



US 20080302799A1

(19) **United States**

(12) **Patent Application Publication**  
**Moore et al.**

(10) **Pub. No.: US 2008/0302799 A1**

(43) **Pub. Date: Dec. 11, 2008**

(54) **METAL CONTAINER WITH SCREW-TOP CLOSURE AND METHOD OF MAKING THE SAME**

(22) Filed: **Jun. 8, 2007**

**Publication Classification**

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(51) **Int. Cl.**  
**B65D 41/04** (2006.01)  
**B65B 55/02** (2006.01)

(52) **U.S. Cl. .... 220/288; 215/44; 426/397; 426/407; 72/379.4; 72/46**

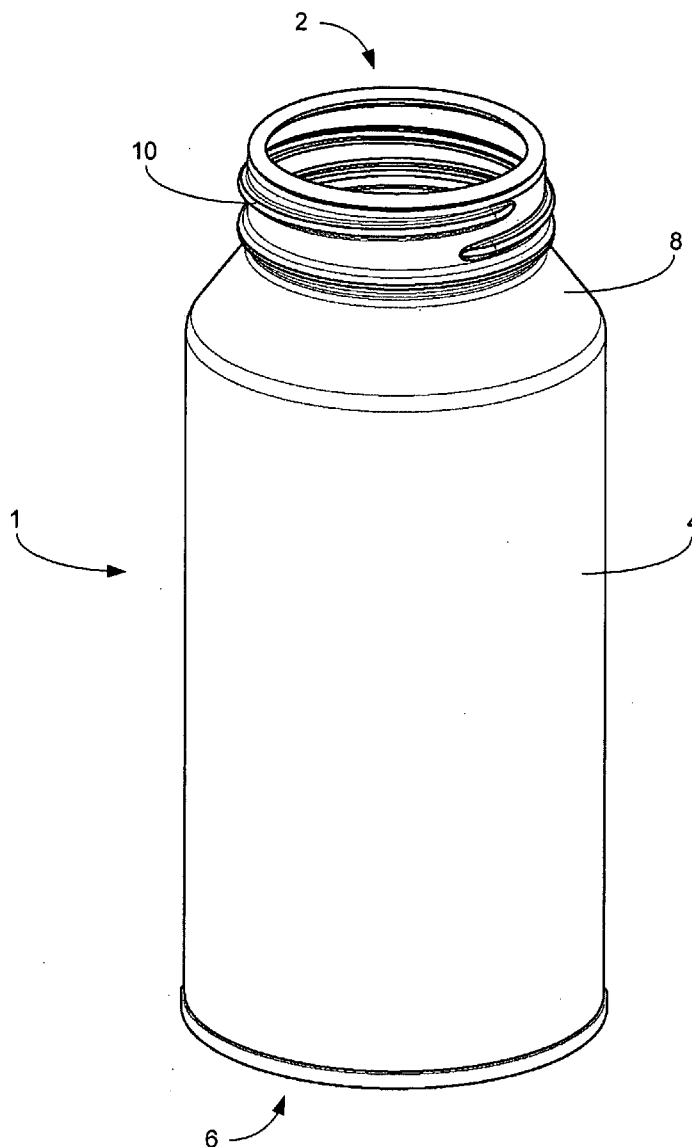
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(57) **ABSTRACT**

A food or drink container kit includes a metal container including a round threaded neck having at least one integrally formed thread. The kit also includes a metal press-on, twist-off closure comprising a round skirt including a gasket material located on at least a portion of the interior of the skirt, a seal forming between the neck and skirt when the closure is placed on the container and heated.

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(21) Appl. No.: **11/811,362**



