, ice creams, juices, syrups, condiments, milk-based or milk-containing products, liquid nutrition products, liquid health care products, and pharmaceutical products. As can be seen in FIG. 4 and FIG. 6A, the primary seal 24 (second material portion) defines an internal surface in fluid communication with the chamber 14 at the outflow port 16 and forms at least most of the surface area of the container closure 20 that can contact any fat containing liquid product within the chamber 14, and that does not leach more than a predetermined amount of leachables into the fat containing liquid product or undesirably alter a taste profile of the fat containing liquid product.

[0056] The term "leachable" is used herein to mean any chemical compound (volatile or non-volatile) that leaches into the product within the container from a component of the container during the period of storage through expiry of the product. An exemplary leachable to be avoided in connection with fat containing liquid nutrition products, such as infant or baby formulas, is mineral oil. Accordingly, as indicated below, in the exemplary embodiments of the present invention, the container body and container closure are not made from materials containing mineral oil, or that contain sufficiently low amounts of mineral oil such that they do not leach mineral oil into the fat containing liquid nutrition product, or substantially do not leach mineral oil into the fat containing liquid nutrition product (i.e., if any mineral oil is leached into the product, any such amount is below the maximum amount permitted under applicable regulatory guidelines for the respective product, such as FDA or LFCA guidelines). In accordance with the currently preferred embodiments of the present invention, the primary seal does not leach more than a predetermined amount of leachables into the product. The

predetermined amount of leachables is less than about 100 PPM, is preferably less than or equal to about 50 PPM, and most preferably is less than or equal to about 10 PPM.

[0057] Drawing attention to FIGS. 7A-B, an exploded view of an embodiment of the container 10 is shown. In the illustrated embodiment, the body 12 is made from a blow molded polymer, such as polyethylene or polypropylene; however, it should be noted that the body 12 can be made from any of numerous different materials that are currently known, or that later become known, such as, for example, additional polymeric materials, metals, composites, or combinations thereof. In addition to the outflow port 16, the primary annular groove 30 and the secondary annular groove(s) 32, the body 12 defines a first tab recess 34 for receiving a breakaway tab 35, which is described in further detail below. The container closure 20 includes a co-molded outer portion, such as by insert molding, that comprises the gripping portion 22, a second tab recess 36, the break away tab 35 and the securing portion or connecting flange 28. The break away tab 35 is frangibly secured to the container closure in the second tab recess 36. The dispensing member 38, particularly in embodiments where a nipple is used, is co-molded, such as by over molding, to one or both of the primary and secondary seals. To fill the container 10, conventional sterilizing methods can be used whereby the body 12 and container closure 20 (and all other components associated with the container 10) are sterilized with heat, radiation, such as gamma or e-beam, and/or chemicals, such as fluid sterilants like vaporized hydrogen peroxide ("VHP"). If filled conventionally, a filling member such as a nozzle (not shown) is inserted through the outflow port 16 and the chamber 14 is filled with the desired amount of product or substance. The filling member is then removed and an additional sterilizing step is employed if required. Then, the container closure 20 is aligned and snap fit to the body 12 such that the breakaway tab 35 is received by the first tab recess 34, which locks the container closure in the first position relative to the body 12. In this assembled configuration, the primary seal 24 is positioned about the outflow port 16 (as noted above) such that the product in the chamber 14 is hermetically sealed. Additionally, the primary sealing member can be co-molded with the container closure.

[0058] If desired, the container closure may be molded in the same mold as the container body, or may be molded in adjacent molding machines, and at least one of the container closure and the body may be assembled within or adjacent to the mold in accordance with the teachings of U.S. Patent Application No. 60/551,565, filed March 8, 2004, entitled "Apparatus and Method

for Molding and Assembling Containers with Stoppers and Filling same"; U.S. Patent Application Serial No. 11/074,454, filed March 7, 2005, entitled "Method for Molding and Assembling Containers with Stoppers and Filling same"; U.S. patent Application Serial No. 11/074,513, filed March 7, 2005, entitled Apparatus for Molding and Assembling Containers with Stoppers and Filling same; U.S. Patent Application Serial No. 60/727,899 filed October 17, 2005, entitled "Sterile De-Molding Apparatus And Method"; and U.S. Patent Application Serial No. 11/582,291, filed October 17, 2006, entitled "Sterile De-molding Apparatus and Method", each of which is hereby expressly incorporated by reference as part of the present disclosure. Alternatively, the closure and body may be co-molded by blow molding, such as by co-extrusion blow molding, wherein the molding process results in a sealed empty container defining one or more sterile chambers therein ready for aseptic filling, such as by needle filling and laser resealing, as disclosed in the following co-pending patent applications, which are hereby incorporated by reference in their entireties as part of the present disclosure: U.S. Application Serial No. 61/104,649, filed October 10, 2008, entitled "Co-Extrusion Blow Molding Apparatus and Method, and Sealed Empty Devices"; and U.S. Application Serial No. 61/104,613, filed October 10, 2008, entitled "Device with Co-Extruded Body and Flexible Inner Bladder and Related Apparatus and Method. One advantage of the devices, apparatus and methods disclosed in these patent applications is that the container is closed to define a sealed, empty sterile chamber at essentially the time of formation, and the container is never opened (through filling, resealing, and during shelf life) until the product is dispensed. Accordingly, a significantly high level of sterility assurance can be achieved. Alternatively, as described above, the sealed empty containers may be sterilized in any of numerous different ways that are currently known, or that later become known, such as by applying radiation, such as beta or gamma radiation, or by applying a fluid sterilant thereto, such as VHP.

[0059] In operation, in order to drink the product from the container 10, the user manually removes the sealing member 44 (if so equipped), which opens outlet aperture 40 of the dispensing member 38 and vent aperture 42, and then the breakaway tab 35, which unlocks the container closure 20. Next, while manually engaging the gripping portion 22 of the container closure 20 and a portion of the body 12, the user moves or, in the illustrated embodiment, rotates the container closure 20 relative to the body 12 from the first position where the primary seal 24 is seated about the outflow port 16 (outflow port closed and product hermetically sealed in

chamber 14) to the second position where the primary seal 24 is displaced from the outflow port 16 (outflow port opened and product ready for dispensing) to allow product to pass from the chamber 14 through the outflow port 16 and into the outlet aperture 40 of the dispensing member 38 to dispense the product. It should be noted that in the illustrated embodiment, there are at least three options that that the user can employ to move the primary seal 24 from the first position to the second position to open the outflow port 16: (i) the user can grasp the body 12 to prevent movement thereof and rotate the container closure 20 in a first direction relative to the body 12; (ii) the user can grasp the container closure 20 to prevent movement thereof and rotate the body 12 in a second direction opposite the first direction relative to the container closure 20; (iii) the user can grasp both the container closure 20 and body 12 and simultaneously rotate the container closure 20 in the first direction and the body 12 in the second direction; or (iv) any combination thereof. As may be recognized by those of ordinary skill in the pertinent art based on the teachings herein, the design of the container closure 20 and/or body 12 is not limited to rotational movements, but rather can involve alternative movement configurations that are currently known, or that later become known capable of displacing the primary seal 24 from the first position to the second position. For example, the container closure 20 and/or body 12 can be moved in a linear or substantially vertical direction relative to each other.

[0060] In FIGS. 8-14B another container embodying the present invention is indicated generally by the reference numeral 110. The container 110 is substantially similar to the container 10 described above with reference to FIGS. 1 through 7, and therefore like reference numerals preceded by the numeral "1" are used to indicate like elements. The primary difference of the container 110 in comparison to the container 10 is that the container closure and/or primary seal 124 further includes a penetrable and thermally resealable portion or stopper 125. Starting with a sealed empty container 110, and providing at least one filling or injection member 150 in fluid communication with at least one storage device containing at least one product stored therein (not shown), the container 110 is aseptically filled by penetrating the stopper 125 with the injection or filling member 150, such as a filling needle (FIGS. 15A-B). The product is then injected (FIG. 15C) through the filling member and into the chamber 114. Upon filling the container 110, the filling member 150 is removed and a resulting penetration hole in the stopper 125 is thermally resealed, such as by the application of laser energy 154 thereto (FIGS. 16A), to seal the product within the container 110 (FIG. 16B) from the ambient atmosphere. The

container 110 is then ready for shipping, storage and, ultimately, dispensing at the direction of the user. As shown in the illustrated embodiment, the primary seal 124 and/or stopper 125 and/or container closure 120 may include an optional annular injection member contacting surface 127 (FIG. 9) that contacts the injection or filling member 150 during withdrawal from the stopper 125 to substantially remove product thereon.

[0061] In one embodiment of the container 110, the container includes an optional overcap 160 (shown in broken lines in FIG. 10A). The overcap 160 is attached mechanically or otherwise to at least one of the container closure 120 and container body 112. The overcap 160 provides an additional barrier to protect the container closure 120 and dispensing member 138 from contamination. The overcap 160 is designed to be removed by the consumer and may include a tear off strip or other mechanism (not shown) to indicate evidence of tampering. It should be noted that the overcap may also be used in conjunction with the container 10 described above and the container 210 described below.

[0062] Referring to FIGS. 17A-F, an example of a method of filling and resealing an embodiment of a container 210 of the present invention is shown. The container 210 is substantially similar to containers 10 and 110, and therefore like reference numerals preceded by the numeral "2" are used to indicate like elements. In the illustrated embodiment, the container 210 comprises two chambers 214, 215 and two resealable portions or stoppers, first stopper 225 and second stopper 226; however, it should be noted that in some embodiments, the container can comprise one or more chambers and one or more resealable portions or stoppers as desired. The first chamber 214 is defined within the container body 212 and the second chamber 215 is defined by a portion of the container body 212 in combination with a portion of the container closure 220; however, in an alternative embodiment, the second chamber 215 is wholly defined within the container closure 220.

[0063] The aseptic filling process starts with a sealed, empty container, defining one or more sealed, empty sterile chambers ready for aseptic filling therein of the product(s). The containers may be molded, such as by blow molding, so that the sealed, empty sterile chambers are created at the time of formation of sealed, empty container, in accordance with the teachings of the above-mentioned patent applications incorporated by reference herein. Alternatively, the sealed, empty containers may be sterilized such as by apply gamma or e-beam radiation thereon. Prior to filling, at least the external surfaces of the container that will contact the filling member are

sterilized, such as by applying a fluid sterilant, such as VHP, or by applying radiation, such as e-beam radiation thereto. Alternatively, the sealed, empty sterile containers may be introduced into a sterile filling machine through a sterile transfer port. Then, starting with the container enclosure 220 assembled to container body 212 and the container 210 having at least two empty sterile sealed chambers 214, 215 (FIG. 17A), a filling member 250 is introduced into the first chamber 214 through the first stopper 225 and a resulting penetration aperture is created (not shown). In an alternative embodiment, a slit (not shown) is preformed in the stopper 225 for receiving the filling member. It should be noted that the penetration aperture and slit can take on numerous shapes and configurations that are currently known or that later become known. The filling member 250 is in fluid communication with a first liquid source (not shown) having a first liquid component 252. The first chamber 214 is then aseptically filled (FIG. 17B) with a desired volume of the first liquid component 252 and the first filling member 250 is removed therefrom. If desired, prior to filling the first chamber with the first liquid components, a purge may be performed by introducing an inert gas, such as nitrogen, into first chamber prior to aseptically filling the chamber with the product. The inert gas may be introduced with the same filling member as the liquid product, or may be introduced with a different filling member. Prior to introducing the inert gas, a vacuum may be drawn on the chamber through the filling member, if desired. Next, a second filling member 254 is introduced into the first chamber 214 through the aperture or slit. The second filling member 254 is in fluid communication with a second liquid source (not shown) having a second liquid component 256. The first chamber 214 is then aseptically filled (FIG. 17C) with a desired volume of the second liquid component 256 and, in turn, combined with the first liquid component to formulate a liquid product formulation within the sterile chamber 214 of the container 210. If desired, a purge likewise may be performed on the second chamber prior to filling. After the second filling member 254 is removed, the respective penetration aperture or slit in the resealable portion or stopper 225 is thermally resealed (FIG. 17D), such as by the application of laser energy 274 thereto, to hermetically seal the filled storage chamber 214 with respect to the ambient atmosphere. With the first chamber 214 filled and sealed, a third filling member 258 is introduced into the second chamber 215 through the second stopper 226 and a resulting penetration aperture is created (not shown). The third filling member 258 is in fluid communication with a third liquid source (not shown) having a third liquid component 260. The second chamber 215 is then aseptically filled (FIG. 17E) with

a desired volume of the third liquid component 260. After the second chamber 215 is filled, the third filling member 258 is removed therefrom, and the penetration aperture or slit in the resealable portion or stopper 226 is thermally resealed (FIG. 17F), such as by the application of laser energy 274 thereto, to hermetically seal the filled storage chamber 215 with respect to the ambient atmosphere. After each fill, an inert gas may be pumped or otherwise released through the filling member prior to removing the filling member from the chamber to expel substantially all liquid through the filling member and into the chamber, and thereby prevent any dripping of liquid onto the container upon removal of the filling member therefrom. Alternatively, if, for example, a peristaltic pump is used to pump the liquid through the filling member, the pump can be reversed prior to withdrawing the filling member to create a suction or vacuum within the distal end of the filling member, and thereby prevent dripping of liquid therefrom and onto the container upon withdrawal of the filling member from the container.

[0064] When the product (i.e. liquid components) are ready for dispensing, the primary seal 224 is moved from the first position to the second as described above, thus opening the outflow port 16 and placing the first and second chambers 214 in fluid communication allowing the combination of liquid components to be dispensed through the outlet aperture 40.

