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(71) Applicant: **SONOCO DEVELOPMENT, INC.** [US/US]; North Second Street, Hartsville, SC 29550 (US).

(72) Inventor: **PRICE, Trevor**; 8010 Sandleford Avenue, NW, North Canton, OH 44720 (US).

(74) Agents: **DURLING, Thomas, J.** et al.; Flaster/ Greenberg P.C., Four Penn Center, 2nd Floor, 1600 John F. Kennedy Blvd., Philadelphia, PA 19013 (US).

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(54) Title: CLOSURE FOR RETORT CONTAINER

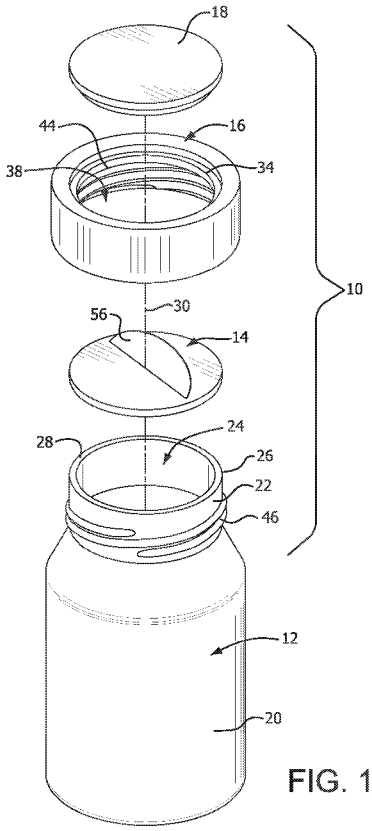

FIG. 1

(57) Abstract: A retortable container is formed with an opening denned by a projecting rim. The rim includes an external surface and securing structure formed thereon. A flexible membrane is sealed to the rim and closes the opening. A closure is provided having a molded plastic tubular ring and a separately formed molded plastic disk. The tubular ring includes an overlapping flange at a top and directed inwardly. The ring and the flange define an outwardly open area. The skirt includes an engagement structure for securing the closure to the external surface of the rim. The disk is separately attached on the outer surface of the ring within the open area after the retort process is applied to the sealed bottle.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

CLOSURE FOR RETORT CONTAINER

Field of the Invention

[0001] The present disclosure relates to containers for products, and more particularly relates to retort containers for food.

Background

[0002] Retort containers are hermetically sealed after filling with a food product, and are then heated to a temperature of at least about 220° F. for a period of time to ensure that all microorganisms in the container have been killed. Cycle times for heating or cooking the container contents typically exceed 10 minutes. As the temperature rises, the pressure inside the container also increases. An overpressure control system is often used to reduce the pressure differential between the inside and outside of the container. As such, the pressure differential typically does not exceed 5 pounds per square inch (psi). After heating, retort containers typically do not require refrigeration prior to opening and consuming the contents. Retort containers can be stored for extended periods in their sealed condition.

[0003] For many years, metal cans were the predominant type of retort containers. Plastic retort containers have been developed. In plastic retort containers, the container lid must be hermetically sealed to the container with sufficient strength to withstand the elevated temperature and pressure conditions during the retort operation. However, the seal strength must be limited so that the consumer may readily remove the lid and seal. Other requirements for all-plastic retort containers and lids include high-barrier performance against water vapor and oxygen, and fast sealing speed.

[0004] An all-plastic retort container having a sealing membrane that is adhesively sealed to the container (as opposed to being heat-sealed to the container) is disclosed in Nomula US 2005/0255266 A1.

[0005] A high-barrier plastic closure for a retort container is disclosed in Nomula US 7,364,779 and Williams et al. US2005/0145630 A1.

[0006] A composite closure for a retort container is disclosed in German et al. US 6,276,543. The closure includes a metal disk for covering the container opening. The disk is retained by an outer band that is threaded onto the rim of the container.

Summary

[0007] In one aspect of the disclosure, a retortable container is provided having a container body defining a reservoir for storing product. The container body includes a defined opening for discharge of product there through. The opening is formed within an upstanding rim projected from the container body. The upstanding container rim includes an external surface and securing structures formed thereon. A membrane is secured to the rim and closes the opening, sealing the product within the reservoir. A closure is provided in the form of a tubular ring having and engagement structure thereon for cooperating with the securing structure on the external surface of the rim. A separately formed disk is provided. The tubular ring includes a skirt formed about a central axis and an overlap flange portion at a top end of the skirt. The flange is directed inwardly towards the central axis and forms an outwardly open area radially inward of the flange. The disk is inserted into the outwardly open area for closing the open area. The disk conforms to the dimensions of the open area and is retained by the flange to close the open area.

[0008] In a further aspect of the disclosure, the ring is formed of a molded plastic and the disk is also formed of a molded plastic. The disk is preferably adhered to the flange of the ring. The securing structure on the container rim and the engagement structure on the skirt preferably include matching threads for inter-engaging and securing the closure on the container rim. The container rim may also define a sealing surface and an adhesive may be provided to seal the membrane to the sealing surface for hermetically sealing the product within the reservoir. The overlap flange on the tubular ring preferably engages the sealed membrane in a closed position of the ring when secured to the rim of the container.

[0009] In a further aspect of the disclosure, a closure is provided for use with a container having a reservoir body and a projecting neck that defines a dispensing opening. An annular rim is formed on the container. The closure is defined by a tubular skirt including an inside surface having an internal dimension adapted to receive the projecting neck of the container.

An engagement structure is formed on the inside surface of the skirt for releasably attaching the closure to the neck of the container. An annular flange is directed inwardly from the tubular skirt at one longitudinal end of the skirt, with the flange defining an outwardly open area at the skirt end. The flange is dimensioned to overlap the annular rim defining the dispensing opening when the tubular skirt is attached to the neck of the container. A sealing disk is separately formed from the tubular skirt and mounted in the outwardly open area defined by the flange. The flange and disk cooperate with one another to close the open area.