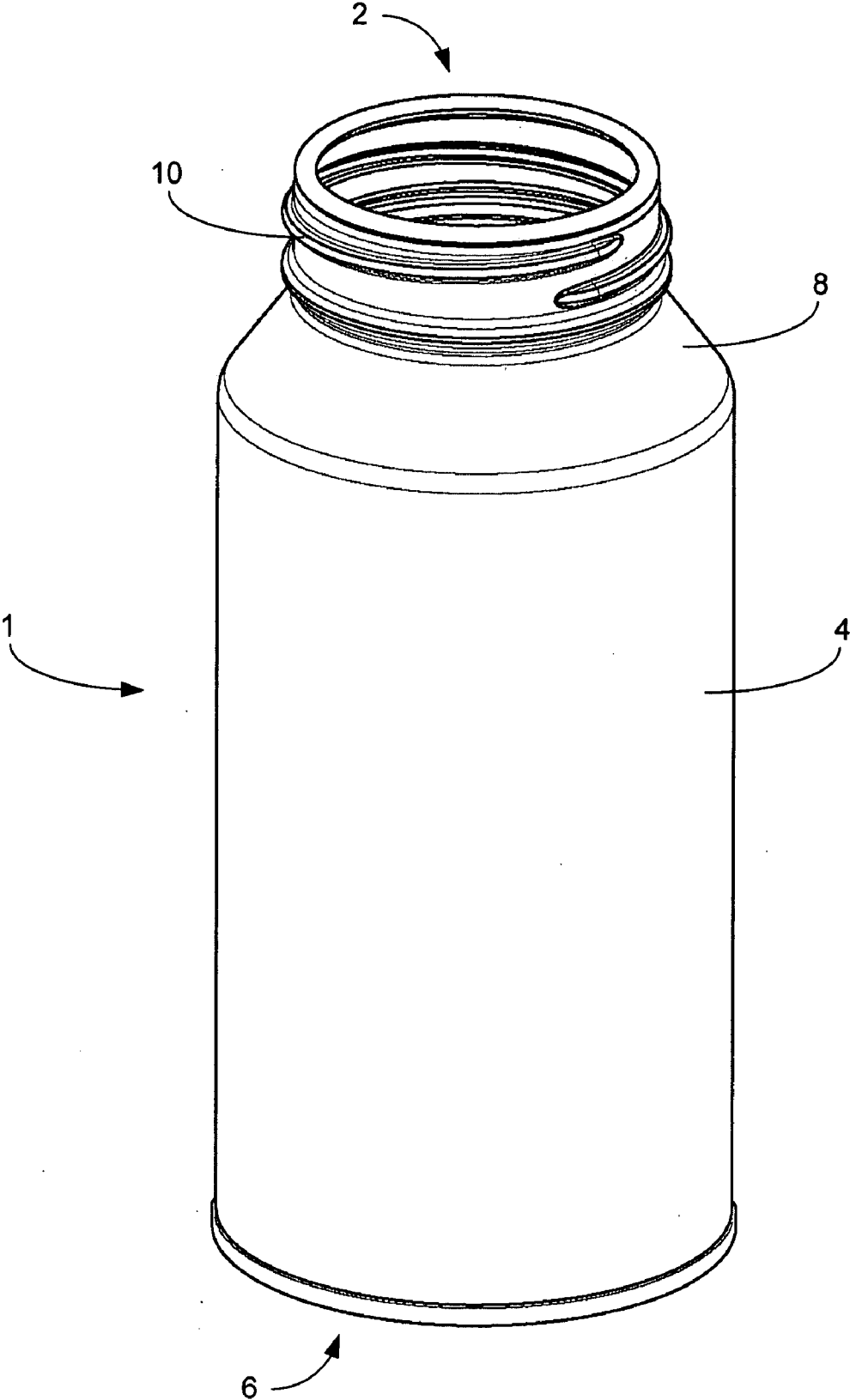


FIG. 1

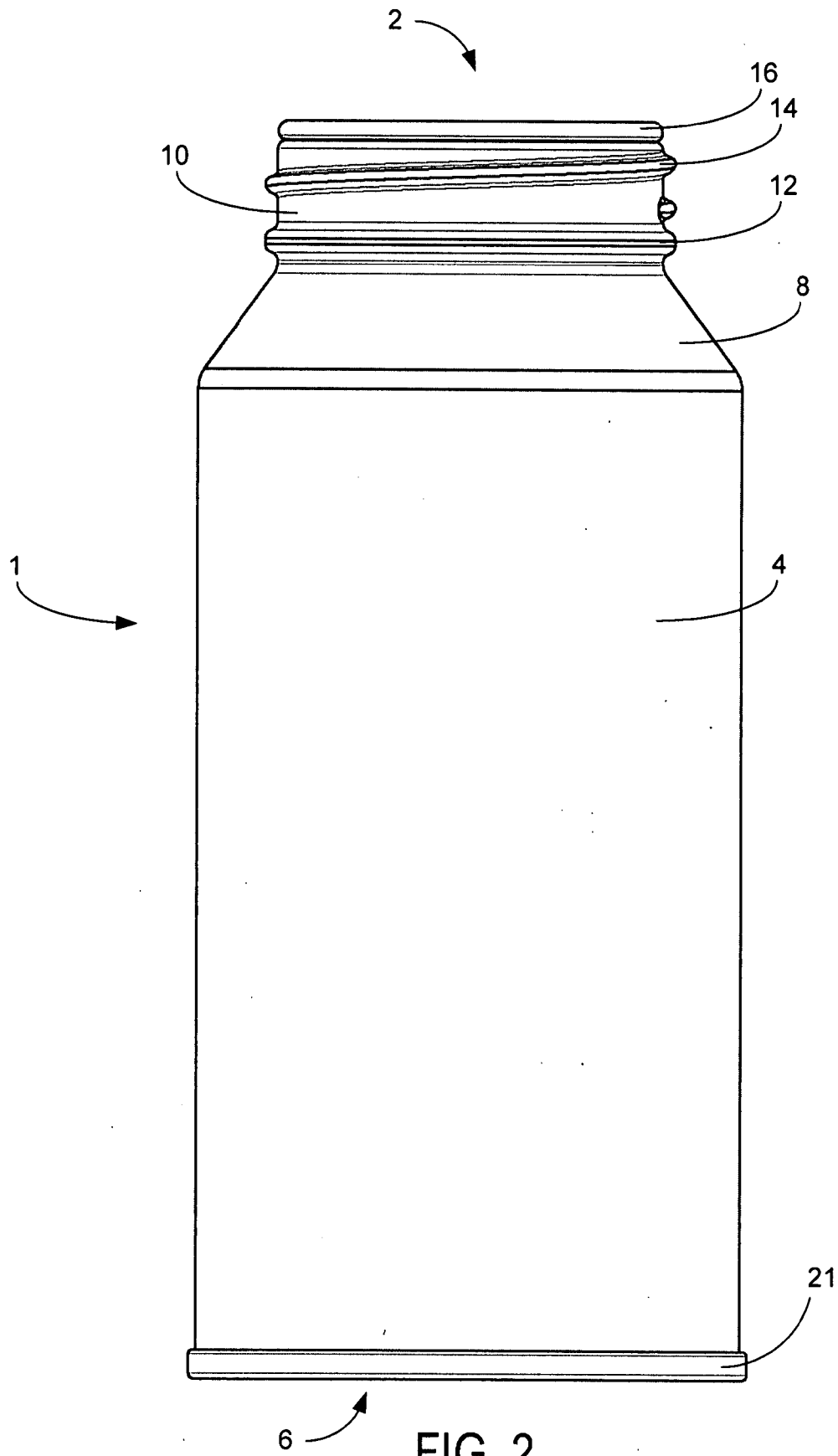


FIG. 2

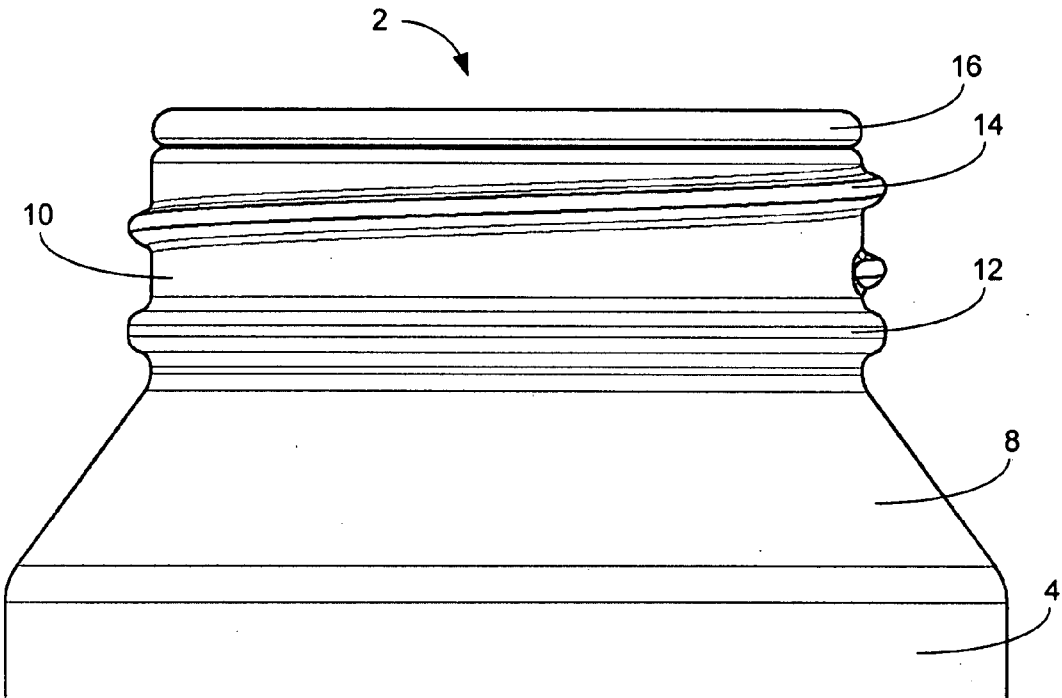


FIG. 3