[0065] In one embodiment of the present invention, the first liquid component 252 is a flavoring, such as vanilla, chocolate, coffee, fruit flavoring, a liquid sweetener, liquid vitamins and/or nutrients, combinations of these or any of numerous other flavorings, liquids, or additives that are currently known or that later become known; the second liquid 256 component is a base liquid, such as milk, baby formula, non-dairy milk substitutes, soy, water, fruit juice, cream, carbonated liquids, liquor, combinations of these or any of numerous other liquids that are currently known or that later become known; and the third liquid component 260 is a probiotic, vitamin or mineral supplement and/or medicament. The dispenser disclosed herein is particularly advantageous for storing and dispensing liquid nutrition products. For example, in some embodiments the liquid nutrition product, such as an infant formula or a growing up milk, is aseptically filled into the first chamber 214, and an additive, such as a dietary or nutritional supplement, such as a probiotic, is filled into the second chamber 215. In some embodiments, the liquid nutrition or other product is filled by filling in series a plurality of product components or ingredients into the same chamber, such as one fill with heat sterilized components, and another fill with cold sterilized components, as disclosed, for example, in the following co-

pending patent applications that are hereby incorporated by reference in their entireties as part of the present disclosure: U.S. Application Serial No. 60/997,675, filed October 4, 2007, entitled "Apparatus and Method for Formulating and Aseptically Filling Liquid Products", U.S. Application Serial No. 12/245,678, filed October 3, 2008, entitled "Apparatus for Formulating and Aseptically Filling Liquid Products" and U.S. Application Serial No. 12/245,681, filed October 3, 2008, entitled "Method for Formulating and Aseptically Filling Liquid Products". One of the advantages of having multiple chambers that are sealed from the ambient atmosphere and from each other is that the liquid components and/or substances in each chamber can be stored as required to best preserve quality, integrity and freshness. For example, probiotics and other substances best maintained in an oil base such as, for example, a food grade oil, can be stored in one chamber, while substances best maintained in a non-oil base, such as, for example, in a water base, can be stored in another chamber. In this manner, the substance(s) in each chamber only interact when the primary seal is displaced from the outlet port, which occurs, for example, when the container closure 20 is moved from the first position to the second position just prior to ingestion/consumption to avoid premature spoilage or a degradation in quality and freshness or, in the case of probiotics, avoid destroying the active ingredients.

[0066] FIGS. 19-25B show another embodiment of a container 310. The container 310 is generally similar to containers 10, 110 and 210, and therefore, like numerals preceded by a numeral "3" are used to indicate like elements. In the illustrated embodiment, the container closure 320 is secured to the body 312 by a snap fit. The securing portion 328 contains an inwardly extending securing projection 328a that fits into the annular securing groove 330. The securing projection 328a contains an angled bottom surface 328b and a top retaining surface 328c. The securing projection 328a has a smaller radial dimension than a securing portion 330a of the securing groove 330. To fit the closure 320 onto the body 312, the closure 320 is pushed downward onto the body so that the angled bottom surface 328b contacts the securing portion 330a of the groove 330. The angled bottom surface 328b causes the securing portion 328 to flex outwardly in response to force applied axially to the closure 320 relative to the body 312. When the securing portion 328 flexes sufficiently so that the securing projection 328a passes the securing portion 330a of the groove 330, the flexing force is at least partially released on the securing portion 328 and the securing projection 328a moves inwardly or snaps into the groove

330. In the secured position, the top retaining surface 328c engages against a retaining surface 330b of the groove 330, preventing the closure 320 from being removed from the body 312.

[0067] The flexibility of the securing portion 328 and the degree of interference between the securing projection 328a and the securing portion 330a of the groove 330 provide sufficient resistance to flexing of the securing portion 328 to help avoid accidental locking of the closure 320 to the body 312 and also prevents the closure 320 from being removed from the body 312. On the other hand, the flexibility is sufficient so that the closure 320 may be snap fit to the body without excessive force, making assembly difficult or risking damage to the parts. In addition, the upper portion of the body 312 exhibits a degree of flexibility in the axial direction such that, upon pushing the closure 320 onto the body 312, the upper portion of the body 312 compresses to a degree, which is exhibited at points of inflection, e.g., the groove 330 is reduced in size during snap engagement. The compressibility of the primary seal 324 is defined, in combination with the flexibility of the body 312 and the securing portion 328, so that when the primary seal 324 engages and compresses against the outflow port periphery 318 during snap engagement, the groove 330 remains large enough to accommodate and engage the securing projection 328a and angled bottom surface 328b.

[0068] With the closure 320 connected to the body 312, the secondary sealing member 326 engages a secondary sealing portion 332 of the body 312 to form a seal between the closure 320 and the body 312. In the illustrated embodiment, the secondary sealing member 326 has an annular projection 326a that extends inwardly. The annular projection 326a is angled downwardly, and engages the secondary sealing portion 332, which is angled upwardly and ends in a substantially upward angled wall portion 332a. In this embodiment, the annular projection 326a is configured and positioned relative to the securing projection 328a, and the secondary sealing portion 332 is configured and positioned relative to the annular groove 330, such that when the closure 320 is engaged with the body 312 such that the securing projection 328a resides in the groove 330, there is an interference fit between the annular projection 326a and the secondary sealing portion 332. This exerts an axial and radial sealing force on the annular projection 326a and the secondary sealing portion 332, improving the seal between the closure 320 and the body 312. Where the annular projection 326a is formed of a flexible or compressible material such as TPE, silicone, rubber or the like, this sealing force compresses and/or flexes the annular projection 326a, causing the annular projection 326a to substantially

conform to the secondary sealing portion 332 and biasing the annular projection 326a into engagement with the secondary sealing portion 332. The wall portion 332a at the end of 332 acts as a stop to the conformed annular projection 326a. This forms a dynamic seal, whose configuration can alter during storage and use without compromising the integrity of the seal, e.g., accommodate thermal expansion and contraction, and accommodate weight and shipping and distribution related loading of secondary product present in the second chamber 315.

[0069] Those of ordinary skill in the art should note that while the annular projection 326a in the illustrative embodiments is shown at a particular angle, other configurations can be used within the scope of the invention. The annular projection 326a can be oriented at another downward angle, have no angle (project horizontally), or project at an upward angle.

[0070] Another manner in which this embodiment differs from the previously described embodiments is the manner in which the closure 320 is retained in the first and second positions. The container closure 320 contains an radially inwardly projecting tab, member, or projection that engages and extends into a first recess or detent 334 in the first position and a second recess or detent 336 in the second position. The tab is not breakaway but remains attached to the closure 320. The first recess 334 is formed between a first sidewall 334a and a second sidewall 334b. The first sidewall 334a is oriented a sharp angle, in this embodiment approximately orthogonal, to the first recess 334 to engage the tab and substantially prevents closure 320 from rotating in the direction toward the first sidewall 334a. The second sidewall 334b is angled at an obtuse angle to the first recess 334. Upon rotation of the closure 320 toward the second position, the tab engages the angled surface of the second side wall 334b, which flexes the closure 320 outwardly around the location of the tab so that the tab may pass by the second side wall 334b and out of the recess 334. In addition, the container body 312 contains a boss 339a that engages a hole 339b in the closure 320 in the first position. Upon rotation of the closure toward the second position, the closure 320 flexes outwardly around the location of the hole 339b so that the hole 339b disengages with and rotates past the boss 339a. The tab, first recess 334, and first sidewall 334a are configured so that the force required to rotate the tab out of the first recess 334 is sufficient to prevent unintentional rotation of the closure 320, which would remove the primary seal 324 from its sealing position on the outflow port 316, yet the closure 320 can be rotated without requiring excessive force. In addition, the initial rotational resistance of the

closure provides a tactile and/or audible indication to the user that, once the resistance is passed, the first chamber 314 is no longer sealed.

[0071] When the closure 320 is rotated to the second position, the tab engages the second recess 336. The second recess 336 is formed between a first sidewall 336a and second sidewall 336b. The portion of the first sidewall 336a directly adjacent to the second recess 336 is oriented at sharp angle, in this embodiment approximately orthogonal, to the recess. The portion of the first sidewall 336a located away the second recess 336 is oriented at an obtuse angle. When the closure 320 is rotated so that the tab engages the obtuse-angled portion of the first sidewall 336a, the closure 320 flexes outwardly around the location of the tab so that the tab may rotate past the first sidewall 336a and engage the second recess 336 when the closure 320 is in the second position. When the tab engages the second recess 336, the adjacent sharp-angled portion of the first sidewall 336a engages the tab and prevents the closure 320 from rotating back toward the first position. The second sidewall 336b is also oriented at a sharp angle to the recess 336, in this embodiment approximately orthogonal, and engages the tab to prevent the closure 320 from rotating past the second position. Thus, the closure cannot be disengaged from the second position under normal use. The tab, second recess 336, and first sidewall 336a are configured so that the force required to rotate the tab into the second recess 336 is sufficient to prevent unintentional engagement of the closure 320 in the second position, yet the second position can be engaged without requiring excessive force. Further, the rotational resistance and then engagement of the tab with the second recess 336 provides an audible and/or tactile indication to the user that the closure 320 is in the second position and ready for use.

[0072] Though in the illustrated embodiment the tab disengages the first recess 334 and engages the second recess 336 by flexing of the closure 320, those of ordinary skill in the art should recognize that other configurations may be used within the scope of the invention. For example, in other embodiments, the tab itself is flexible, and flexes outwardly upon rotation against the first sidewalls 334a, 336a of the first and second recess 334, 336. In such embodiments, the flexibility of the tab is configured to provide adequate resistance to unintentional rotation of the closure 320. Further, friction between the annular projection 326a of the secondary sealing member 326 and the secondary sealing portion 332 provides resistance to rotation of the closure 320 relative to the body 312. This friction resistance is proportional to the sealing force between the annular projection 326a and the secondary sealing portion 332.

Though high sealing force is desirable to maintain the seal between the closure 320 and the body 312, if the rotational friction is too high, it will be difficult to rotate the closure 320. Accordingly, in the illustrated embodiment, the annular projection 326a and the secondary sealing portion 332 are configured so that the friction force is within an acceptable range for use of the device. Those of ordinary skill should recognize that the friction force depends not only on the configurations of the annular projection 326a and the secondary sealing portion 332 and the resulting sealing force between them, but the frictional characteristics of the material of the annular projection 326a. Use of material with low friction characteristics will permit a correspondingly higher sealing force.

[0073] The container closure 320 has a first barrier layer 390 and a second barrier layer 392 substantially overlying the first barrier layer. The first barrier layer 390 forms a substantial barrier against fluid, vapor and gas penetration. The first barrier layer 390 is a generally nonelastomeric material, such as polypropylene. In the illustrated embodiment, the first barrier layer 390 has a generally convex or domed shape and forms the second chamber 315. It also provides structural support for the overlying second barrier layer 392 and dispensing member 338. In the illustrated configuration, the convex shape in combination with the dispensing member replicate the shape and feel of a female breast, which promotes proper latch-on by an infant during feeding and also eases the transition between breast and bottle. It should be noted that other shapes and configurations are contemplated within the scope of the invention.

[0074] The first barrier layer 390 contains openings so that fluid may flow from the first and second chambers 314, 315 to the dispensing member and to accommodate the primary seal 324 and vent aperture 342. However, these openings are minimized to the extent possible to limit fluid, vapor and gas passage through the closure 320, and to limit contact of substance within the device 310 with the second barrier layer 392. In certain embodiments, such as the one illustrated in FIGS. 19-25B, the first barrier layer 390 defines more internal surface area of the container closure 320 than the second barrier layer 392. In some such embodiments, the first barrier layer 390 comprises at least about 50% of the total contacting (internal) surface area of the closure 320, in any amount up to nearly 100%. Put another way, the above-described openings in the first barrier layer 390 comprises less than about 50%, in any amount down to almost 0%, of the contacting surface area.

[0075] The second barrier layer 392 overlies the first barrier layer 390 and provides an additional barrier against fluid, vapor and gas. At the periphery of the first barrier layer 390, the second barrier layer 392 extends between the first barrier layer 390 and the securing portion 328 to form a seal therebetween and also to form the secondary sealing portion 326. In the illustrated embodiment, the second barrier layer 392 is formed of the same TPE material as and is integral with the dispensing portion 338. In this embodiment, the second barrier layer 392 and dispensing portion 338 are formed, i.e., molded, as one piece, which may be co-molded with or overmolded to the first barrier layer 390. In alternative embodiments, the second barrier layer 392 is another material besides TPE, such as silicone or another suitable material. In such embodiments, the first barrier material 390 can be glass-filled polybutylene terephthalate or amorphous polyetherimide or polycarbonate that are compatible with silicone overmolding. In yet further embodiments, the second barrier layer 392 is a different material than the dispensing portion 338. In one such embodiment, the second barrier layer 392 is TPE, and the dispensing portion is silicone. This permits the dispensing portion 338 to have the familiar characteristics of known bottle nipples, and limits exposure of the contents of the container to the TPE material. Further, the TPE material is highly compatible for molding with the polypropylene first barrier layer 390. In yet other embodiments, the second barrier layer 392 is not integral with the dispensing portion 338.

[0076] In the illustrated embodiment, the second barrier layer 392 forms the primary seal 324. In this embodiment, the second barrier layer 392 extends underneath the opening in the first barrier layer that accommodates the primary seal 324 and resealable portion 325 to form the primary seal 324. As such, the second barrier layer 392 forms one continuous barrier from the secondary sealing portion 326 to the dispensing portion. In alternative embodiments, the primary seal 324 is not integral with the second barrier layer 392. In yet further embodiments, the primary seal 324 is a different material from the second barrier layer. In some such embodiments, the primary seal 324 is vulcanized rubber. In other embodiments, the primary seal 324 is silicone. In such embodiments, the first barrier material 390 can be glass-filled polybutylene terephthalate or amorphous polyetherimide or polycarbonate which are compatible with silicone overmolding. In those embodiments, the container 310 contents do not contact TPE at the primary seal.

[0077] In the embodiment of FIG. 25A, the primary seal 324 sealingly engages the outflow port periphery 318, sealing the outflow port 316 and preventing fluid communication between the first chamber 314 and the container closure 320 and the second chamber 315. The primary seal 324 and the outflow port periphery 318 are dimensioned and configured so that, when the closure 320 is fully engaged with the container body 312, the primary seal 324 and the outflow port periphery 318 form an interference fit. As seen in FIG. 25A, the portions 358 of the primary seal adjacent to the outflow port 316 is wider than the outflow port periphery 318 (radially with respect to the outflow port periphery 318). In the illustrated embodiment, the primary seal portions 358 is about 100% wider (twice) as wide. It should be understood, however, that the invention contemplates the flow path being any amount wider, e.g., 50% wider or more than 100% wider. The outflow port periphery 318 compresses the primary seal 324, which provides increased sealing forces at the interference location. In addition, the portions 358 of the primary seal 324 adjacent to the interference location extend part way down the external (radially outward) and internal (radially inward) surfaces of the outflow port periphery 318. This decreases the available surface area of the primary seal 324 between the outflow port periphery 318 and the first barrier layer for passage of vapor, e.g., air, water, etc. through the primary seal 324. This also increases the surface area that is in sealing contact between the primary seal 324 and outflow port periphery 318, and lengthens the flow path through which any liquid, vapor or gas must traverse to penetrate the primary seal. In some embodiments, the flow path is at least about 50% longer than the radial thickness or width of the primary seal portions 358. It should be understood, however, that the invention contemplates the flow path being any amount longer than the radial thickness of the primary seal portions 358, up to or even exceeding 100%.