[0010] In a further aspect of the closure, the inside surface of the tubular skirt that engage with the corresponding surface formed on the projecting neck of the container may include a threaded surface on the tubular skirt. The threaded surface is formed for releasably engaging and securing the tubular skirt to a correspondingly thread surface on the projecting neck of the container. The tubular skirt and the sealing disk are preferably each formed from plastic. Further, an adhesive may be provided for securing the disk within the open area formed by the annular flange on the skirt. The flange may include a stepped internal surface and the disk may include a mating peripheral surface. The disk may further include a circular perimeter and an adhesive may be provided to secure the disk to the flange.

[0011] In a further aspect of the disclosure, a method of forming of a retort container and closure is provided. The method includes the step of providing a container body having an internal reservoir, with the container body having a neck portion with a defined opening for discharge of the product, and the opening formed within an upstanding rim projecting from the container body and defining an external surface. Product is provided within the reservoir and a membrane is sealed to the rim for closing the opening. The secured membrane serves to seal the product within the reservoir. A closure engages on the external surface of the rim, over the membrane sealed to the rim. The closure is formed by a tubular ring having an annular skirt formed about a central axis. An overlap flange is provided at a top end of the skirt. The flange is directed inwardly from the skirt towards the central axis. An outwardly open area is defined radially inward of the flange and an engagement structure is provided on an inside wall of the skirt for engaging the external surface of the rim and securing the closure to the rim. The sealed product is heated within the container reservoir when the closure is engaged on the rim. After heating the product, a disk is secured within and closes the open area of the ring.

[0012] In a further aspect of the method, the rim may include a sealing surface and the step of adhesively sealing the membrane to the sealing surface serves to hermetically seal the product within the reservoir. Further, the overlap flange of the tubular ring may engage the membrane sealed to the sealing surface when the closure is a closed position, with the ring secure on the rim of the container. The ring and disk may each be molded from a plastic material, such as polypropylene. The membrane preferably comprises a foil material, serving as a barrier layer.

[0013] Other features and combinations of features will become apparent from the detailed description to follow, taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0014] For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood that the invention is not limited to the precise arrangements and instrumentalities shown.

[0015] Fig. 1 is an exploded perspective view of an embodiment of a container and closure as contemplated by the present disclosure.

[0016] Fig. 2 is a partially assembled perspective view of the container and closure embodiment of Fig. 1.

[0017] Fig. 3 is a partial cross sectional view of the container and closure embodiment as shown in Fig. 2.

[0018] Fig. 4 is a cross sectional view of the container and closure embodiment graphically showing the retort process.

[0019] Fig. 5 is a partial cross sectional view of the fully assembled container and closure embodiment according to Fig. 1.

[0020] Fig. 6 is a partial cross sectional view of the container showing removal of the sealing membrane portion of the closure.

[0021] Fig. 7 is a re-assembled container and closure, after removal of the sealing membrane.

Detailed Description

[0022] Referring now to the drawings, where like numerals identify like elements, there is shown in Fig. 1 a retortable container construction, which is generally referred to by the

numeral 10. The container 10 includes a container or reservoir body 12 defining an internal reservoir therein, a sealing membrane 14, a closure ring 16 and a sealing disk 18. The container body 12 includes a reservoir body 20 and a projecting neck 22. A discharge opening 24 is defined by the neck portion 22 of the container body 12. An upstanding rim 26 is formed on the top end of the neck 22 and surrounds the opening 24. The rim 26 includes a sealing surface 28 for securing the membrane 14 to the rim 26 and closing the opening 24. As shown, the elements of the container 10 are axially positioned around a central axis line 30.

[0023] In the intermediate assembly shown in Fig. 2, as also shown in cross section in Fig. 3, the membrane 14 is sealed to the sealing surface 28 of the rim 26. The closure ring 16 is engaged with and secured to an external surface of the rim 26 on the projecting neck 22 of the container body 12. The separate disk 18 is not attached to the ring 16. As shown, the ring 16 includes a tubular skirt 32 formed about the longitudinally extending central axis 30 and an inwardly directed overlap flange 34 on the top end of the skirt 32. The inner rim of the flange 34 defines a disk engagement surface. The flange 34 defines an outwardly extending opening or open area 38 in the closure 18, with the open area 38 overlapping the container body opening 24, with the membrane 14 positioned there between. As more particularly shown in the cross section of Fig. 3, a seal 40 is provided between the membrane 14 and the sealing surface 28 of the rim 26 of the container body 12. An adhesive 42 may be provided between the upper surface of the membrane 14 and the lower surface of the flange 34. Engagement means 44 is provided on the inside wall of the closure ring 16, preferably in the form of a threaded surface. Securing means 46, again preferred to be a threaded surface, is provided on the outside wall of the neck 22 of the container body 12 for inter engagement with the engagement means 44 on the closure ring 16.

[0024] In Fig. 4, there is graphically shown the retort cooking process for the intermediate assembly (Figs. 2 and 3) of the container 10. Product (not shown) is stored in the reservoir body of the container body 12 and sealed by the membrane 14. The ring 16 is attached to the neck 22 of the container body 12 and the inwardly projecting flange 34 overlaps the sealing surface 28 and engages the outer periphery of the membrane 14 as sealed to the sealing surface 28. The sealed container body 12 is then subjected to an external heating source 48, which may include microwave energy. The applied heat/energy 48 creates heat and pressure 50 within the sealed container body 12. As shown, the heat/energy 48 is also applied through the membrane 14 covering the open area 38 defined inwardly of the flange 34 on the closure ring 16.