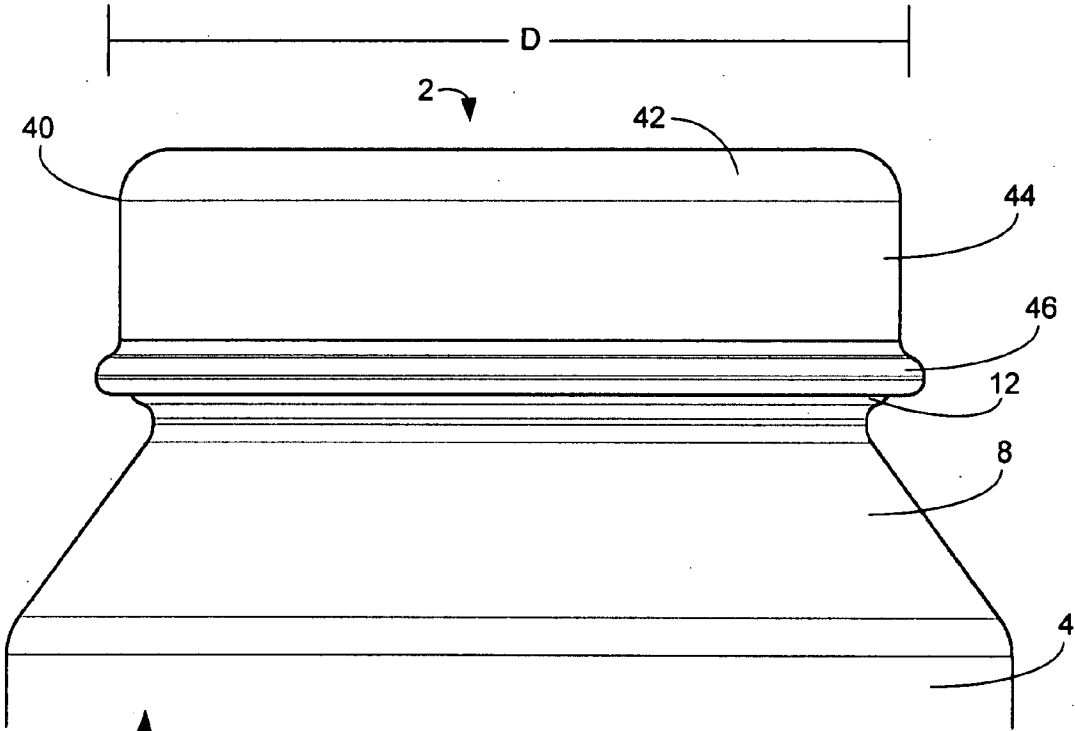


FIG. 4

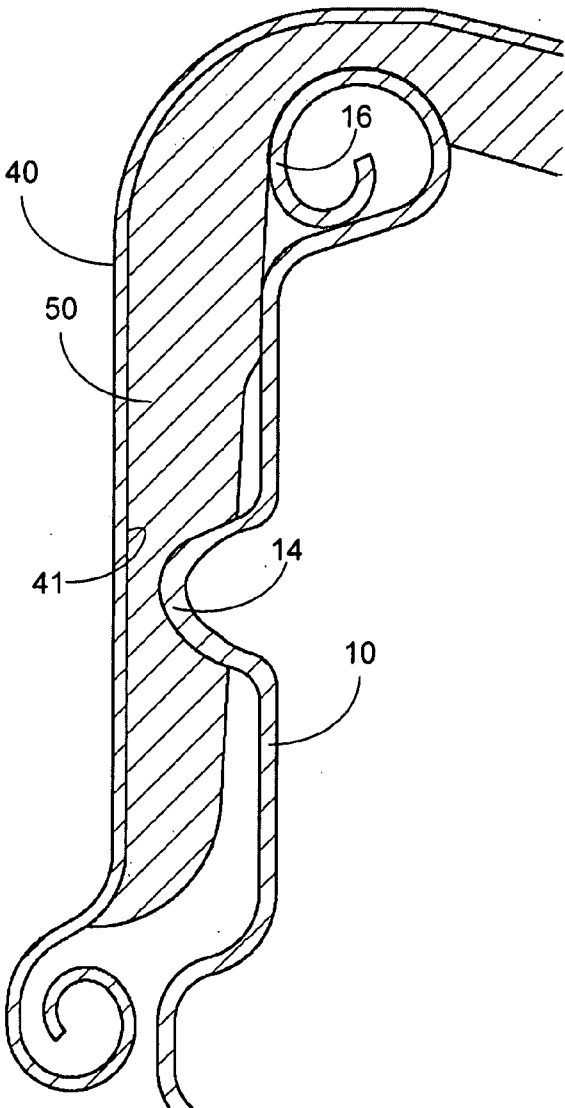


FIG. 5

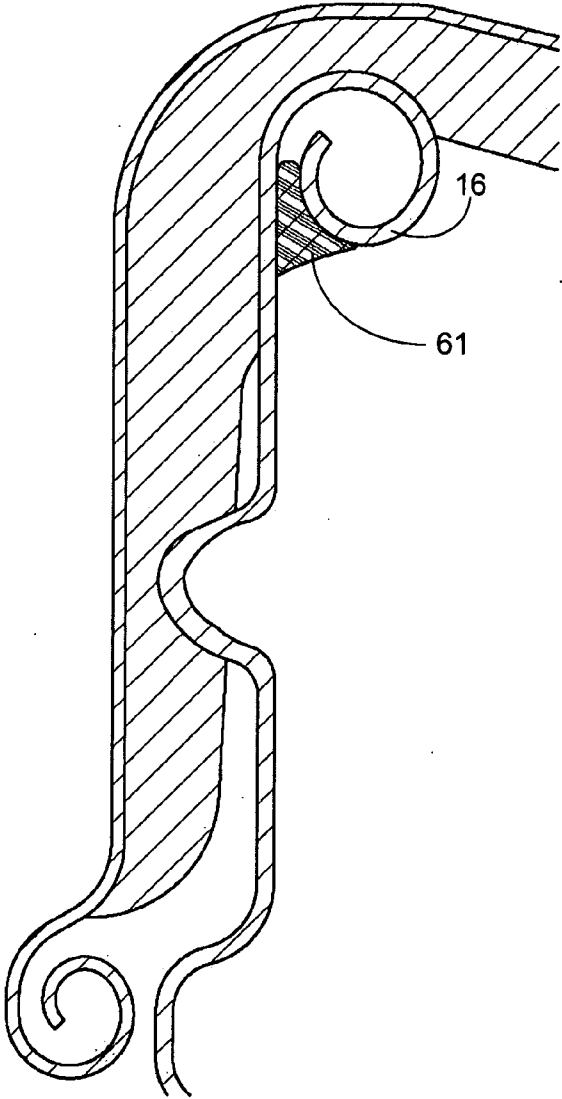


FIG. 6