[0078] In the illustrated embodiment, the resealable portion 325 overlies the primary seal 324. The resealable portion 325 is co-molded with or overmolded on the primary seal 324. As can be seen, the resealable portion 325 is generally dome shaped but is generally axi-symmetric and has a generally uniform thickness and generally flat external surface substantially across its cross-section. The symmetry, uniform thickness and flat external surface features provide generally consistent piercing depth, piercing angle, and piercing forces, and in embodiments where the resealable portion 325 is thermally resealable, generally consistent laser radiation or thermal resealing energy incidence, and thermal absorption across the stopper 325. Thus,

penetration by the filling member and subsequent resealing is generally consistent without regard to the location on the stopper 325.

[0079] In embodiments including a thermally resealable portion 325, in contrast to the thermally resealable portion 325, the primary seal 324 is not configured to absorb the laser radiation. The primary seal 324 thus acts to insulate the second chamber 315, the container body 312, and the sealing surfaces between the primary seal 324 and outflow port periphery 318 from the heat of the stopper 325 during resealing. It also prevents the incident laser from penetrating through the primary seal 324 into the product in the chamber 314 and potentially altering, degrading or damaging the product or product components. Utilizing a non-absorbing primary seal 324 also provides a greater thickness of material to act as a barrier through the container closure 312 without increasing resealing time. In alternate embodiments, the primary seal 324 comprises barrier TPE materials such as those from Kraiburg (HTM8501/81, HTM8501/86, HTM8502/01). In yet another embodiment, the thermally resealable portion 325 comprises barrier TPE material in addition to the ingredient that is laser absorbent, e.g., pigment.

[0080] It should be understood that the filling method described above can include an infinite number of liquid sources, liquid components and respective filling members, and the containers can be filled with any one liquid component, any combination of selected liquid components or, if desired, all available liquid components, in any available chamber and in any order.

[0081] The sterile, empty container and closure assemblies 10 may be filled and resealed in accordance with the teachings of any of the following patent applications and patents that are hereby incorporated by reference in their entireties as part of the present disclosure: U.S. Provisional Patent Application Serial No. 60/981,107, filed October 19, 2007, entitled "Container Having a Closure and Removable Resealable Stopper for Sealing a Substance Therein and Related Method," U.S. Application Serial No. 60/997,675, filed October 4, 2007, entitled "Apparatus and Method for Formulating and Aseptically Filling Liquid Products", U.S. Application Serial No. 12/245,678, filed October 3, 2008, entitled "Apparatus for Formulating and Aseptically Filling Liquid Products" and U.S. Application Serial No. 12/245,681, filed October 3, 2008, entitled "Method for Formulating and Aseptically Filling Liquid Products", U.S. Patent Application Serial No. 11/339,966, filed January 25, 2006, entitled "Container closure with Overlying Needle Penetrable and Thermally Resealable Portion and Underlying Portion Compatible with Fat Containing Liquid Product, and Related Method," U.S. Patent

Application Serial No. 11/879,485, filed July 16, 2007, entitled "Device with Needle Penetrable and Laser Resealable Method, and Related Portion," which is a continuation of similarly titled U.S. Patent Application Serial No. 11/408,704, now U.S. Patent No. 7,243,689, issued July 17, 2007, which is continuation of U.S. Patent Application Serial No.10/766,172 filed January 28, 2004, entitled "Medicament Vial Having A Heat-Sealable Cap, And Apparatus and Method For Filling The Vial", now U.S. Patent No. 7,132,631, issued April 25, 2006, which is a continuation-in-part of similarly titled U.S. Patent Application Serial No. 10/694,364, filed October 27, 2003, now U.S. Patent No. 6,805,170, issued October 19, 2004, which is a continuation of similarly titled co-pending U.S. Patent Application Serial No. 10/393,966, filed March 21, 2003, which is a divisional of similarly titled U.S. Patent Application Serial No. 09/781,846, filed February 12, 2001, now U.S. Patent No. 6,604,561, issued August 12, 2003, which, in turn, claims the benefit of similarly titled U.S. Provisional Application Serial No. 60/182,139, filed February 11, 2000; similarly titled U.S. Provisional Patent Application No. 60/443,526, filed January 28, 2003; similarly titled U.S. Provisional Patent Application No. 60/484,204, filed June 30, 2003; U.S. Patent Application No. 10/655,455, filed September 3, 2003, entitled "Sealed Containers And Methods Of Making And Filling Same," U.S. Patent Application Serial No. 10/983,178, filed November 5, 2004, entitled "Adjustable Needle Filling and Laser Sealing Apparatus and Method; U.S. Patent Application Serial No. 11/901,467, filed September 17, 2007, entitled "Apparatus and Method for Needle Filling and Laser Resealing", which is a continuation of similarly titled U.S. Patent Application 11,510,961, filed August 28, 2006, now U.S. Patent No. 7,270,158 issued September 18, 2007, which is a continuation of similarly titled U.S. Patent Application Serial No. 11/070,440, filed March 2, 2005, now U.S. Patent No. 7,096,896, issued August 29, 2006, U.S. Patent Application Serial No. 11/074,513 filed March 7, 2005, entitled "Apparatus for Molding and Assembling Containers with Stoppers and Filling Same," and U.S. Patent Application Serial No. 11/074,454, filed March 7, 2005, entitled "Method for Molding and Assembling Containers with Stoppers and Filling Same", U.S. Patent Application Serial No. 11/786,206, filed April 10, 2007, entitled "Ready to Drink Container with Nipple and Needle Penetrable and Laser Resealable Portion, and Related Method", and U.S. Application Serial No. 11/804,431, filed May 18, 2007, entitled "Delivery Device with Separate Chambers Connectable in Fluid Communication When Ready for Use, and Related Method".

[0082] In the illustrated embodiment of the invention, the needle penetrable and thermally resealable portions or stoppers 125, 225, 226 are preferably made of a thermoplastic/elastomer blend, and may be the same material as those described in the co-pending patent applications and/or patents incorporated by reference above. Accordingly, in one such embodiment, the penetrable and thermally resealable portion or stopper is a thermoplastic elastomer that is heat resealable to hermetically seal the needle aperture by applying laser radiation at a predetermined wavelength and power thereto, and defines (i) a predetermined wall thickness, (ii) a predetermined color and opacity that substantially absorbs the laser radiation at the predetermined wavelength and substantially prevents the passage of radiation through the predetermined wall thickness thereof, and (iii) a predetermined color and opacity that causes the laser radiation at the predetermined wavelength and power to hermetically seal the needle aperture formed in the needle penetration region thereof in a predetermined time period of less than or equal to about 5 seconds and substantially without burning the needle penetration region.

[0083] In one embodiment, the penetrable and thermally resealable portion or stopper is a thermoplastic elastomer that is heat resealable to hermetically seal the needle aperture by applying laser radiation at a predetermined wavelength and power thereto, and includes (i) a styrene block copolymer; (ii) an olefin; (iii) a predetermined amount of pigment that allows the penetrable and thermally resealable portion to substantially absorb laser radiation at the predetermined wavelength and substantially prevent the passage of radiation through the predetermined wall thickness thereof, and hermetically seal the needle aperture formed in the needle penetration region thereof in a predetermined time period of less than or equal to about 5 seconds; and (iv) a predetermined amount of lubricant that reduces friction forces at an interface of the needle and the penetrable and thermally resealable portion or stopper portion during needle penetration thereof. In one such embodiment, the penetrable and thermally resealable portion or stopper includes less than or equal to about 40% by weight styrene block copolymer, less than or equal to about 15% by weight olefin, less than or equal to about 60% by weight mineral oil, and less than or equal to about 3% by weight pigment and any processing additives of a type known to those of ordinary skill in the pertinent art. The term "pigment" is used herein to mean any of numerous different substances or molecular arrangements that enable the material or material portion within which the substance or molecular arrangement is located to substantially absorb laser radiation at the predetermined wavelength and, in turn, transform the

absorbed energy into heat to melt the respective material forming the penetrable and thermally resealable portion or stopper and resealing an aperture formed therein.

[0084] In one embodiment, the penetrable and thermally resealable portion or stopper is a thermoplastic elastomer that is heat resealable to hermetically seal the needle aperture by applying laser radiation at a predetermined wavelength and power thereto, and includes (i) a first polymeric material in an amount within the range of about 80% to about 97% by weight and defining a first elongation; (ii) a second polymeric material in an amount within the range of about 3% to about 20% by weight and defining a second elongation that is less than the first elongation of the first polymeric material; (iii) a pigment in an mount that allows the penetrable and thermally resealable portion or stopper to substantially absorb laser radiation at the predetermined wavelength and substantially prevent the passage of radiation through the predetermined wall thickness thereof, and hermetically seal a needle aperture formed in the needle penetration region thereof in a predetermined time period of less than or equal to about 5 seconds; and (iv) a lubricant in an amount that reduces friction forces at an interface of the needle and second material portion during needle penetration thereof.

[0085] In one embodiment of the invention, the pigment is sold under the brand name Lumogen™ IR 788 by BASF Aktiengesellschaft of Ludwigshafen, Germany. The Lumogen IR products are highly transparent selective near infrared absorbers designed for absorption of radiation from semi-conductor lasers with wavelengths near about 800 nm. In this embodiment, the Lumogen pigment is added to the elastomeric blend in an amount sufficient to convert the radiation to heat, and melt the stopper material, preferably to a depth equal to at least about 1/3 to about 1/2 of the depth of the needle hole, within a time period of less than or equal to about 5 seconds, preferably less than about 3 seconds, and most preferably less than about 1-1/2 seconds. The Lumogen IR 788 pigment is highly absorbent at about 788 nm, and therefore in connection with this embodiment, the laser would preferably transmit radiation at about 788 nm (or about 800 nm). However, commonly used and cost effective laser diodes such as GaAlAs emit at 808 nm, which has been found to be sufficiently absorbed. One advantage of the Lumogen IR 788 pigment is that very small amounts of this pigment can be added to the elastomeric blend to achieve laser resealing within the time periods and at the resealing depths required or otherwise desired, and therefore, if desired, the needle penetrable and laser resealable stopper may be transparent or substantially transparent. This may be a significant aesthetic advantage. In one

embodiment of the invention, the Lumogen IR 788 pigment is added to the elastomeric blend in a concentration of less than about 150 ppm, is preferably within the range of about 10 ppm to about 100 ppm, and most preferably is within the range of about 20 ppm to about 80 ppm. In this embodiment, the power level of the 800 nm laser is preferably less than about 30 Watts, or within the range of about 8 Watts to about 18 Watts.

[0086] In one embodiment of the present invention, the substance or product contained within the storage chamber is a fat containing liquid product, such as infant or baby formula, and the primary seal and the penetrable and thermally resealable portion or stopper, first container closure member, any other components of the container closure that is exposed to potential direct contact with the product stored within the chamber, and the body each are selected from materials (i) that are regulatory approved for use in connection with nutritional foods, and preferably are regulatory approved at least for indirect contact, and preferably for direct contact with nutritional foods, (ii) that do not leach an undesirable level of contaminants or non-regulatory approved leachables into the fat containing product, such mineral oil, and (iii) that do not undesirably alter the taste profile (including no undesirable aroma impact) of the fat containing liquid product to be stored in the container.

[0087] In the embodiment of the present invention wherein the product is a fat containing liquid nutrition product, such as an infant or baby formula, exemplary materials for the penetrable and thermally resealable portion or stopper are selected from the group including GLS 254-071, GLS LC254-071, GLS LC287-161, GLS LC287-162, C-Flex R70-001, C-Flex R70-005 + about 62.5 ppm Lumogen, C-Flex R70-005 + about 75 ppm Lumogen, Evoprene TS 2525 4213, Evoprene SG 948 4213, Evoprene G968-4179 + about 0.026% Carbon Black, Evoprene G968-4179 + about 62.5 ppm Lumogen and Cawiton 7193, modifications of any of the foregoing, or similar thermoplastic elastomers. In one such embodiment, the body is an injection molded multi-layer of PP/EVOH. In another such embodiment, the body is blow molded, such as by extrusion blow molding, and is an HDPE/EVOH multi layer. In embodiments where carbon black is used as a laser absorbent, other laser wavelengths such as 980 nm (e.g., InGaAs) or 1064 nm (e.g., AlGaAs, Nd:YVO4, Nd:YAG, Nd:YLF) can be used.

[0088] In yet further embodiments, the sealing step is accomplished other than by thermal or laser sealing. In some such embodiments, liquid sealant sealing is utilized, e.g., silicone, as described in co-pending U.S. provisional application no. 61/476,523, filed April 18, 2011, which

is incorporated by reference in its entirety as if fully set forth herein. In yet other embodiments, a covering or covering portion is placed over the penetration site as described in the above-mentioned U.S. Patent Application No. 10/655,455, filed September 3, 2003, now U.S. Patent No. 7,100,646 issued September 5, 2006, which is also incorporated by reference herein. Those of skill in the art should recognize that while in some embodiments non-thermal or non-laser resealing processes may be utilized on thermally or laser resealable stoppers, in other embodiments the stopper or resealable portion is not thermally or laser resealable.

[0089] As may be recognized by those skilled in the pertinent art based on the teachings herein, numerous changes and modifications may be made to the above-described and other embodiments of the present invention without departing from its scope as defined in the appended claims. For example, the first and/or second chamber of the container can be filled with any desired substance such as, for example, a liquid product, an additive, a probiotic or combinations thereof, by any of numerous sterile filling methods that are currently known, or that later become known, and without forming and/or resealing a filling member aperture in one or both of the resealable portions, while maintaining the stored substances in the respective chambers separate (if desired) until mixing and dispensing occurs. Additionally, the nipple, seals and other components of the container closure may be made of any of numerous different materials that are currently known, or that later become known for performing their functions and/or depending on the container application(s), including the product to be stored within the container. For example, the nipple or teat may take any of numerous different configurations of nipples, and may be formed of any of numerous different nipple materials, that are currently known, or that later become known. As a further example, the penetrable and thermally resealable material may be blended with any of numerous different materials to obtain any of numerous different performance objectives. For example, any of the thermoplastic elastomers described above may be blended with, for example, small beads of glass or other insert beads or particles to enhance absorption of the laser radiation and/or to reduce or eliminate the formation of particles when needle penetrated. In addition, the body and container closure may take any of numerous different shapes and/or configurations, and may be adapted to receive and store within the storage chamber any of numerous different substances or products that are currently known or that later become known, including without limitation, any of numerous different food or beverage products, including low acid or fat containing liquid products, such as milk-based

products, including without limitation milk, evaporated milk, infant formula, growing-up milks, condensed milk, cream, half-and-half, yogurt, and ice cream (including dairy and non-diary, such as soy-based ice cream), other liquid nutrition products, liquid healthcare products, juice, syrup, coffee, condiments, such as ketchup, mustard, and mayonnaise, and soup, and pharmaceutical products. The term "liquid nutrition product" is used herein to mean enterally ingested liquids that are formulated primarily for meeting one or more specific nutritional requirements of, and that contribute to the energy requirements of, a person that ingests the liquid. Liquid nutrition products do not include, for example, foods and beverages that are administered other than enterally, such as parenteral or injectable liquids, pharmaceutical, dermatological, cosmetic, ophthalmic and veterinary products and preparations, vaccines, and dietary and nutritional supplements without sufficient calorific value to contribute to the energy requirements of a person that ingests the liquid. The term "food and beverage products" are used herein to mean food and beverages that are orally ingested by humans, but does not include liquid nutrition products, foods and beverages that are administered other than orally, such as by injection, pharmaceutical, dermatological, cosmetic, ophthalmic and veterinary products and preparations, vaccines, and dietary and nutritional supplements. In addition, although described with reference to liquid products herein, the containers and filling apparatus and methods equally may be employed with gaseous, powdered, and semi-solid products. Accordingly, this detailed description of preferred embodiments is to be taken in an illustrative, as opposed to a limiting sense.