[0025] In Fig. 5, there is shown in cross section the final assembly of the container 10. The sealing disk 18 is positioned from the outside within the open area 38. As shown, the flange 34 and body of the ring 16 form a stepped surface 52. The disk 18 preferably includes a similarly stepped surface 54 on its outer periphery. The disk 18 and corresponding surfaces 52, 54 serve to cooperate with one another to retain the disk 18 within the (previously) open area 38 defined by the ring 18. The disk 18 is inserted from outside of the ring 18 into the open area 38 defined by the flange. The insertion of the disk 18 from above the ring 16 completes the closure formed by the ring 18. The disk 18 is externally inserted and snaps into the opening 38. The preferred engagement between the disk 18 and ring 16 is an interference or friction fit. The dimension tolerances are contemplated to be relatively close, providing a liquid tight seal. The stepped surfaces 36 assist in forming the seal. An adhesive or similar material may be utilized. Other forms of attachment of the plastic disk to the plastic ring may also be used.

[0026] In Fig. 6, there is shown the removal of the membrane 14 to provide access to the product stored within the reservoir 20 of the container body 12. As illustrated, the membrane 14 is provided with a gripping tab 56 that may be partially separated from the body of the membrane 14 creating a means for separating the membrane 14 from the sealing surface 28 of the rim 26 of the container body 12. The gripping tab 56 is exposed by removal of the ring 16 and disk 18 combination (as shown in Fig. 5) from the neck 22 of the container body 12. The inter-engaging threads or similar means (44, 46) permit the closure to be easily removed from the container body. Once the membrane 14 is removed, the discharge opening of the container body 12 is open for discharge of the product.

[0027] The resealing of the container body 12 is shown in Fig. 7 by the attachment of the closure ring and disk combination 16, 18 to the neck 22 of the container body 12. The inter-engaging threads 44, 46 (or similar structures) secure the ring 16 and its attached disk 18 to the container body 12, after removal of the membrane 14. Hence, the product within the reservoir 20 may be partially dispensed after removal of the membrane 14 (Fig. 6) and the container body 12 resealed by the combination ring 16 and disk 18. It is preferred that the ring 16 be dimensionally formed, such that the flange 34 engages the sealing surface 28 of the rim 26 when the ring 16 returns to seal the reservoir opening 24.

[0028] The container 10 is assembled prior the retort process (Fig. 4) without the disk 18, as shown in Figs. 2 and 3. The adhesive 42 is provided on the upper surface of the membrane 14 or on the bottom surface of the flange 34. This adhesive 44 serves to retain the membrane 14 in position, during application of the ring 16 onto the neck 22 of the container body 20. Hence, the membrane 14 is secured to the underside of the flange 34 within the ring 16 by the adhesive 42. Upon attachment of the ring 16, the membrane 14 extends across the open area 38 defined by the inwardly directed flange. The combination ring 16 and membrane 14 is then applied to the neck 22 of the container body 20. The flange overlaps the membrane and the sealing surface of the rim of the container.

[0029] In the present constructions, the ring 14 is contemplated to be made of a plastic material as formed by an injection molding process. The disk portion 18 of the completed closure is contemplated to also be formed by injection molding. The disk 18 and is preferably made of the same material as the ring 14, but may be any compatible material. The preferred material is polypropylene. The closure parts - disk and ring - are preferably made of a single material or monolayer. The disk 18 may be retained within the outwardly open area 38 of the ring 16 by a frictional engagement between the stepped surface 36 of the ring 16 and engagement surface 54 of the disk 18. An adhesive is preferably also provided. Other sealing means may be used, such as ultrasonic welding, spin welding, etc.

[0030] The membrane 14 may be made of any number of materials. The membrane may be formed from a metal foil patch, forming the barrier layer. A polypropylene sealant layer may be provided on the lower surface of the foil. The polypropylene will serve as a sealant layer and deter fracturing of the foil. A tie layer may be provided between the foil and the polypropylene and an exterior coating may be applied to the polypropylene (or directly to the foil) for forming a fracture layer. A polyester material may be added to the top surface of the foil. The combination of polyester, foil and polypropylene may be formed as a laminate or otherwise. Alternatively, the foil material may be coated on the top with a lacquer or similar material. An organic coating may be applied to the bottom surface of the foil for forming the sealing material for the membrane to the rim surface 28. Other material combinations are possible, beyond these preferred structures.

[0031] The membrane is contemplated to be sealed to the sealing surface 28 of the container rim 26 after application of the ring 16 to the rim 26. Generally, the seal is created by an induction heating process. Induction heating or sealing is a non-contact method of heating a metallic material and attaching it to the top of a plastic (or glass) container. The sealing process takes place after the container has been filled and capped. The combination ring 16 and membrane 14 is positioned on the rim 26 before the application of energy. The combination is then passed under an induction coil, which emits an oscillating electromagnetic field. The conductive foil layer begins to heat in the presence of the electromagnetic energy. However, the plastic ring 16 and the container rim 26 are not affected by the energy exposure. The heat from the foil serves to melt the sealing layer on the bottom of the foil, and the polymer sealing material flows onto the rim 26. When cooled, the sealing layer or coating creates a bond with the sealing surface 28 of the container rim 26, resulting in a hermetic seal. Neither the container nor its contents are affected. The cycle time for the energy application is a matter of seconds. The engagement of the ring 16, including the contact of the flange 34 with the portion of the membrane 14 overlapping the rim surface 28, serves to fix the position of the membrane 14 and secure the final seal with the rim 26. The flange engagement is contemplated to support the membrane 14 during retort heating. The resulting pressure differential may cause the membrane to bow outwardly. The bowing angle could potentially serve to create a pealing action at the sealing surface 28. The flange 34 may be formed such that the position of the bowed surface is inward of the sealing

surface 28. The flange engagement of the membrane edge further secures the seal during retort.