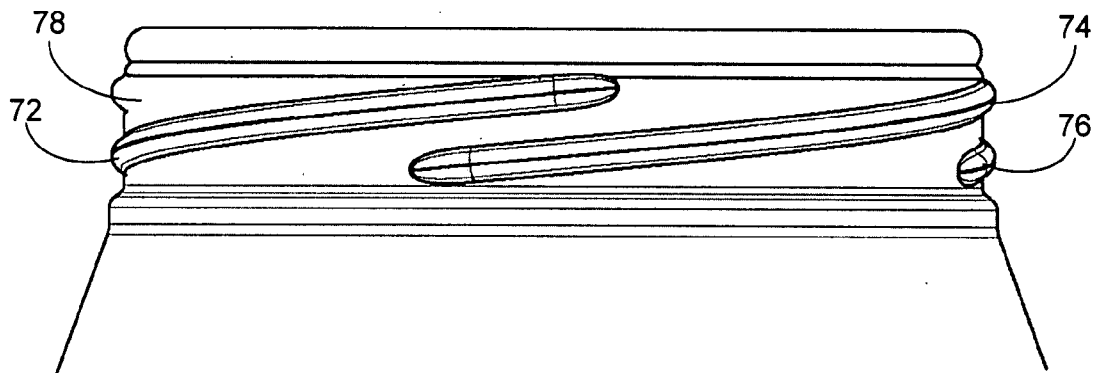


FIG. 7A

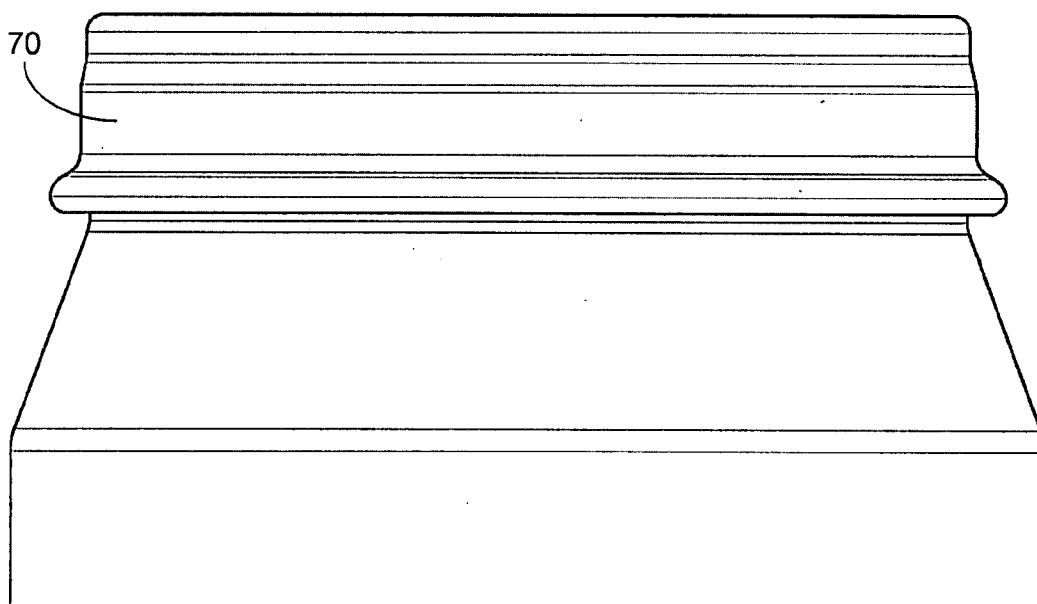


FIG. 7B

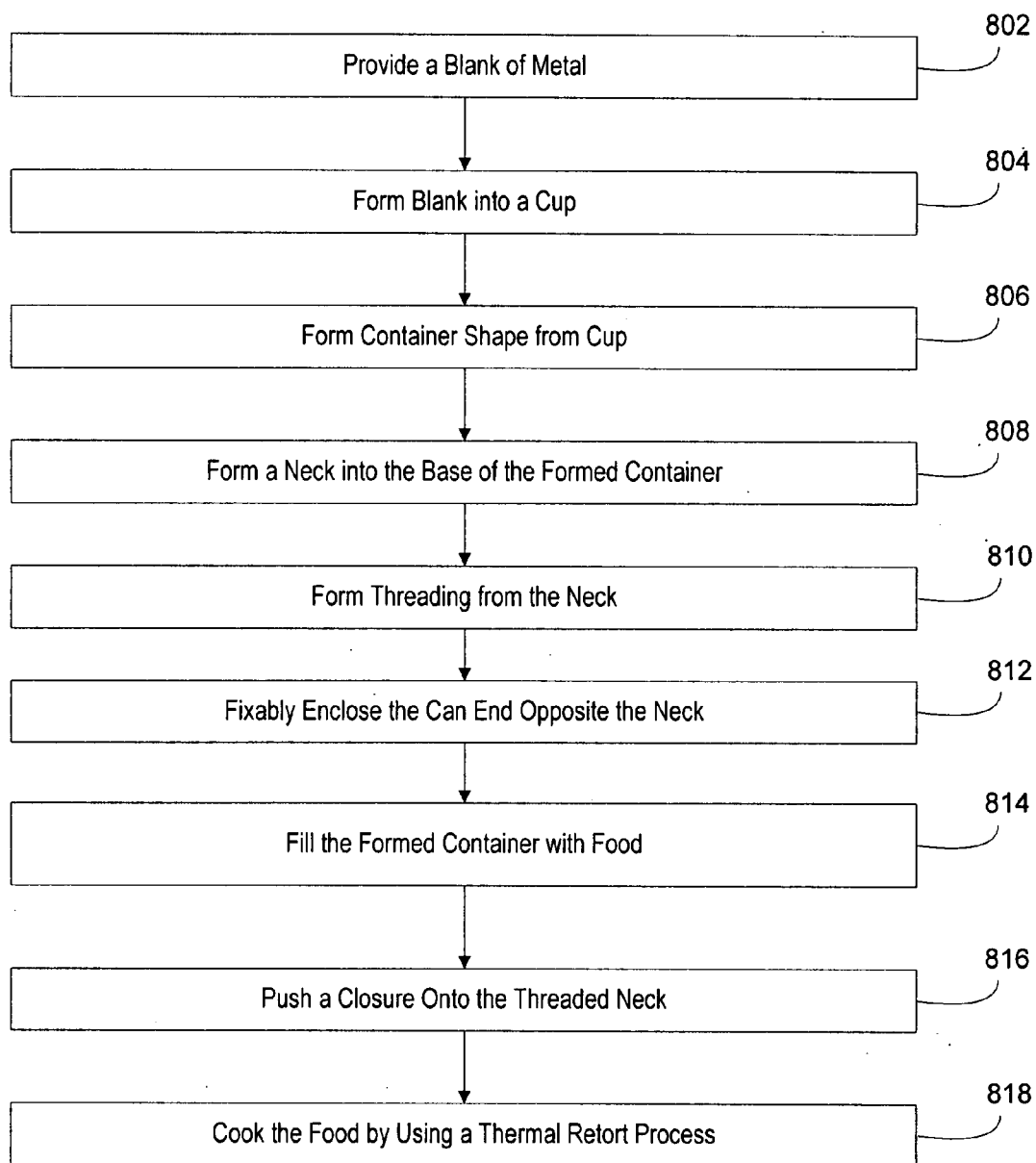


FIG. 8