What is claimed is:

1. A container for storing and dispensing a product, the container comprising:

a body defining a chamber for storing the product and an outflow port periphery defining an outflow port in fluid communication with the chamber; and

a container closure including:

a primary seal;

a secondary seal forming a substantially fluid-tight seal between the container closure and the body; and

a dispensing member defining an outlet aperture in fluid communication with the body;

wherein at least one of the container closure and body is movable relative to the other between a first position where the primary seal at least one of i) extends into the outflow port in a direction toward the chamber and sealingly engages a surface of the outflow port periphery that is internal to the outflow port and ii) sealingly engages a surface of the outflow port periphery that is external to the outflow port and extends along said surface in a direction toward the chamber to hermetically seal the product in the chamber, and a second position where the primary seal is displaced from the outflow port to place the dispensing member in fluid communication with the outflow port and allow product to pass from the chamber through the outflow port and to the outlet aperture of the dispensing member.

2. A container as defined in claim 1, wherein a radial thickness of the primary seal adjacent to the outflow port periphery is greater than a radial thickness of the outflow port periphery.

3. A container as defined in claim 2, wherein said radial thickness of the primary seal is at least about 50% greater than said radial thickness of the outflow port periphery.

4. A container as defined in claim 1, wherein the secondary seal extends from the closure in a radially-inward direction.

5. A container as defined in claim 1, wherein the container closure includes a first barrier layer and a second barrier layer, wherein the first barrier layer defines more than about 50% of the internal surface of the container closure.

6. A container as defined in claim 1, further including at least one additional chamber, the at least one additional chamber located in at least one of (i) the body of the container, (ii) the container closure and (ii) a combination of the body of the container and container closure, and is in fluid communication with the chamber when the primary seal is in the second position, wherein the chamber stores a first substance, the at least one additional container stores at least one additional substance, the first substance and the at least one additional substance forming the dispensed product.

7. A container as defined in claim 1, further comprising a portion that is penetrable by an injection or filling member, and a resulting injection aperture in the penetrable portion is resealable.

8. A container as defined in claim 7, wherein the elastomeric portion is resealable by at least one of a) thermally resealing; b) liquid sealant and c) a covering portion placed over the injection aperture.

9. A container as defined in claim 1, wherein the primary seal is penetrable by an injection member for aseptically filling the chamber with the product through the injection member, and is resealable to seal the product within the chamber.

10. A container as defined in claim 9, wherein the primary seal is resealable by at least one of a) thermally resealing; b) liquid sealant and c) a covering portion placed thereover.

11. A container as defined in claim 1, wherein the dispensing member is eccentrically mounted on the closure and defines an axis of symmetry that is oriented at an acute angle relative to an elongated axis of the body, and wherein the closure further defines a vent aperture that is laterally spaced from the dispensing member on an approximately opposite side of the closure relative to the dispensing member for improving the flow of product between the chamber and outlet aperture when the container closure is in the second position.

12. A container as defined in claim 1, further comprising a sealing member that is movable between a first position sealing at least one of (i) the outlet aperture, (ii) the vent aperture and (iii) the outlet aperture and the vent aperture, and a second position opening at least

one of (i) the outlet aperture, (ii) the vent aperture and (iii) the outlet aperture and the vent aperture.

13. A container as defined in claim 12, wherein the sealing member is frangibly connected to the dispensing member and container closure such that in the first position the sealing member is connected to at least one of the dispensing member and container closure, and in the second position the sealing member is disconnected from at least one of the dispensing member and container closure.

14. A container as defined in claim 11, wherein the dispensing member is a nipple.

15. A container as defined in claim 14, wherein the nipple includes a stem portion and a tip portion, the outlet aperture extending trough the stem portion and tip portion.

16. A container as defined in claim 15, wherein the nipple is at least one of a round nipple, a bi-stable nipple, and a stretchable nipple.

17. A container as defined in claim 15, wherein the container closure has an outer convexed surface, and the nipple extends outwardly from the outer convexed surface.

18. A container as defined in claim 17, wherein the outer convexed surface in combination with the nipple replicate the shape and feel of a female breast.

19. A container as defined in claim 14, wherein the container closure defines a central region and the nipple is laterally spaced relative to the central region.

20. A container as defined in claim 1, wherein the container closure rotates between the first position and the second position about a longitudinal axis of the container.

21. A container as defined in claim 1, wherein the container closure further comprises a radially-inwardly projecting member and the body further comprises at least one of a) a first detent configured to releaseably engage the member in the first position; and b) a second detent configured to engage the member in the second position and to substantially prevent the container closure from moving out of the second position.

22. A container as defined in claim 21, wherein the first detent is configured to permit the container closure to substantially move in only a single direction toward the second position.

23. A container as defined in claim 1, wherein the dispensing member is at least one of (i) a drinking spout, (ii) a drinking spout including a one-way check valve, wherein the check valve opens under negative pressure to allow the product to exit the outlet aperture, and (iii) a push-pull cap, wherein the outlet aperture is closed when the cap is in the retracted push position and the outlet aperture is open when the cap is in the extended pull position.

24. A container as defined in claim 1, wherein the chamber is adapted for storing a fat containing liquid product; the body, sealing member and dispensing member do not leach more than a predetermined amount of leachables into the fat containing liquid product and do not undesirably alter a taste profile of the fat containing liquid product; and the predetermined amount of leachables is less than about 100 PPM.

25. A container as defined in claim 1, wherein the container closure further includes a securing portion connectable to the body for securing the container closure to the body.

26. A container as defined in claim 25, wherein the securing portion is at least one of threadedly connected to and snap-fit to the body.

27. A container as defined in claim 1, wherein the body is made from a blow molded polymer.

28. A container as defined in claim 1, wherein the primary seal includes a thermoplastic elastomer that is heat resealable to hermetically seal a penetration aperture by applying laser radiation at a predetermined wavelength and power thereto, and defines (i) a predetermined wall thickness, (ii) a predetermined color and opacity that substantially absorbs the laser radiation at the predetermined wavelength and substantially prevents the passage of radiation through the predetermined wall thickness thereof, and (iii) a predetermined color and opacity that causes the laser radiation at the predetermined wavelength and power to hermetically seal the penetration aperture in a predetermined time period of less than or equal to about 5 seconds and substantially without burning the primary seal.

29. A container as defined in claim 1, wherein the primary seal includes a thermoplastic elastomer that is heat resealable to hermetically seal a penetration aperture by applying laser radiation at a predetermined wavelength and power thereto, and includes (i) a styrene block copolymer; (ii) an olefin; (iii) a predetermined amount of pigment that allows the primary seal to substantially absorb laser radiation at the predetermined wavelength and substantially prevent the passage of radiation through the predetermined wall thickness thereof, and hermetically seal the penetration aperture in a predetermined time period of less than or equal to about 5 seconds; and (iv) a predetermined amount of lubricant that reduces friction forces at an interface of the injection member and primary seal during penetration thereof.

30. A container as defined in claim 1, further including a removable overcap attached to at least one of the container closure and body.

31. An assembly comprising a container as defined in claim 1; a filling apparatus comprising a manifold including a plurality of injection members spaced relative to each other and movable relative to a container support for penetrating a plurality of containers mounted on the support within the filling apparatus, filling the containers through the injection members, and withdrawing the injection members from the filled containers; and a plurality of assemblies connectable to a source of radiation for applying radiation to a penetration spot on a penetrable and resealable portion of a respective container closure and resealing a respective injection member penetration aperture therein.

32. An assembly as recited in claim 31, wherein the assemblies comprise laser optic assemblies connectable to a laser radiation source and focusable substantially on the penetration spot for applying laser radiation thereto and resealing thereof.

33. An assembly as recited in claim 31, further comprising:

a housing defining an inlet end, an outlet end, and a sterile zone between the inlet and outlet ends;

conveyor located at least partially within the sterile zone and defining a plurality of container positions thereon for supporting and moving containers in a direction from the inlet end toward the outlet end through the sterile zone;

a fluid sterilant station located within the sterile zone and coupled in fluid communication with a source of fluid sterilant for transmitting fluid sterilant onto the container closure of a respective container supported on the conveyor within the fluid sterilant station and sterilizing an exposed penetrable and resealable portion of the respective container closure; and

at least one sterilant removing station located within the sterile zone between the fluid sterilant station and the outlet end of the housing, and coupled in fluid communication with a source of gas for transmitting the gas onto a container supported on the conveyor within the at least one sterilant removing station to flush away fluid sterilant on the container;

wherein the manifold and assemblies are located within the sterile zone between the at least one sterilant removing station and the outlet end of the housing for receiving the sterilized containers therefrom.

34. An assembly as defined in claim 31, wherein the fluid sterilant is hydrogen peroxide.

35. An assembly as defined in claim 31, further comprising a source of sterile gas coupled in fluid communication with the sterile zone for creating an over pressure of sterile gas within the sterile zone, and means for directing a flow of sterile gas substantially in a direction from the outlet end toward the inlet end of the housing to thereby prevent fluid sterilant from flowing onto containers located adjacent to the needle manifold.

36. A container for storing a product comprising:

first means for providing a chamber for receiving the product and for providing an outflow port periphery defining an outflow port in fluid communication with the chamber;

second means for closing the chamber of the first means; wherein the second means includes third means for forming a substantially fluid-tight seal between the first means and the second means;

fourth means for insertion into a user's mouth and drawing with the mouth product from the chamber therethrough; and

fifth means for at least one of i) extending into the outflow port in a direction toward the chamber and sealingly engaging a surface of the outflow port periphery that is internal to the

outflow port and ii) sealingly engaging a surface of the outflow port periphery that is external to the outflow port and extends along said surface in a direction toward the chamber for hermetically sealing the product in the chamber.

37. A container as defined in claim 36, further comprising sixth means for allowing penetration of the second means by the injection member for aseptically filling the chamber with the product through the injection member, and for allowing resealing of the second means to seal the product within the chamber.

38. A container as defined in claim 36, wherein the first means is a container body, the second means is a container closure, the third means is a sealing member, the fourth means is a nipple, and the fifth means is a sealing member that is movable between a first position to hermetically seal the product in the chamber and a second position to allow the product to flow out of the chamber and into the nipple for dispensing.

39. A container as defined in claim 37, wherein the sixth means is a penetrable and resealable elastomeric portion that is penetrable by the injection member for aseptically filling the chamber with the product through the injection member, and that is resealable to seal the product within the chamber.

40. A container as defined in claim 39, wherein the elastomeric portion is resealable by at least one of a) thermally resealing by the application of laser radiation or energy thereto; b) liquid sealant and c) a covering portion placed thereover.

41. A method comprising the following steps:

(i) filling a container with a product, wherein the container comprises a body defining a sealed, empty chamber for storing the product and an outflow port periphery defining an outflow port in fluid communication with the chamber; and a container closure, the container closure including a primary seal, a secondary seal forming a substantially fluid-tight seal between the container closure and the body, and a dispensing member defining an outlet aperture in fluid communication with the body, wherein at least one of the container closure and body is movable relative to the other between a first position where the primary seal at least one of i) extends into the outflow port in a direction toward the chamber and sealingly engages a surface of the outflow

port periphery that is internal to the outflow port and ii) sealingly engages a surface of the outflow port periphery that is external to the outflow port and extends along said surface in a direction toward the chamber to hermetically seal the chamber during storage, and a second position where the primary seal is displaced from the outflow port to open the chamber;

wherein the filling step comprises:

(a) at least one of (1) sterilizing the body and container closure, (2) molding the body and container closure with a sealed, empty, sterile chamber at the time of molding, and (3) assembling the body and closure upon molding so that the assembled container defines a sealed, empty, sterile chamber;

(b) introducing an injection member in fluid communication with a source of the product into fluid communication with the chamber;

(c) aseptically filling the chamber with the product through the injection member; and

(d) withdrawing the injection member from the chamber and resealing the chamber with respect to the ambient atmosphere; and

(ii) aseptically storing the product in the sealed chamber with the primary seal in the first position to hermetically seal the product in the chamber with respect to the ambient atmosphere.

42. A method as defined in claim 41, further comprising moving at least one of the container closure and body relative to the other from the first position to the second position; placing the chamber in fluid communication with the dispensing member; and dispensing the product through the dispensing member.

43. A method as defined in claim 42, wherein the container further comprises a dispensing member in the form of a nipple eccentrically located on the closure and a vent laterally spaced relative to the nipple and in fluid communication with the chamber in the second position, and wherein the dispensing step further comprises allowing air to vent through the vent while liquid flows through the nipple and substantially preventing air from flowing through the nipple.