[0032] As an alternative to the induction sealing process, a sealing adhesive may be provided on the sealing surface 28 of the container body rim 26 or pattern applied on the underside of the membrane 14. Regardless of the form, the seal 40 is contemplated to have strength sufficient to withstand the heat and pressure of the retort process. The engagement of the flange 34 with the perimeter of the membrane 14, by means of securing the ring 16 on the container body 20, assists in maintaining the seal during retort and thereafter. Further, a fracture layer is preferably provided. As such, removal of the membrane 14 from the sealing surface 28 results in a physical break or tear of the layer, leaving a portion on the sealing surface. This construction simplifies the opening process during removal of the membrane. Other forms and materials for sealing may also be utilized.

[0033] The ring 16 may be removed from the container body 20, with the membrane 14 remaining sealed to surface 28 on the ring 26 of the container body 20. The membrane seal 40 is maintained until the membrane is physically peeled from the rim 22 of the container body 20, such as by use of the gripping tab 56 (Fig. 6). The use of the gripping tab 56 creates a peeling force sufficient for removal of the membrane 14 from the sealing surface 28 of the container body rim 26.

[0034] Because the ring 16 includes an open area 38, the membrane 14 is exposed during the retort process. Hence, heat transfer is not retarded by a closed cap surface. Further, the sealing of the container body 20 is created by a membrane material 14, rather than an internally positioned metal disk - which maybe made of coated steel -- as often utilized in some retort container body type applications. Metal disks often result in complications in recycling operations, creating operational and mechanical issues within grinding or similar destructive processes.

[0035] Additional structures and elements may be added to the ring and disk combination, which forms the completed closure. For example, a tamper evident band may be provided at the base of the ring. One form of such a band includes ratchets that restrict opening of the closure, until the band is separated from the ring or otherwise deformed. Deformation of the bad provides an indication of prior use or tampering with the product within the container body. Other tamper evident structures are known and may be utilized. Various structures may be molded into the inside surfaces of the ring and the perimeter of the

disk. The form of the disk may also vary, for example a change in color or graphics, to permit the use of a generic ring structure within multiple product applications. Other modifications may be made to accommodate marketability needs and desires.

[0036] The present disclosure shows and describes one or more exemplary embodiments. It should be understood by those skilled in the art from the foregoing that various other changes, omissions and additions may be made therein, without departing from the spirit and scope of the contemplated invention, with the scope of the invention being defined by the foregoing claims. Further, the terms herein are used in a generic and descriptive sense and are not necessarily for purposes of limitation. The scope of the invention is set forth in the following claims.

Claims

What is claimed is:

1. A retortable container comprising:

a container body defining a reservoir for storing product, the container body having a defined opening for discharge of the product there through, the opening formed within an upstanding rim projected from the container body, the rim having an external surface and securing means formed thereon,

a membrane secured to the rim, the membrane closing the opening and sealing the product within the reservoir; and

a closure having

a tubular ring,

the ring having engagement means thereon for cooperative engagement with the securing means on the external surface of the rim, and

a separately formed disk,

the tubular ring having a skirt formed about a central axis, an overlap flange portion at a top end of the skirt and directed inwardly towards the central axis, an outwardly open area formed radially inward of the flange, the disk insertable into the outwardly open area for securing the disk and closing the open area,

wherein the disk conforms to the dimensions of the open area, and the disk is retained by the flange within the open area to close the open area.

2. A retortable container as in claim 1 wherein the ring is formed of a molded plastic.

3. A retortable container as in claim 2 wherein the disk is formed of a molded plastic.

4. A retortable container as in claim 3 wherein the disk is adhered to the flange of the ring.

5. A retortable container as in claim 1 wherein the securing means on the container rim and the engagement means on the skirt comprise matching threads for engaging and securing the closure on the container rim.

6. A retortable container as in claim 1 wherein the rim comprises a sealing surface and wherein an adhesive seals the membrane to the sealing surface for hermetically sealing the product within the reservoir.

7. A retortable container as in claim 6 wherein the overlap flange of the tubular ring engages the membrane sealed to the sealing surface in a closed position of the ring on the rim of the container.

8. A closure for use with a container having a reservoir body and a projecting neck that defines a dispensing opening and an annular rim, the closure comprising:

a tubular skirt having an inside surface having an internal dimension adapted to receive the projecting neck of the container,

engagement means formed on the inside surface of the tubular skirt, the engagement means for releasably attaching the tubular skirt to the projecting neck of the container,

an annular flange directed inwardly from the tubular skirt at one longitudinal end thereof, the flange defining an outwardly open area, and the flange dimensioned to overlap the annular rim of the dispensing opening when the tubular skirt is attached to the projecting neck of the container, and

a sealing disk separately formed from the tubular skirt and mounted in the outwardly open area defined by the flange, the flange and disk cooperating with one another to close the open area.

9. The closure according to claim 8, wherein the engagement means comprises inter-engaging surfaces on the inside surface of the tubular skirt for engaging with corresponding surface formed on the projecting neck of the container.

10. The closure according to claim 9, wherein the engagement means comprises a threaded surface on the tubular skirt for releasably engaging and securing the tubular skirt to a correspondingly thread surface on the projecting neck of the container.

11. The closure according to claim 8, wherein the tubular skirt and the sealing disk are each formed from plastic.

12. The closure according to claim 8, further comprising an adhesive securing the sealing disk within the open area formed by the annular flange.

13. The closure according to claim 8 wherein the disk has a circular perimeter and wherein the flange includes a stepped internal surface and the disk includes a mating peripheral surface.