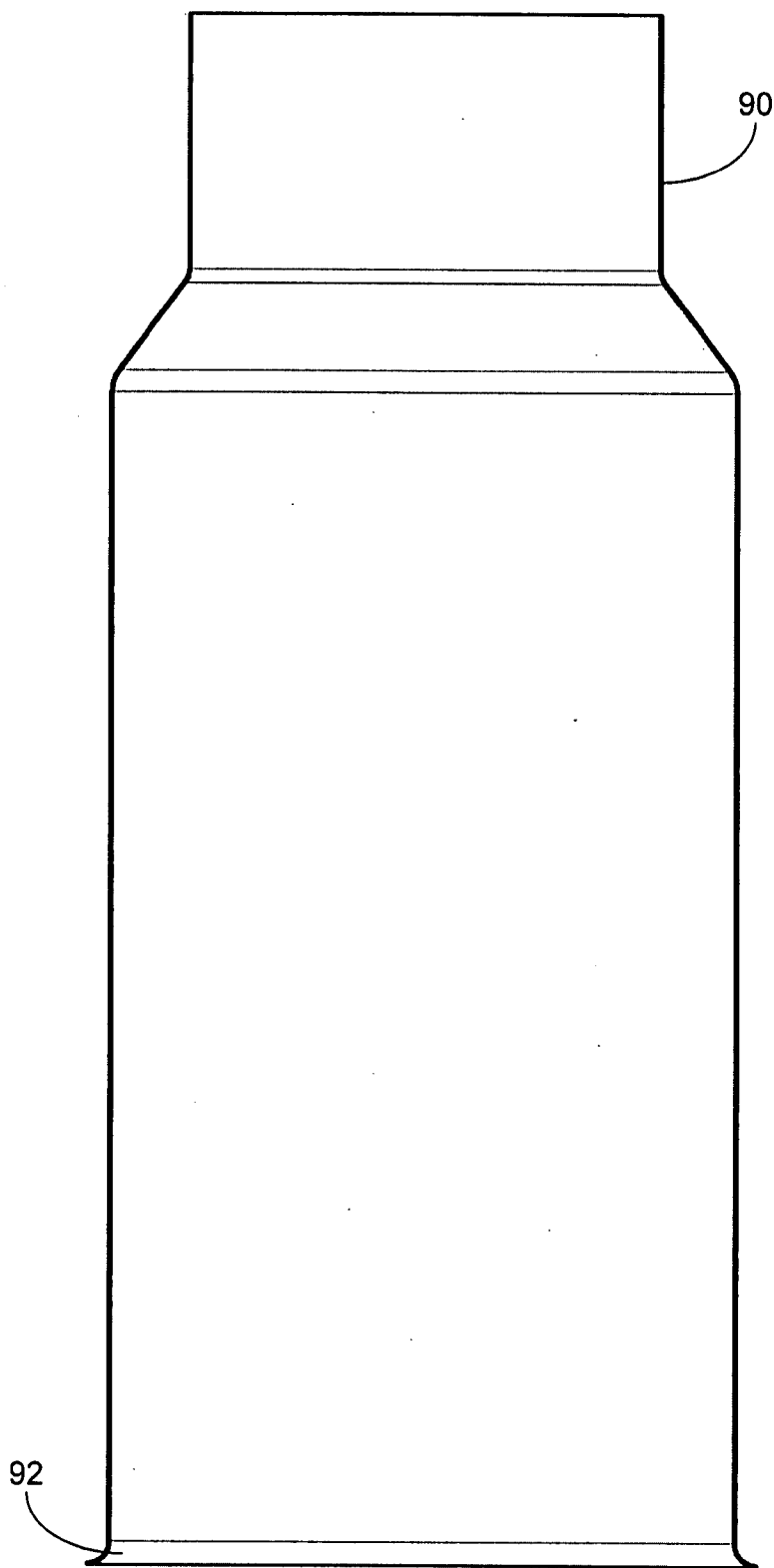


FIG. 9



**METAL CONTAINER WITH SCREW-TOP CLOSURE AND METHOD OF MAKING THE SAME**

**BACKGROUND**

[0001] The application generally relates to metal food containers. The application relates more specifically to metal food containers with screw-top closures and methods of making the same.