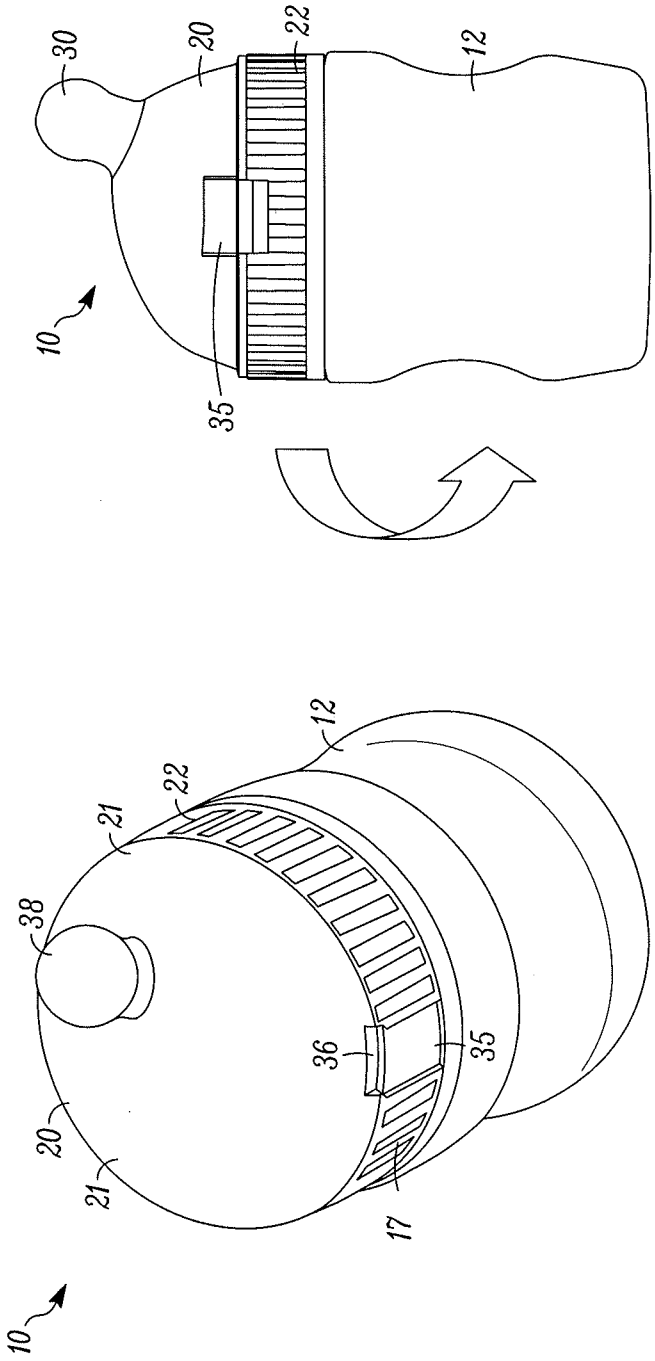

FIG. 1

FIG. 2

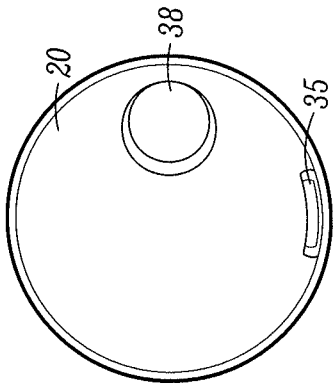

FIG. 3

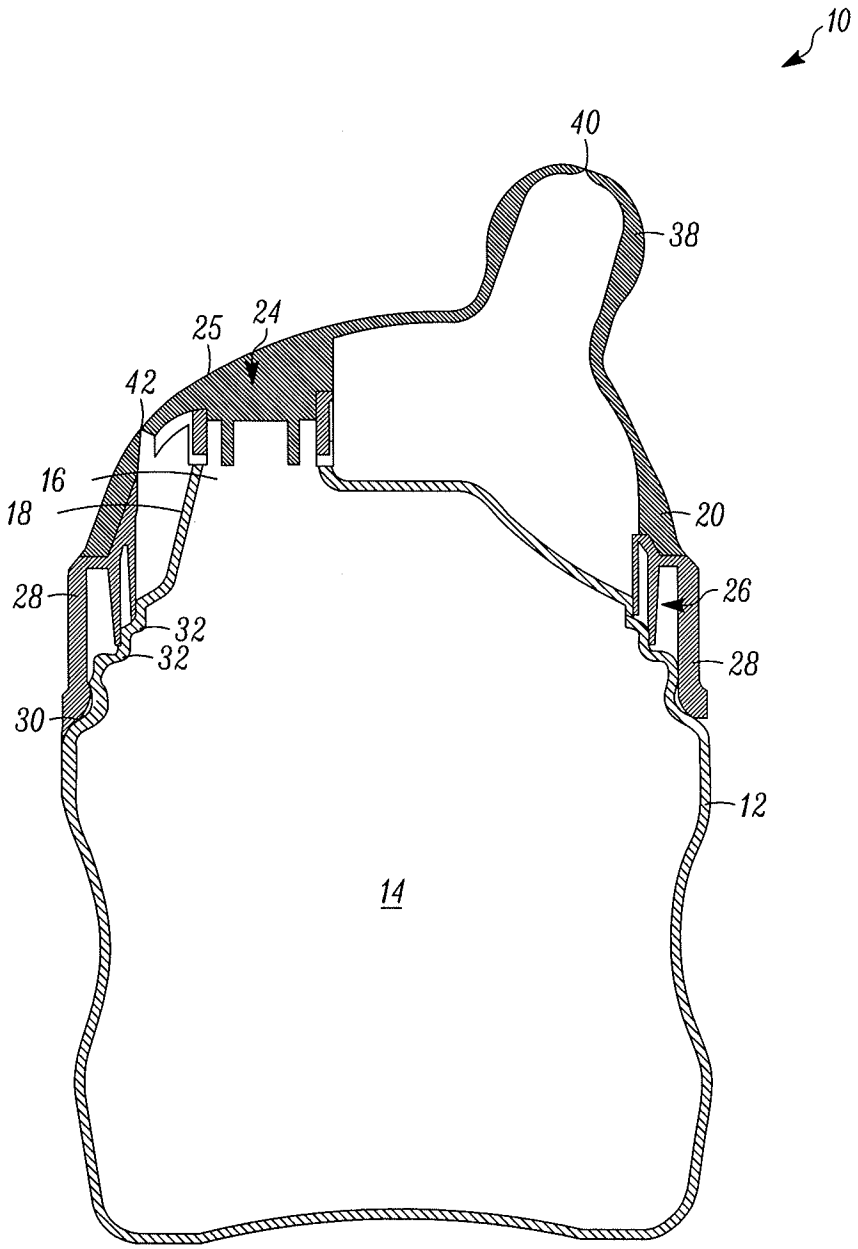

FIG. 4A

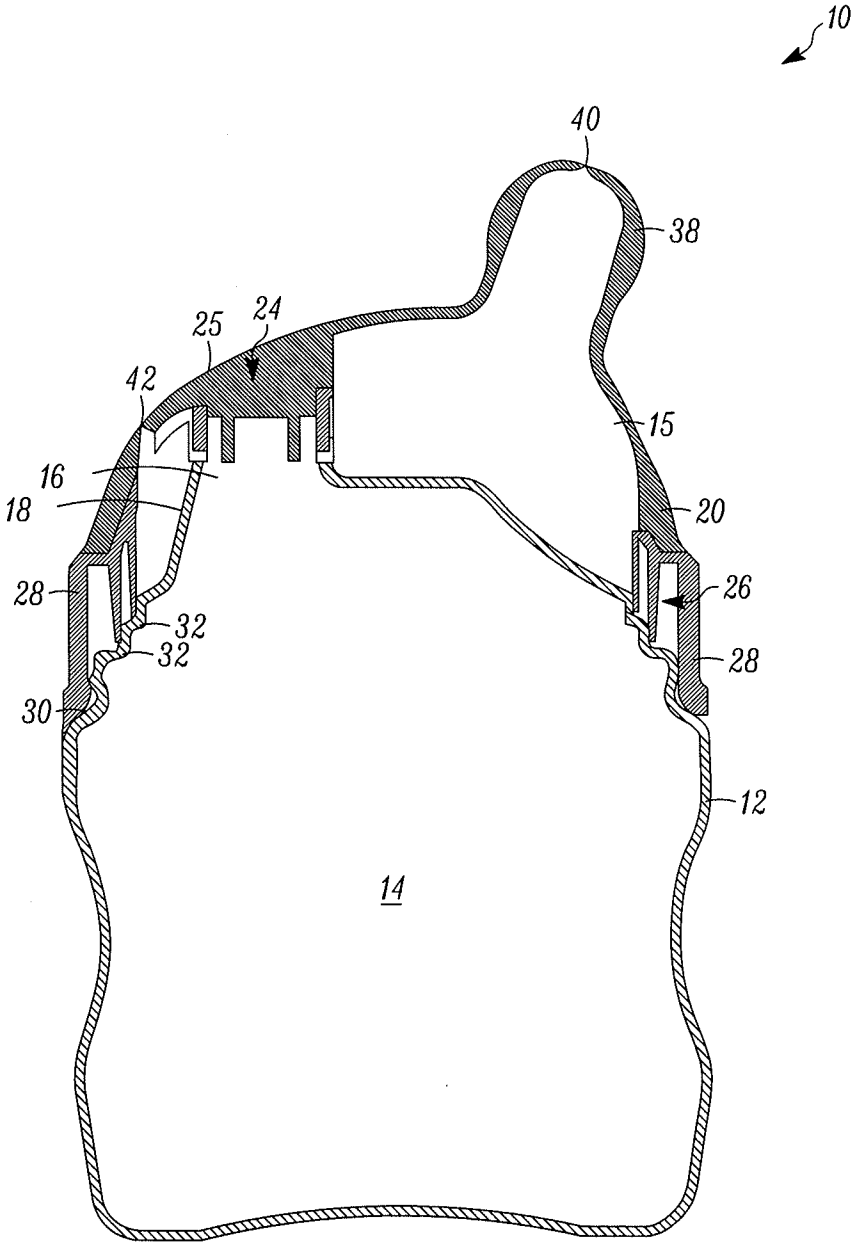

FIG. 4B

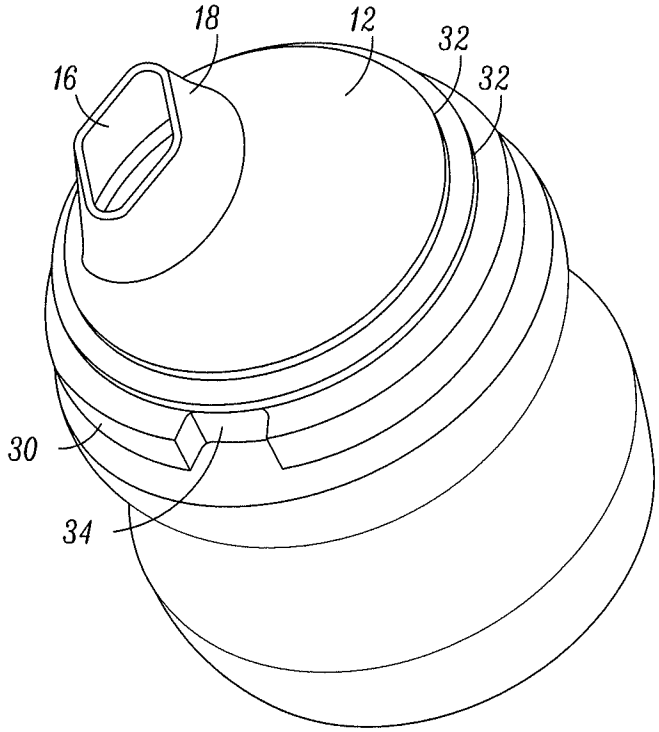

FIG. 5A

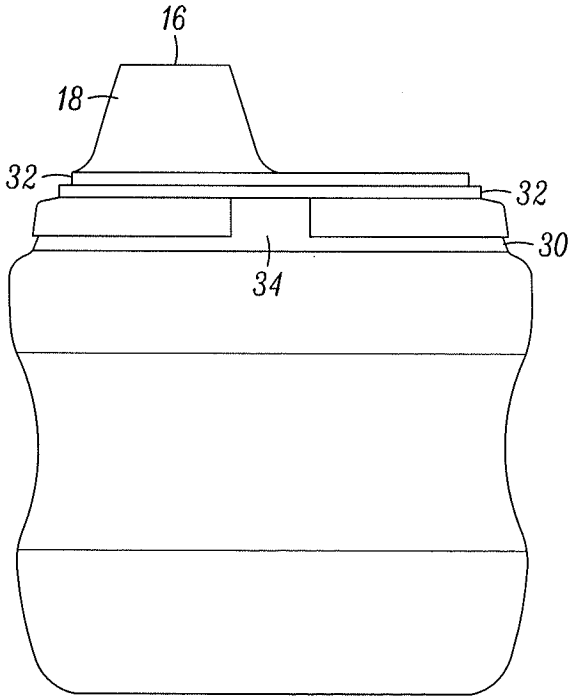

FIG. 5B

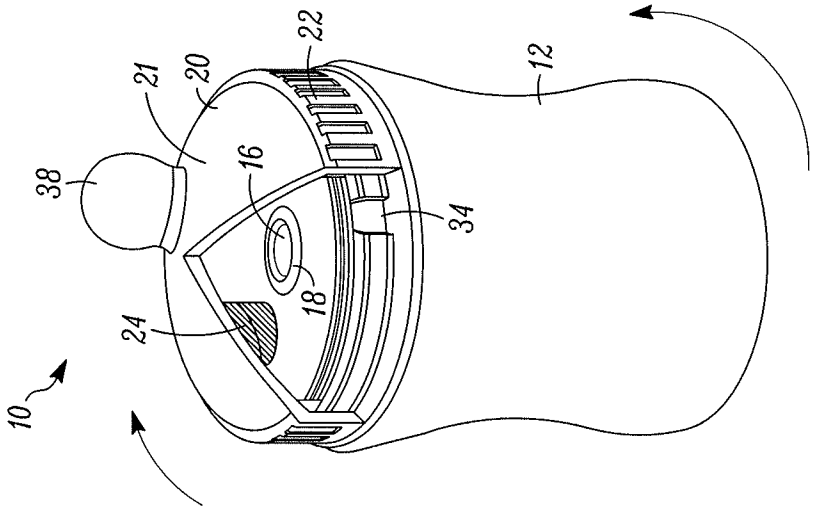

FIG. 6B

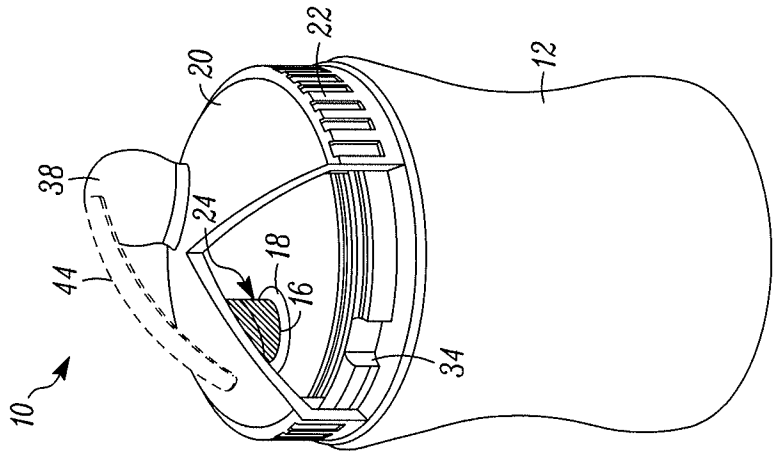

FIG. 6A

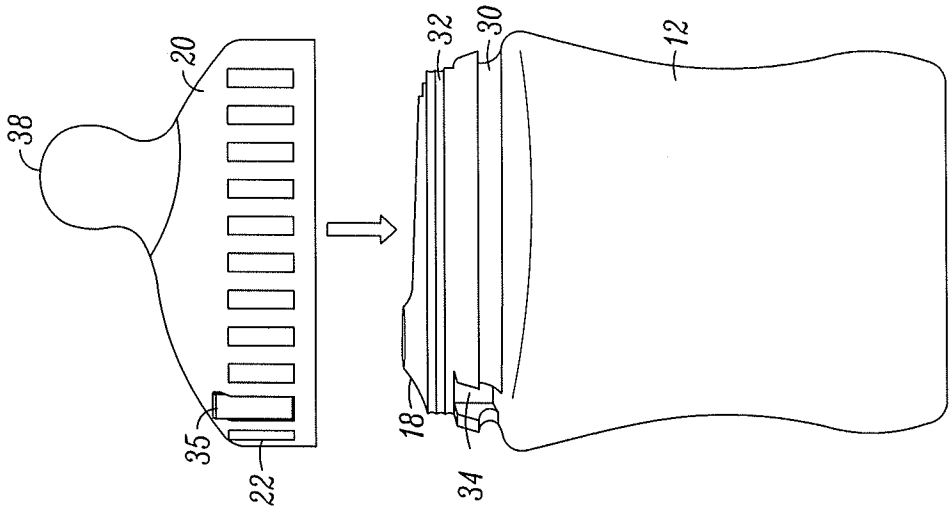

FIG. 7B

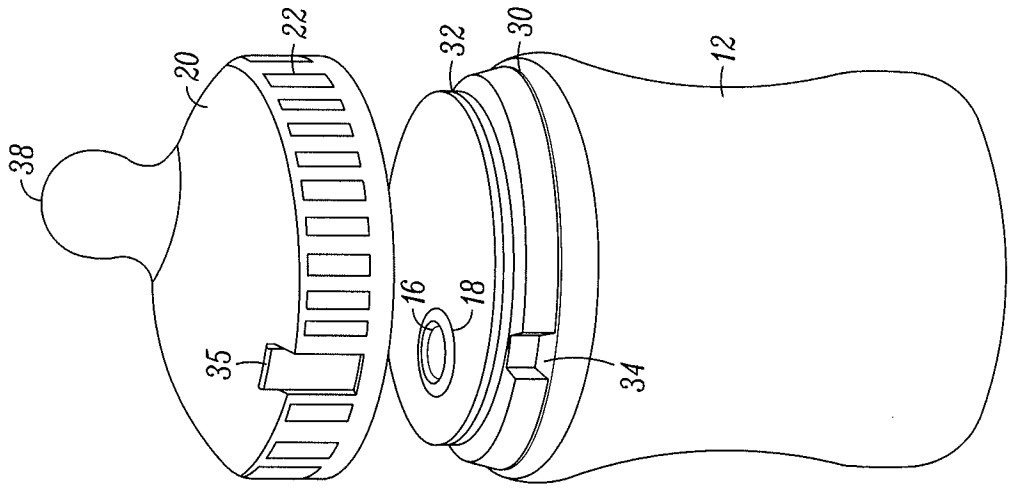

FIG. 7A