14. The closure of claim 8 further comprising an adhesive securing the disk to the flange.

15. A method of forming of a retort container and closure, comprising the steps of:

providing a container body having an internal reservoir, the container body having a neck portion with a defined opening for discharge of the product, the opening formed within an upstanding rim projected from the container body, the rim having an external surface,

providing product within the reservoir,

securing a membrane seal to the rim for closing the opening, the secured membrane sealing the product within the reservoir;

engaging a closure on the external surface of the rim, over the membrane sealed to the rim, the closure formed by a tubular ring, the ring having an annular skirt formed about a central axis, an overlap flange portion at a top end of the skirt, the flange directed inwardly from the skirt towards the central axis, an outwardly open area defined radially inward of the flange, and engagement means on an inside wall of the skirt for engaging the rim external surface and securing the closure to the rim,

heating the product within the container sealed by the membrane and having the closure engaged on the rim of the container, and

after heating of the product, securing a disk within and closing the open area of the ring.

16. A method as in claim 15 wherein the rim comprises a sealing surface and further comprising the step of adhesively sealing the membrane to the sealing surface for hermetically sealing the product within the reservoir of the container body.

17. A method as in claim 16 wherein the overlap flange of the tubular ring engages the membrane sealed to the sealing surface in a closed position of the ring secure on the rim of the container.