[0002] Metal containers are used to store a variety of materials and objects. Some types of metal containers are used to store perishable material such as organic material, solid food, food having a liquid component, and liquids. These containers must often meet a variety of requirements depending on their intended use. For example, some containers must be able to withstand acidity of certain levels such that the container's intended contents do not compromise the container. Other containers must be able to successfully store liquid such that manipulation of the container during shipping and typical use do not cause the container to deform, break an airtight seal, and/or leak the container's contents. Yet other containers must be able to withstand food cooking processes involving the container.

[0003] While some containers are filled with uncooked food or pre-cooked food then sealed for later consumption, other containers are filled with uncooked food, the container is sealed, and the food is cooked or sterilized while sealed within the container. This process is commonly called a thermal retort process. Thermal retort processes often have certain advantages. First, cooking food within the container is often faster than cooking food outside of the container. Second, cooking the food inside the container helps to sterilize the food and the container. Third, end-users often appreciate pre-cooked food contents as preparation times are often shorter and more convenient. Fourth, sealing food contents then sterilizing via a thermal retort process helps maintain the seal and preserves the food contents.

[0004] Many conventional containers used with thermal retort processes use ends that may only be opened once and are not easily reclosed or resealed. For example, some conventional containers suitable for use with thermal retort processes are metal cans having an end designed for use with a can-opener. Other conventional containers suitable for use with thermal retort processes are metal cans having "pop-tops", "pull tops", convenience ends, or convenience lids. Thermal retort processes present challenges to the design and manufacture of reclosable and/or resealable metal cans. For example, the pressure and temperature rigors of the thermal retort process may compromise the seal with the thread structures. In addition, traditional methods of making metal food containers are often incompatible with the precise forming steps often required to create adequate reclosable structures (e.g., screw-top threads).

[0005] Therefore, it is desirable to provide a metal container having a reclosable feature. Further, it is desirable to provide a reclosable metal container suitable for use with thermal retort processes. Further, it is desirable to provide a reclosable metal container having a screw-top that end-users may conveniently open and reclose. Further, it is desirable to provide a reclosable metal container having threads and a closure capable of withstanding a thermal retort process.

[0006] What is needed is a container and/or method of making the same that satisfies one or more of these needs or provides other advantageous features. Other features and

advantages will be made apparent from the present specification. The teachings disclosed extend to those embodiments that fall within the scope of the claims, regardless of whether they accomplish one or more of the aforementioned needs.

**SUMMARY**

[0007] One embodiment relates to a food or drink container kit. The container kit includes a metal container including a round threaded neck having at least one integrally formed thread. The container kit also includes a metal press-on, twist-off closure comprising a round skirt including a gasket material located on at least a portion of the interior of the skirt, a seal forming between the neck and skirt when the closure is placed on the container and heated.

[0008] Another embodiment relates to a method for creating a metal container with a press-on, twist-off closure. The method includes providing a blank of material and forming a cup from the blank of material. The cup has a closed cup end, side walls, and an open cup end. The method further includes forming the closed cup end to create a neck and a primary container opening and forming at least one thread in the neck. The method yet further includes attaching a bottom part to the open cup end to form a metal body that is closed except for the primary container opening, such that once the metal container is filled, once the press-on, twist-off closure is pressed onto the neck, and once the container is heated, a seal is formed between the closure and the metal container.

[0009] Another embodiment relates to a container made by a process. The process includes filling a metal container with food, the container comprising a preservative coating lining interior surfaces of the container and a threaded neck having at least one integrally formed thread configured to receive a closure. The process further includes pressing a press-on, twist-off closure onto the threaded neck, the closure comprising an interior surface and a plastisol gasket material lining at least a portion of the interior surface, wherein after heating the closure a seal is created with the threaded neck, capable of withstanding a heating and cooling process such that the plastisol gasket material lining the interior surface of the closure resiliently engages the at least one integrally formed threads. The process yet further includes heating the container to sterilize the food contained within the container and to create a vacuum that provides a physical force that helps securably hold the closure onto the container.

[0010] Another embodiment relates to a food or drink storage apparatus. The storage apparatus includes a metal container including a round threaded neck having at least one integrally formed thread. The storage apparatus also includes a metal press-on, twist-off closure comprising a round skirt including a gasket material located on at least a portion of the interior of the skirt, a seal forming between the neck and skirt when the closure is placed on the container and heated.

[0011] Alternative exemplary embodiments relate to other features and combinations of features as may be generally recited in the claims.