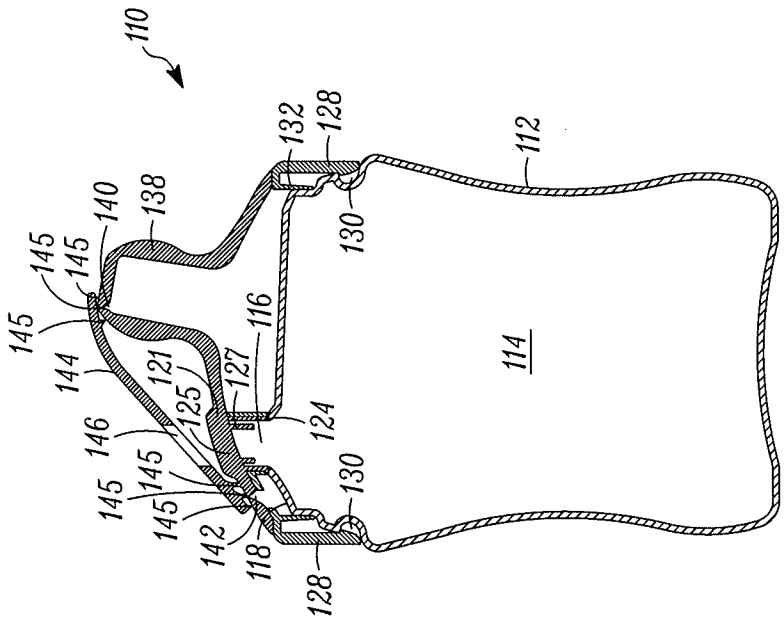
110
132
128
112
140
138
145
145
145
116
121
127
144
125
124
146
145
145
145
142
118
130
130
128
114

FIG. 9

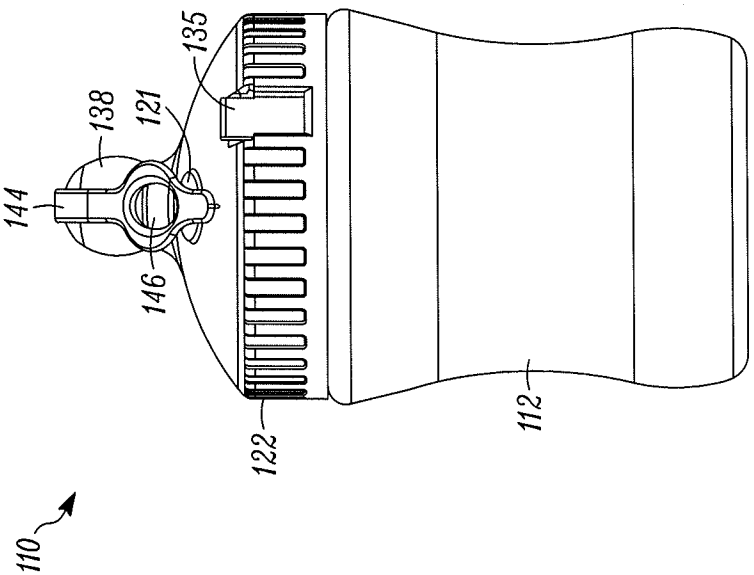
135
138
121
144
146
122
112
110

FIG. 8

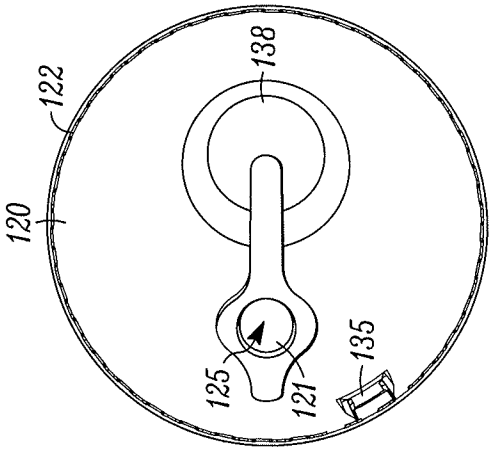

FIG. 10B

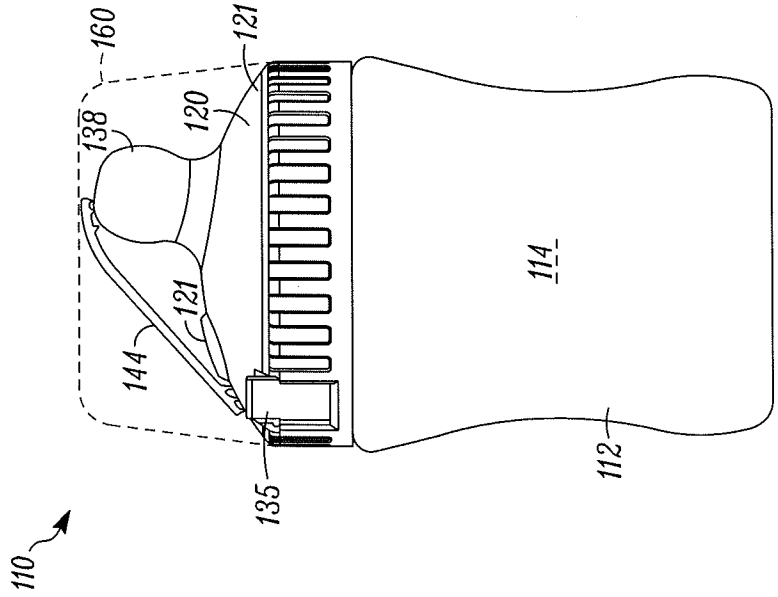

FIG. 10A

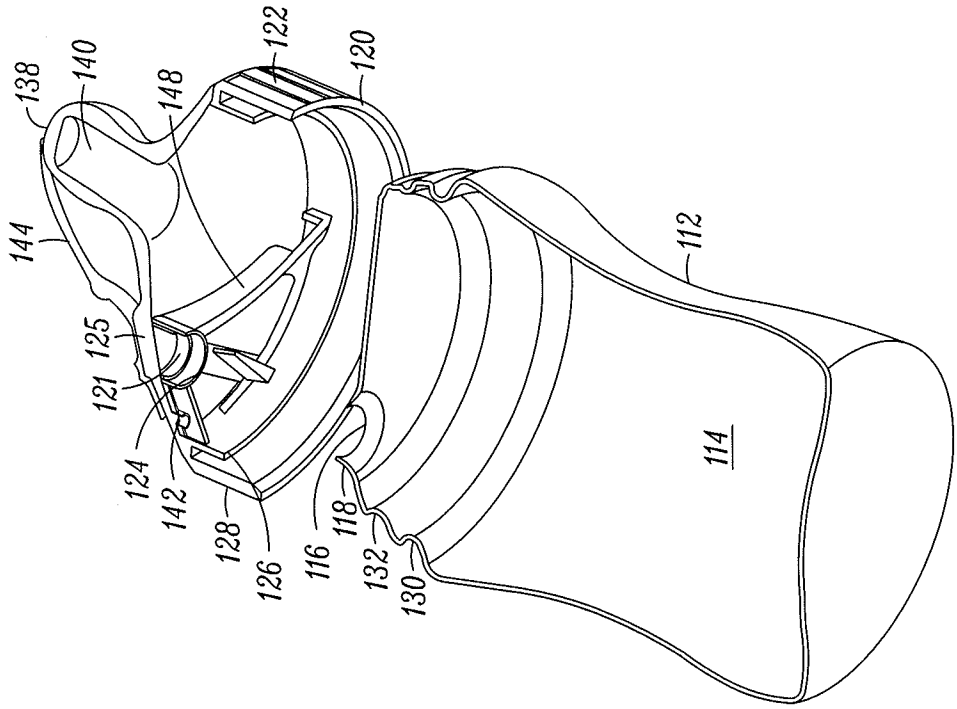
122
120
138
140
148
144
125
121
124
142
128
126
116
118
132
130
112
114

FIG. 12

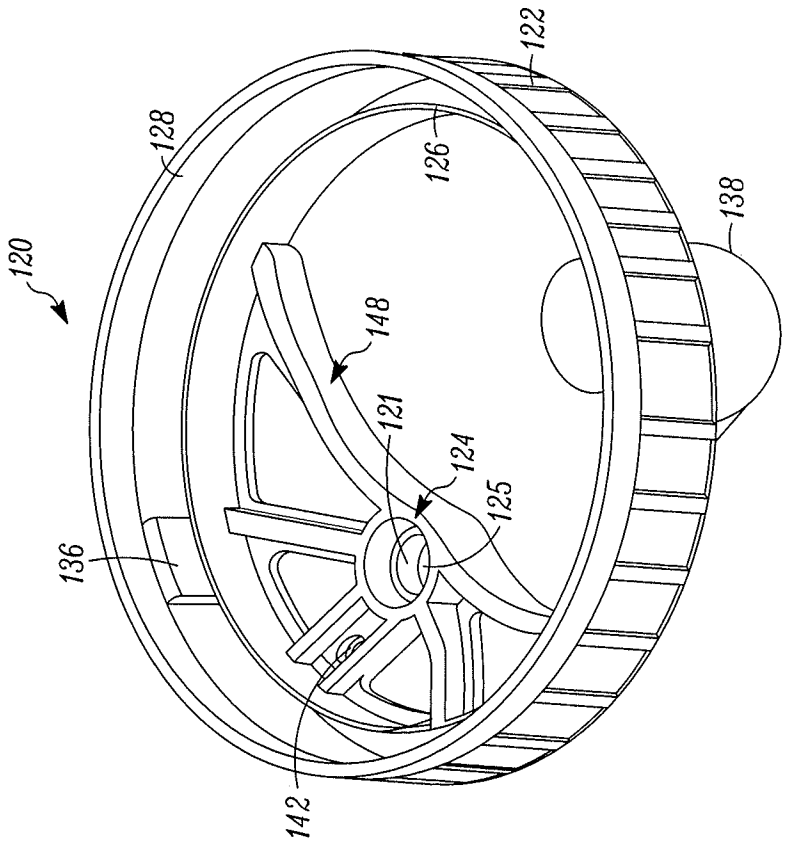
122
128
126
138
120
148
121
124
125
136
142