18. A method as in claim 15 wherein the ring and the disk are each molded from a plastic material.

19. A method as in claim 18 wherein the plastic material is polypropylene.

20. A method as in claims 17 wherein the membrane comprises a foil material as a barrier layer.

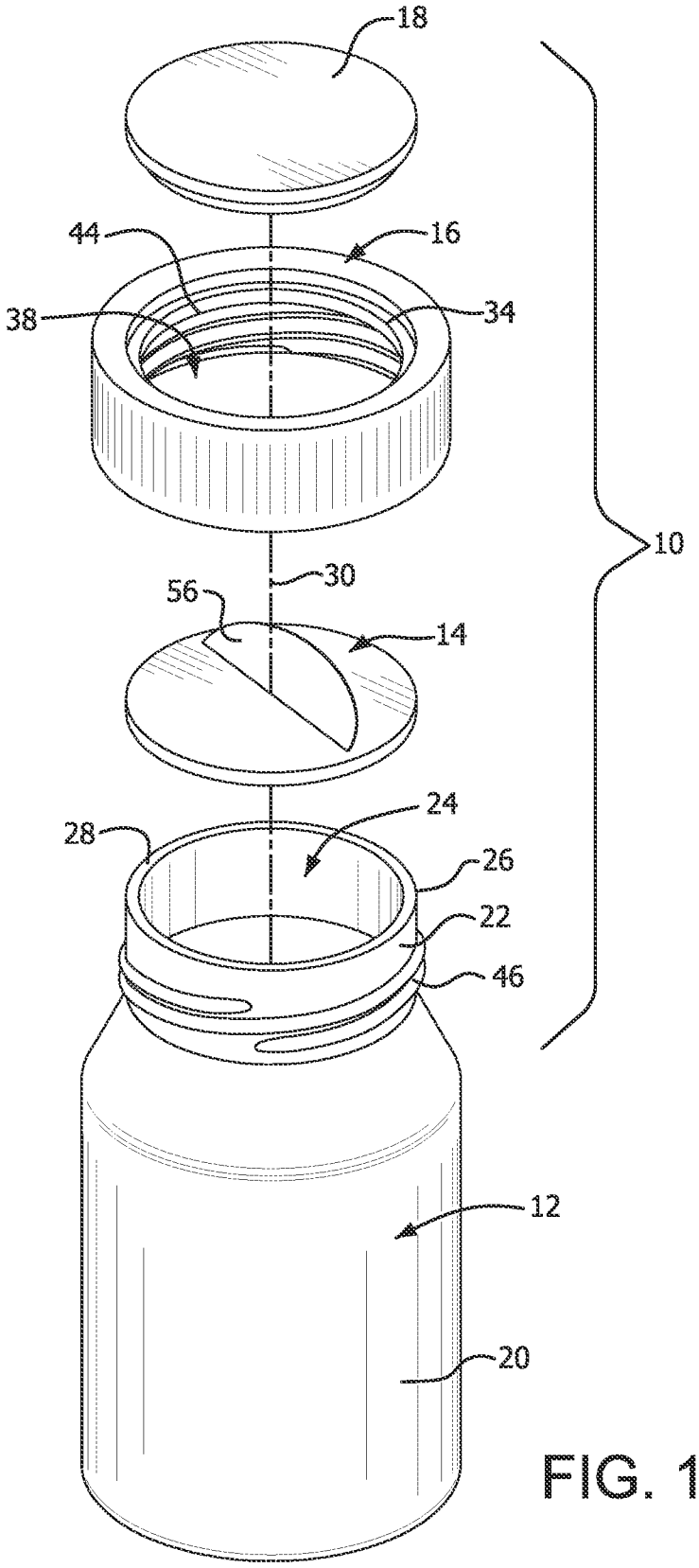

FIG. 1

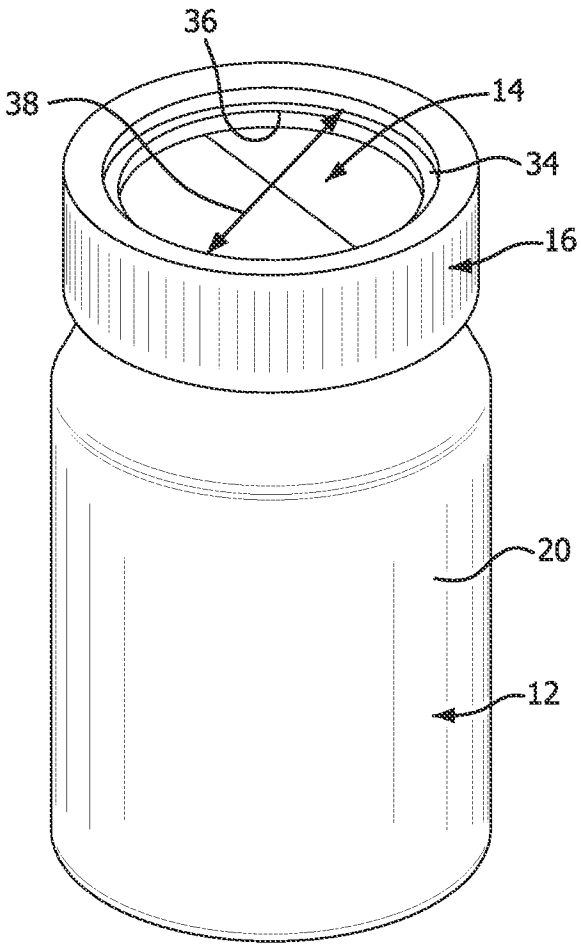

FIG. 2

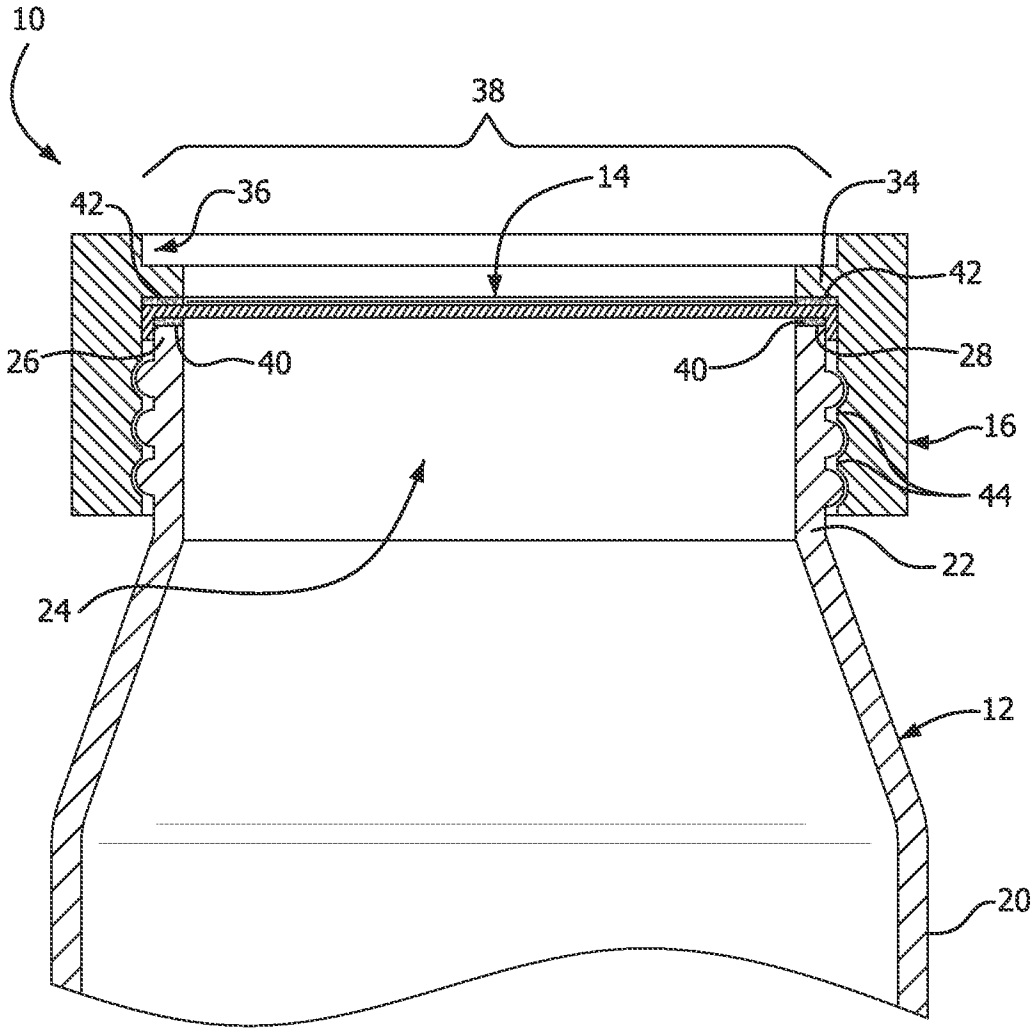