FIG. 11

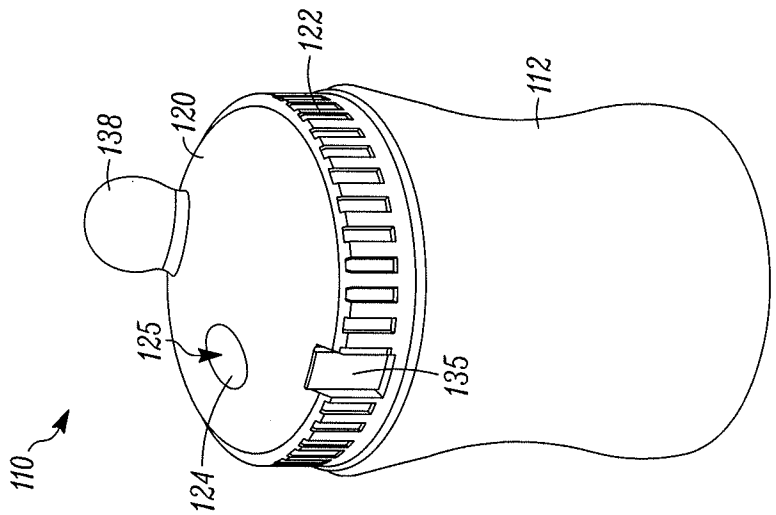

FIG. 13B

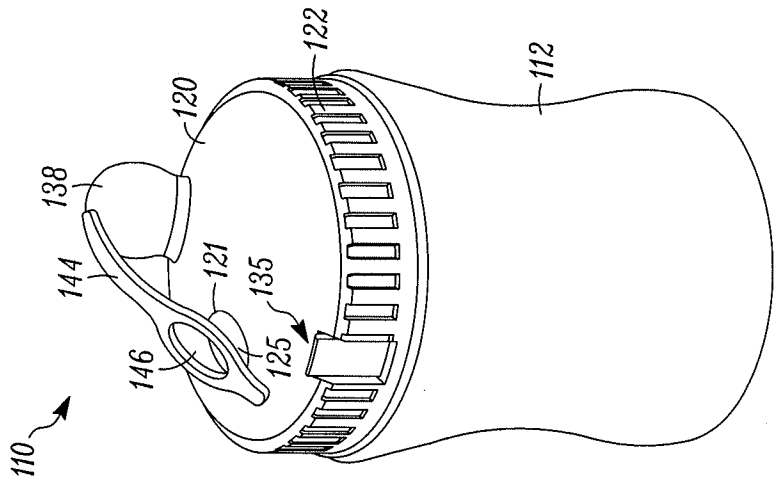

FIG. 13A

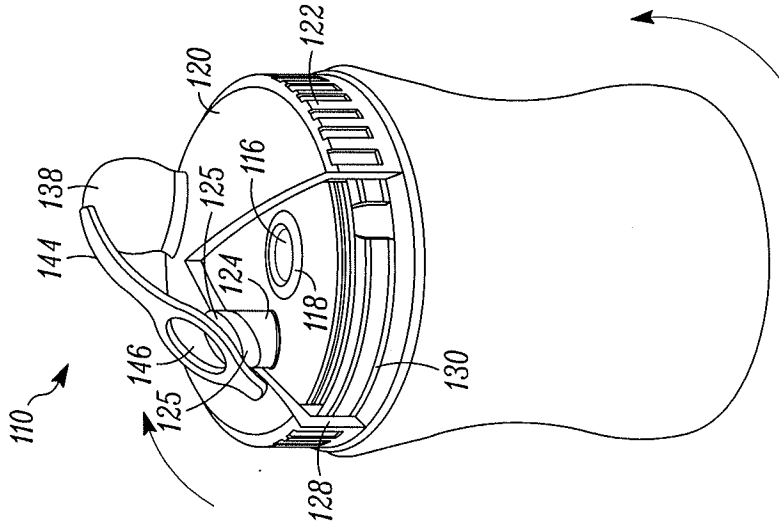

FIG. 14B

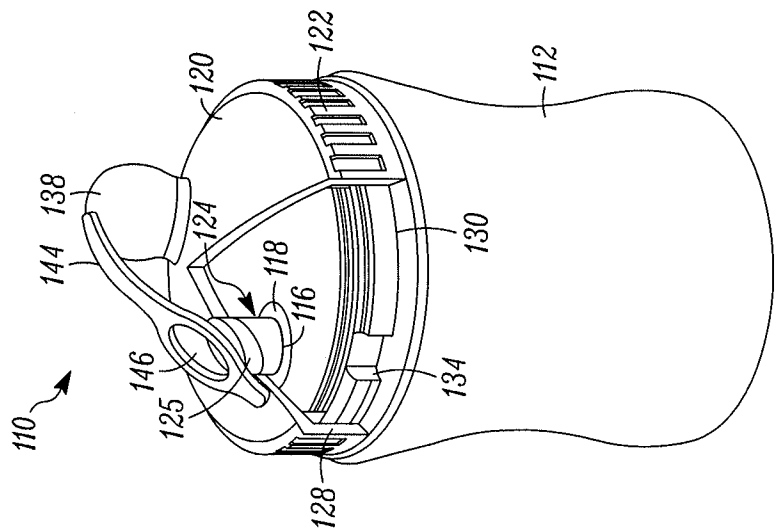

FIG. 14A

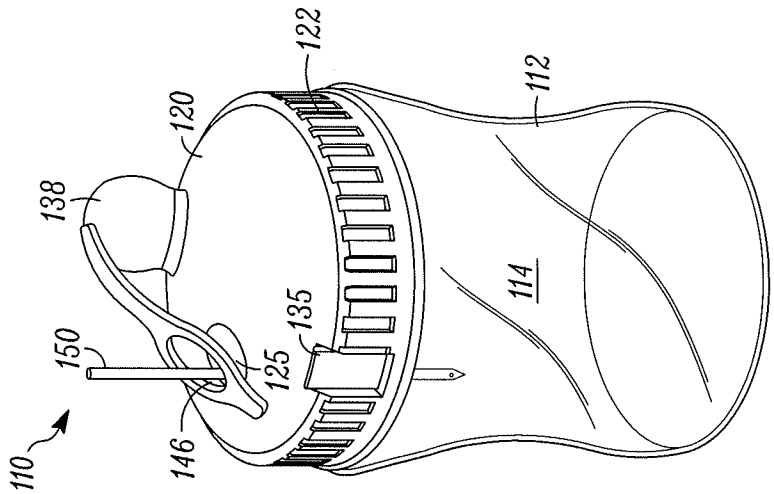

FIG. 15B

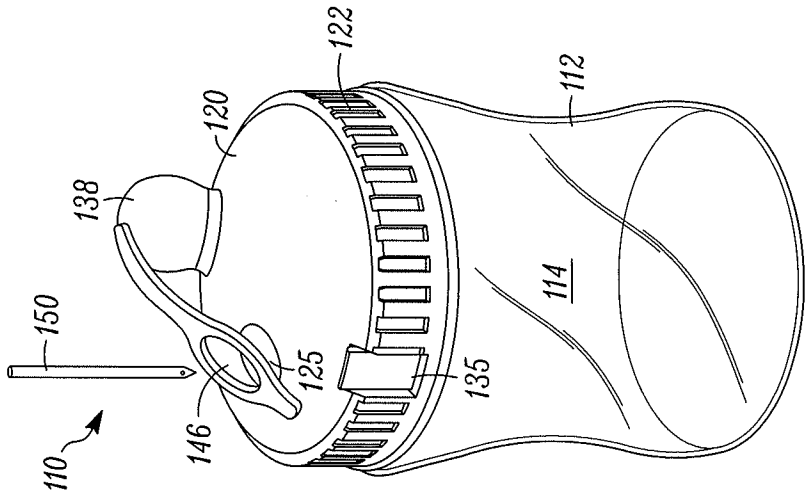

FIG. 15A

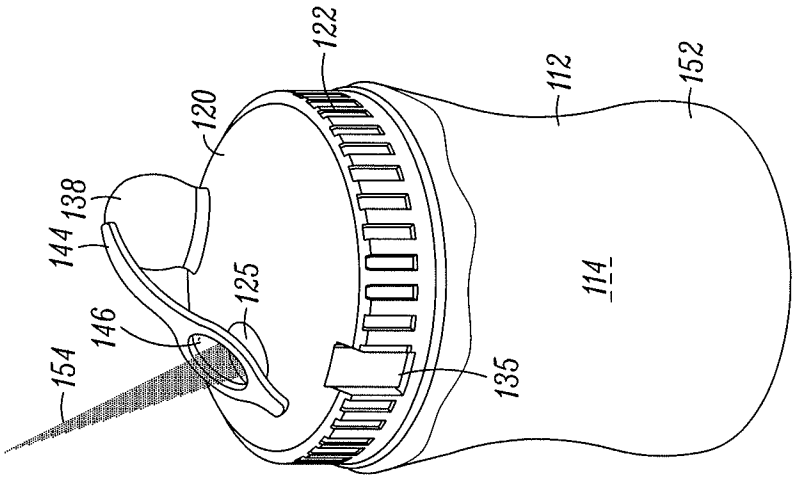

FIG. 16A

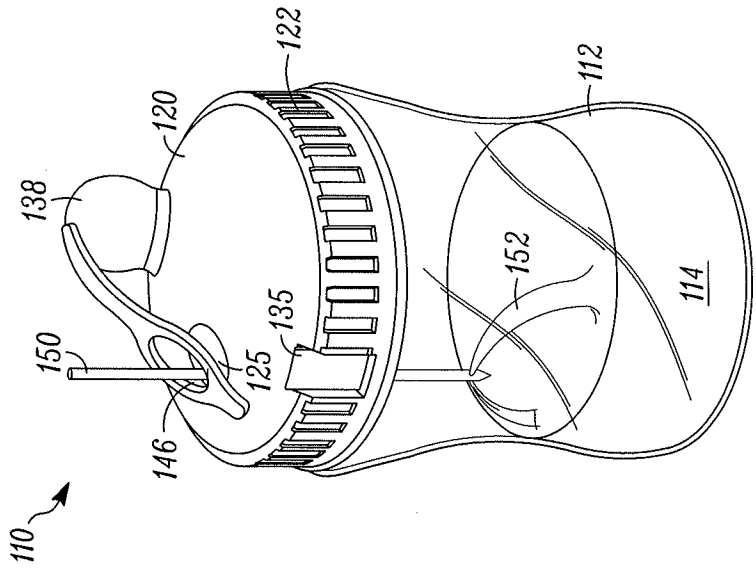

FIG. 15C

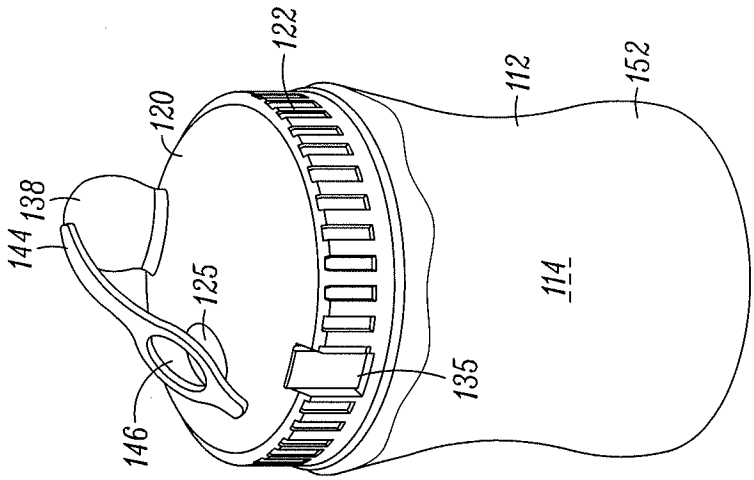

FIG. 16B

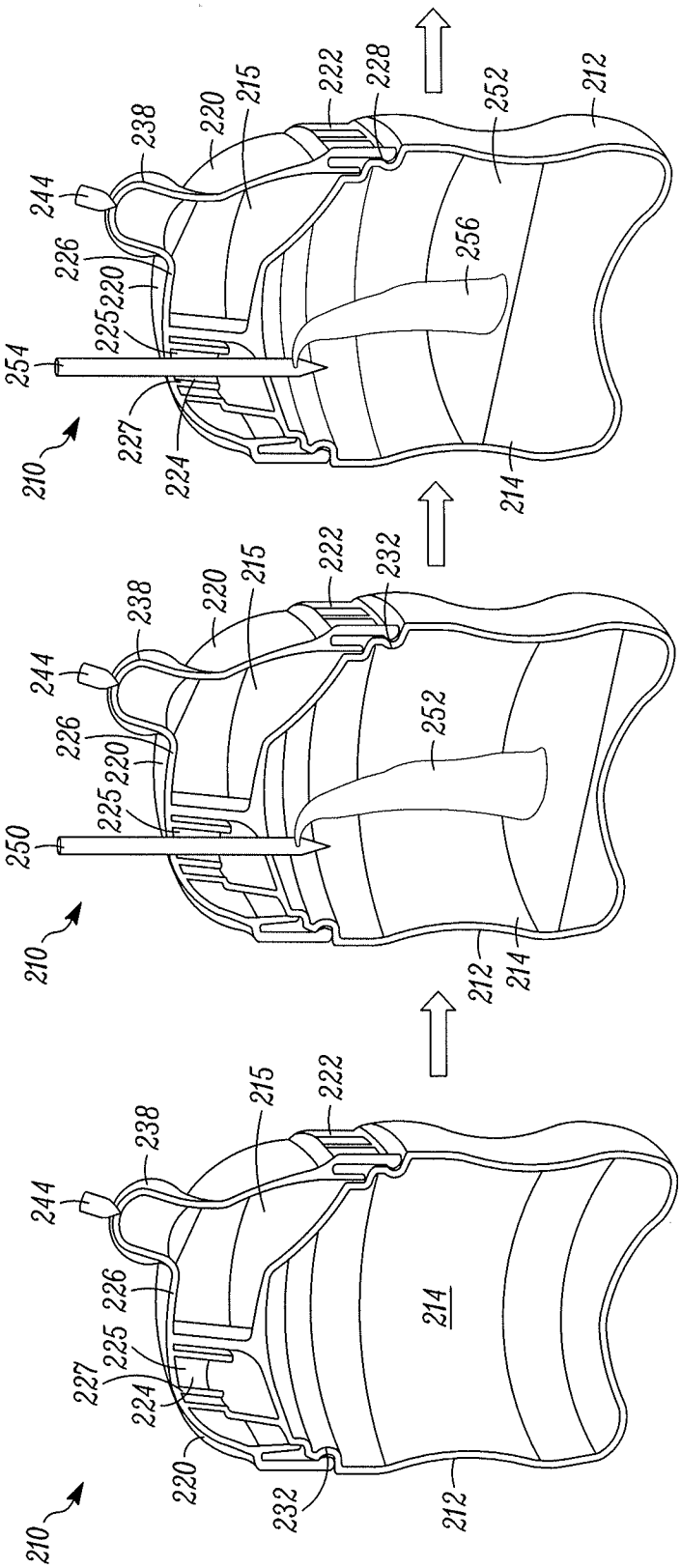

FIG. 17A

FIG. 17B

FIG. 17C

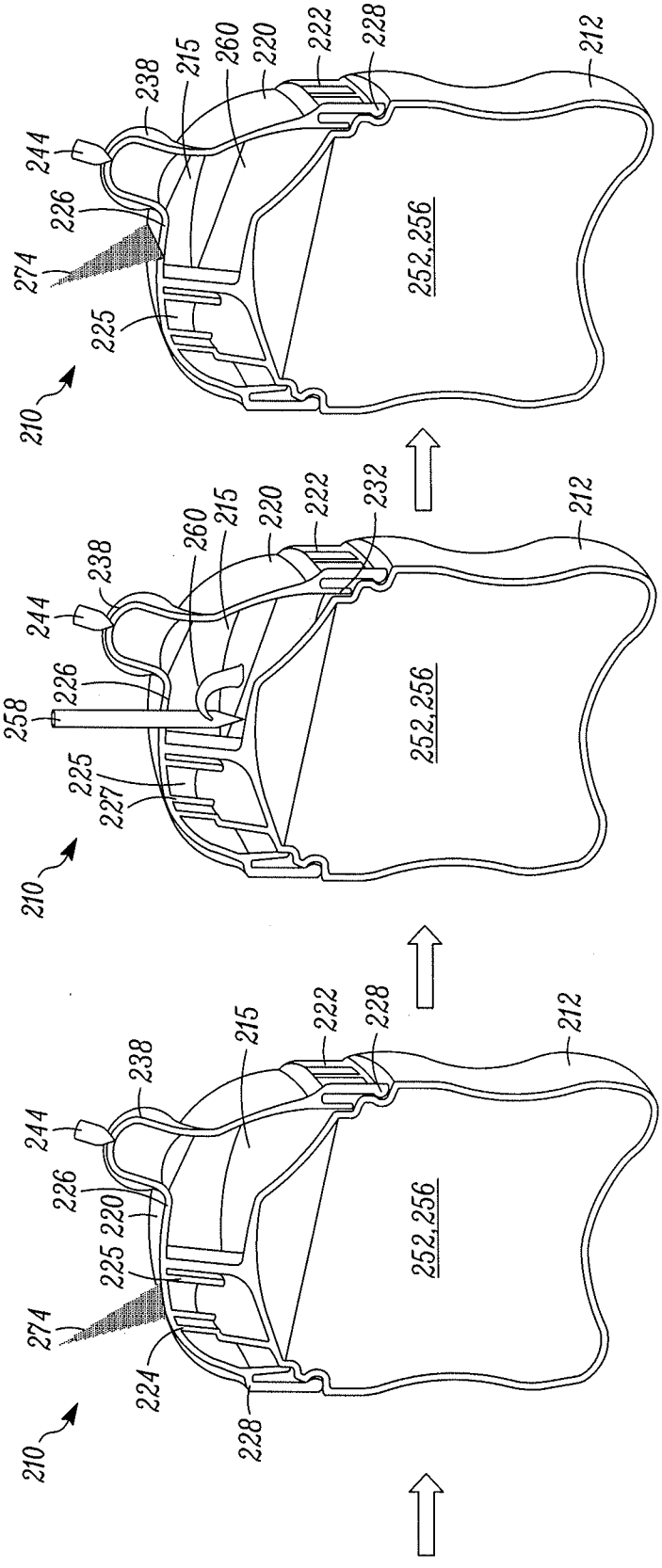

FIG. 17F

FIG. 17E

FIG. 17D

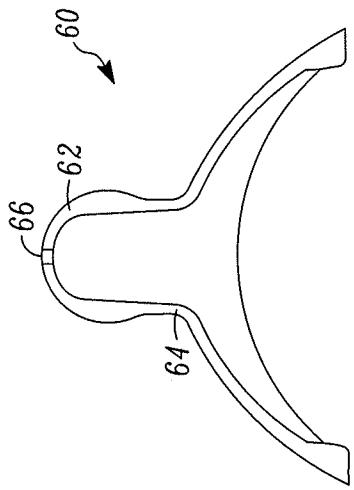

FIG. 18B

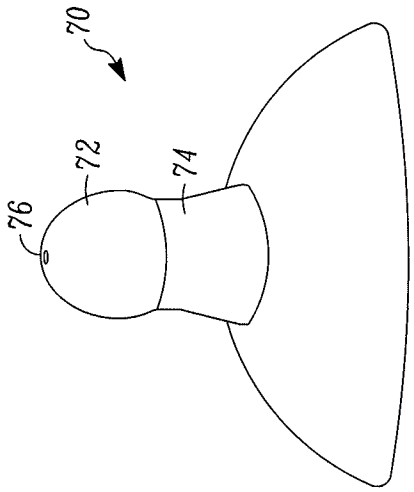

FIG. 18C

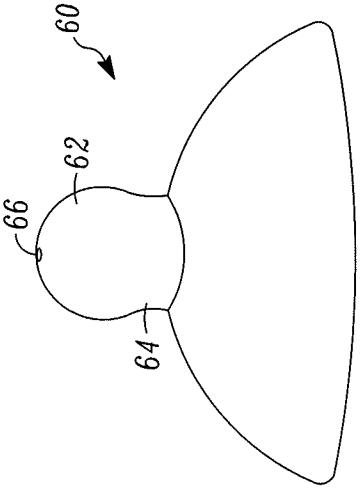

FIG. 18A

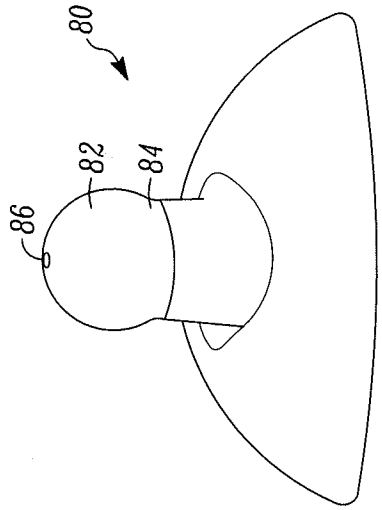

FIG. 18E

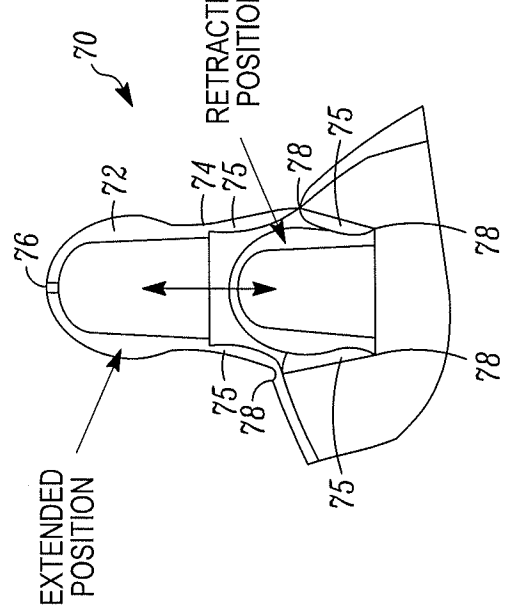

FIG. 18D

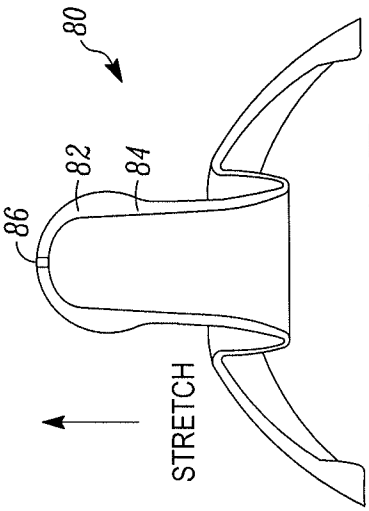

FIG. 18F

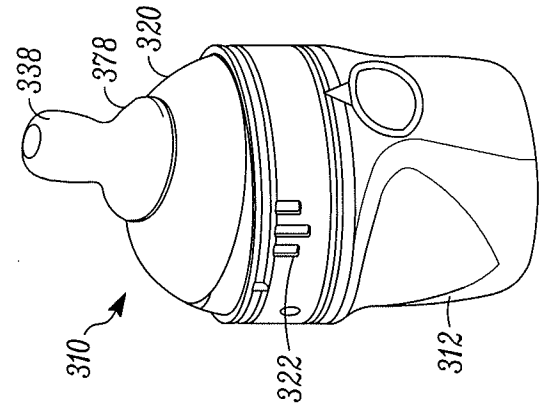

FIG. 20

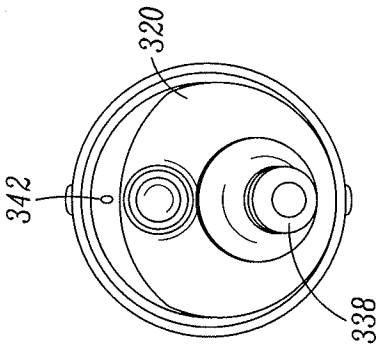

FIG. 21

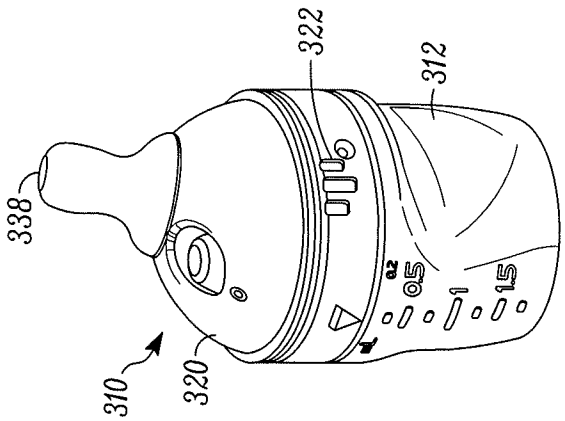

FIG. 19

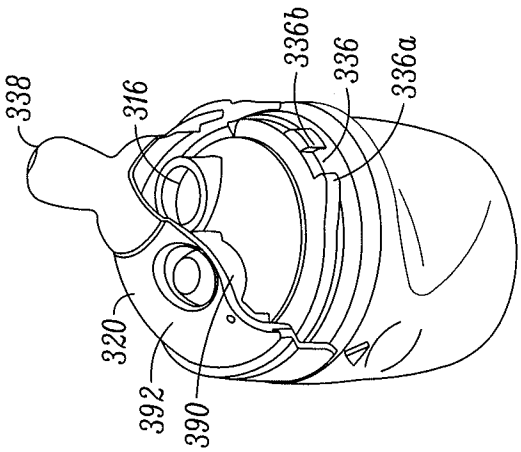

FIG. 24

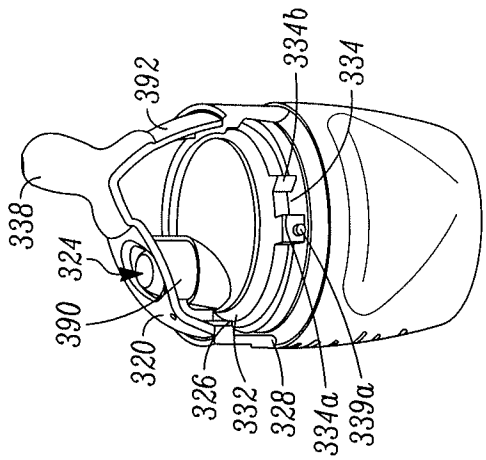

FIG. 23

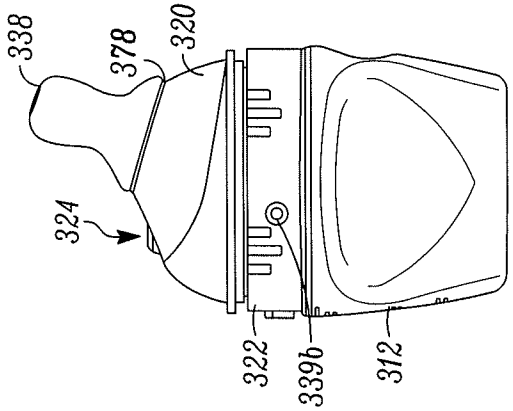

FIG. 22

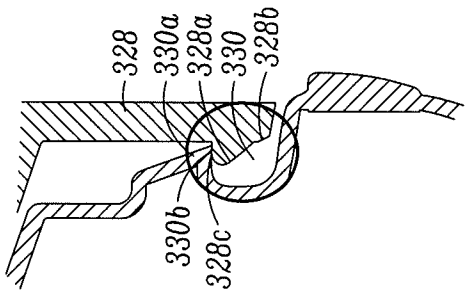

FIG. 25B

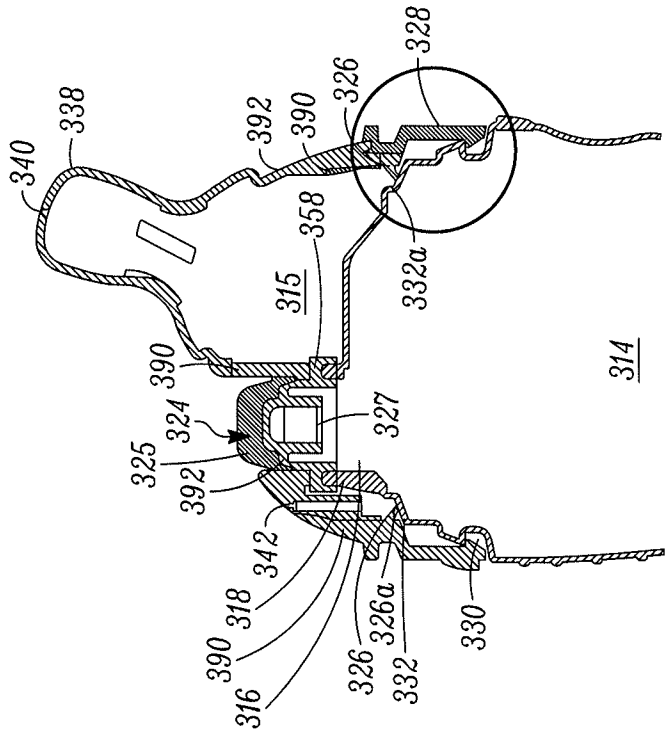

FIG. 25A

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/034703

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61J 9/00 (2011.01)
USPC - 215/11.1
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - A61J 9/00; B65B 3/04, 51/10, 55/02; B65D 47/20 (2011.01)
USPC - 53/467; 206/219; 215/11.1, 270, 331, 337; 220/703

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2009/0139883 A1 (PY et al) 04 June 2009 (04.06.2009) entire document	1-4, 6-20, 23-30, 36-43 ---------- 5, 21-22, 31-35
Y	US 2004/0124168 A1 (SILVER) 01 July 2004 (01.07.2004) entire document	5
Y	GB 2,164,325 A (DUDZIK) 19 March 1986 (19.03.1986) entire document	21-22
Y	US 2007/0283666 A1 (PY et al) 13 December 2007 (13.12.2007) entire document	31-35

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 July 2011	26 JUL 2011
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)