FIG. 3

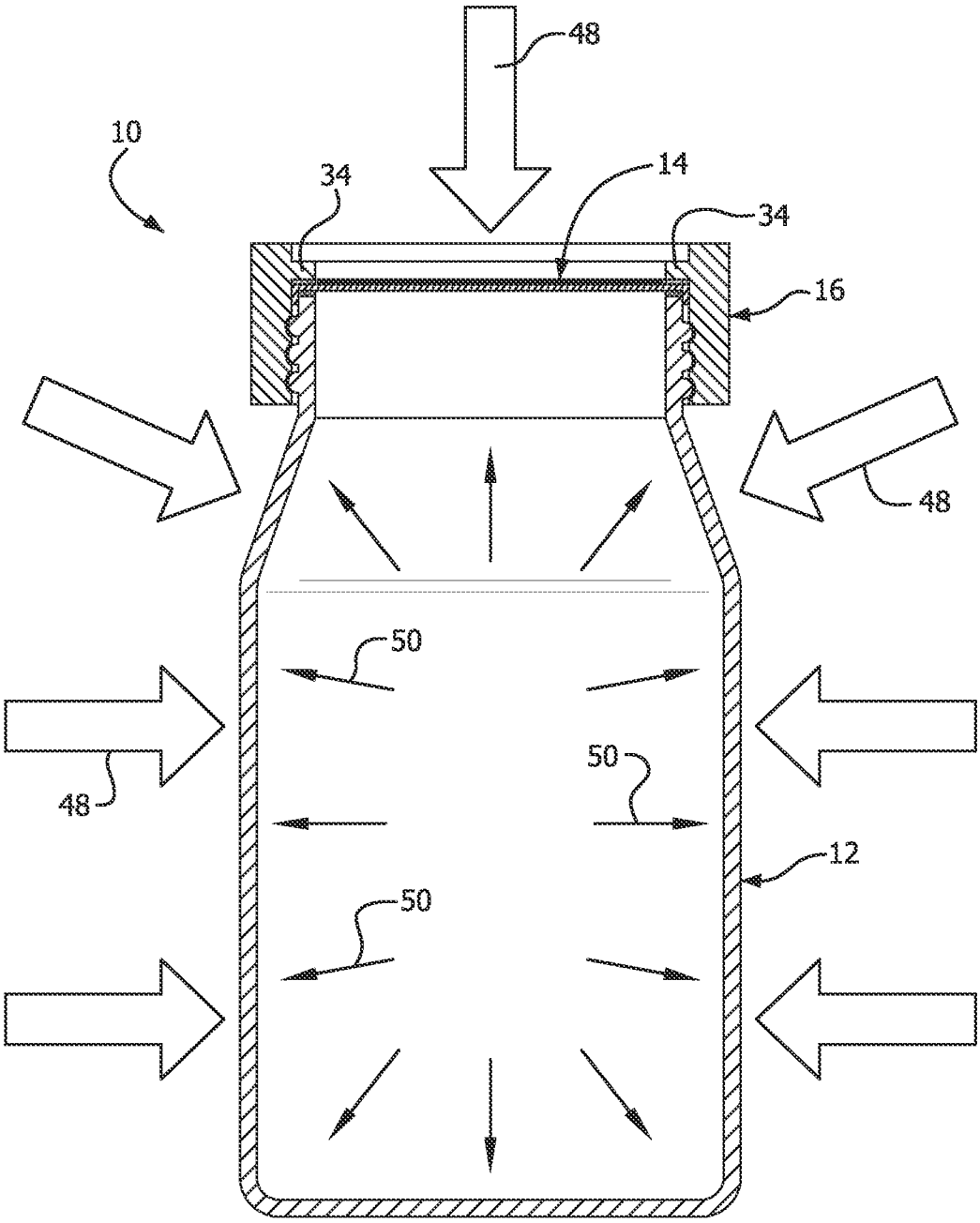

FIG. 4

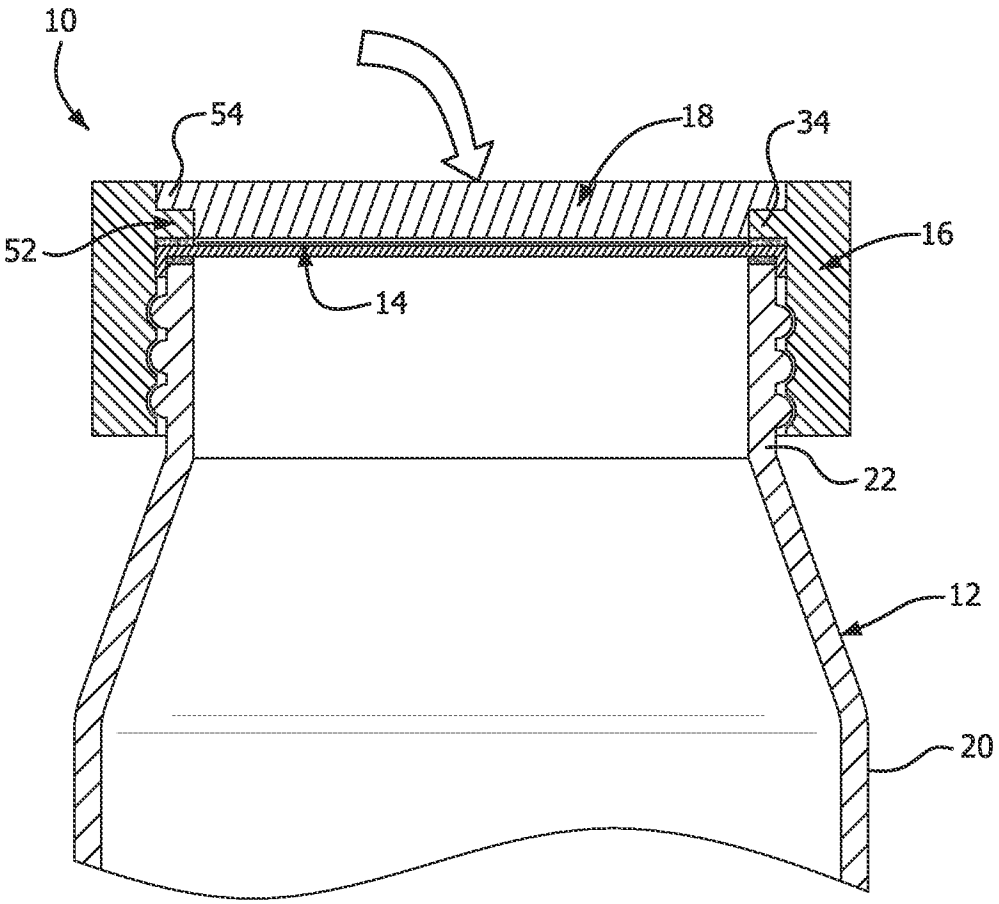

FIG. 5

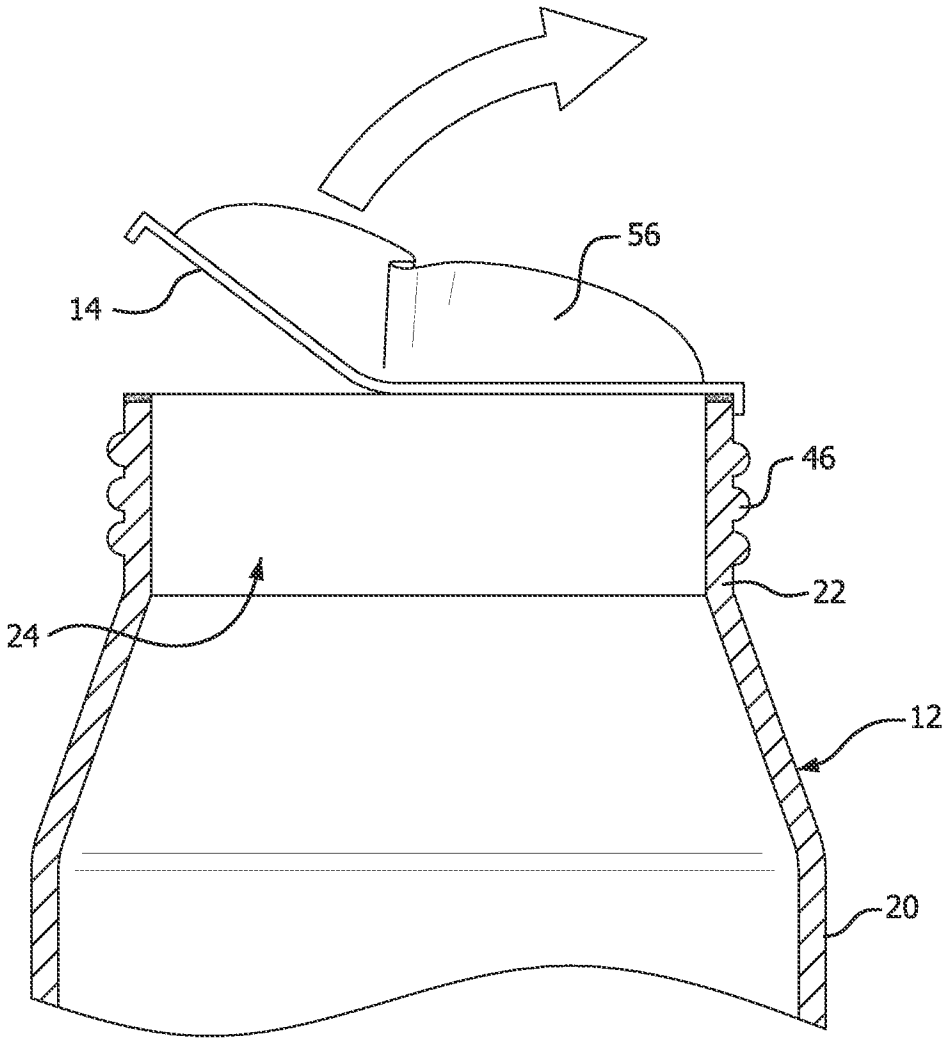

FIG. 6

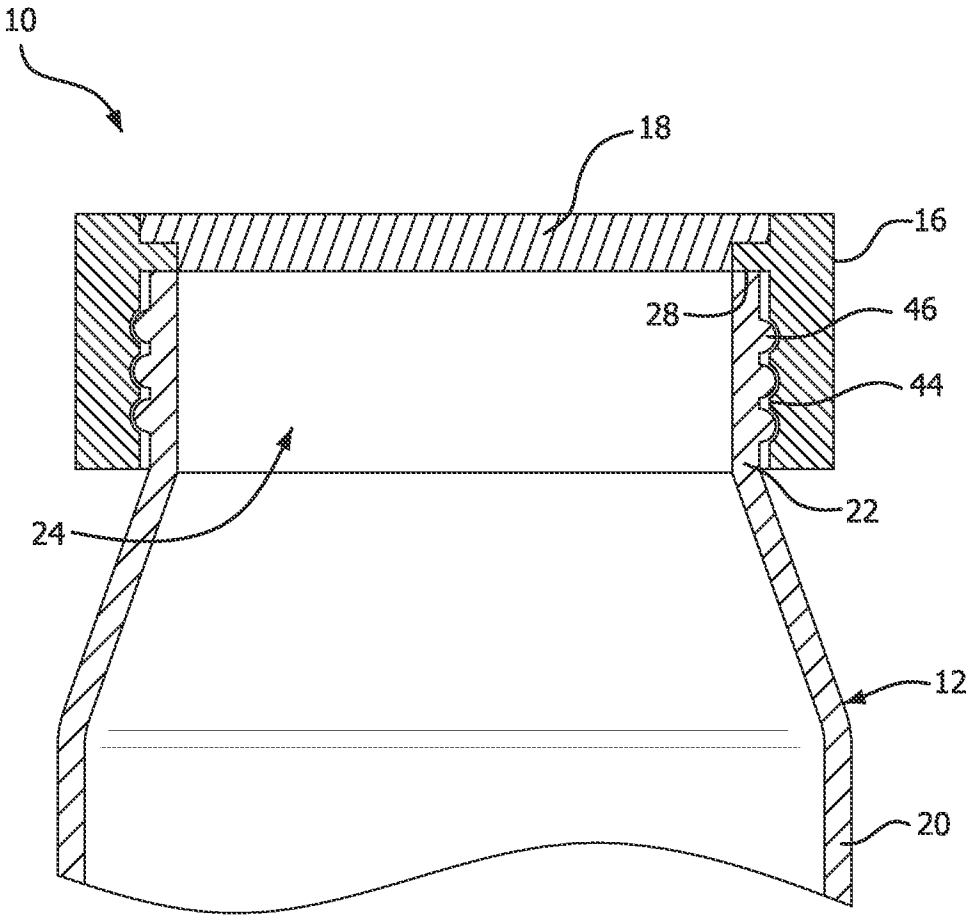

FIG. 7