**BRIEF DESCRIPTION OF THE FIGURES**

[0012] The application will become more fully understood from the following detailed description, taken in conjunction with the accompanying figures, wherein like reference numerals refer to like elements, in which:

[0013] FIG. 1 is a perspective view of a metal container having a threaded neck, according to an exemplary embodiment;

[0014] FIG. 2 is a side profile view of a metal container having a threaded neck, according to an exemplary embodiment;

[0015] FIG. 3 is a close-up side profile view of the threaded neck, according to an exemplary embodiment;

[0016] FIG. 4 is a close-up side profile view of the threaded neck having a press-on twist-off closure installed, according to an exemplary embodiment;

[0017] FIG. 5 is a partial sectional view of the container threading having the closure installed, according to an exemplary embodiment;

[0018] FIG. 6 is a partial sectional view of the container threading having the closure installed, according to an alternative embodiment;

[0019] FIG. 7A is a side profile view of a threaded neck, according to an alternative embodiment;

[0020] FIG. 7B is a side profile view of a threaded neck having a closure installed, according to an alternative embodiment;

[0021] FIG. 8 is a flow chart of a method of making the metal container, according to an exemplary embodiment.

[0022] FIG. 9 is a side profile view of a metal container during manufacturing, prior to forming threading into the container neck, according to an exemplary embodiment.

#### DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENTS

[0023] Before turning to the figures which illustrate the exemplary embodiments in detail, it should be understood that the application is not limited to the details or methodology set forth in the following description or illustrated in the figures. It should also be understood that the phraseology and terminology employed herein is for the purpose of description only and should not be regarded as limiting.

[0024] Referring generally to the figures, a metal container (i.e., a can) is shown having a threaded neck integrally formed from the metal of the container body. The threads are formed to fit a screw-top closure and the closure is a press-on/twist-off closure. The container is suitable for use with a thermal retort process. Referring still to the figures in general, a process of making a metal container is provided so that the integrally formed threads are formed from a relatively unworked or un-thinned portion of metal once the majority of the container body has been formed.

[0025] Referring to FIG. 1, a perspective view of metal container 1 is shown, according to an exemplary embodiment. Metal container 1 includes a top end 2, a body 4, and a bottom end 6. Container 1 and body 4 are shown as substantially cylindrical (i.e., the container walls or piece forming body 4 are curvilinear). According to various other embodiments, container 1 may take any number of other container shapes as may be desirable for different applications or aesthetic qualities. For example, container 1 may be formed to have one or more angles that create a polygonal cross-section such as a rectangular cross section. Container 1 and body 4 could also be formed to have any number of edges, curves, and/or beads as may be desirable for end-users and/or for structural integrity purposes. Metal container 1 may be sized to store about eight ounces of liquid contents or may be sized

differently (e.g., less than eight ounces, more than eight ounces, twelve ounces, sixteen ounces, thirty two ounces, etc.).

[0026] According to an exemplary embodiment, the metal of container 1 is about 0.008 inches thick and is primarily made of tin plated steel. According to various other exemplary embodiments, the metal of container 1 is formed from steel having a working gauge range from about 0.006 inches thick to about 0.013 inches thick, or other available working ranges. According to various other alternative embodiments, container 1 may be formed of aluminum, tin free steel, and/or another metal material that may be used to form metal food containers. The material of container 1 may also be more or less thick along certain structures or locations of body 4. For example, in the middle of the side walls of container body 4, the material may be more thin than material closer to the top end or bottom end.

[0027] The top of container 1 and container body 4 angles inward to create a frusto-conical portion 8. A threaded neck 10 extends from the frusto-conical portion 8. According to an exemplary embodiment, frusto-conical portion 8 is angled around thirty-seven degrees from the vertical surfaces of body 4 and sized so that the diameter of the neck with a closure installed thereon is smaller than the diameter of body 4. According to various other embodiments, frusto-conical portion 8 is angled more or less than thirty-seven degrees from vertical. This sizing and structure may create an aesthetically pleasing container top, provide a user with increased leverage for opening the screw-top, and/or prevent the container top, threads, and closure from experiencing some amount of the unavoidable contact that containers typically have with adjacent containers or other structures during manufacture, shipping, and/or use. According to other various exemplary embodiments, frusto-conical portion 8 may not be present on the container, may be characterized as a cone-shaped shoulder area, or may take any other shape or size.

[0028] Referring to FIG. 2, a side view of metal container 1 is shown, according to an exemplary embodiment. At bottom end 6 of metal container 1, one or more bottom seal structures 21 may fixably seal a bottom end piece to container body 4. According to an exemplary embodiment, bottom seal structures 21 are a double seam including folds of metal adjoining a container flange (e.g., 92 shown in FIG. 9) and a bottom end piece (i.e., sanitary end) so that a substantially hermetic seal is created.

[0029] Referring to FIGS. 2 and 3, detail of threaded neck 10 is shown, according to an exemplary embodiment. Threaded neck 10 is integrally formed from the metal of container 1, container body 4, and/or frusto-conical portion 8. Threaded neck 10 extends upward from frusto-conical portion 8 along the vertical axis of container body 4. The radius and height of threaded neck 10 is generally determined based on the radius and depth of the closure with which the threaded neck will be used. A lower ring 12 and one or more thread 14 extend from threaded neck 10.

[0030] According to an exemplary embodiment, thread 14 is a single thread conforming to the Glass Packaging Institute's (GPI) glass finish designation number 465, last revised Feb. 5, 1999. According to other alternative embodiments, different thread designations or specifications may be used to create the container's threads (e.g., GPI glass finish designation number 2215, etc.).

[0031] Neck edge 16 will generally be curled or rounded to provide a suitable sealing surface (e.g., uniform and having

some substantial diameter relative to the gauge of the container walls). Neck edge 16 may also be curled or rounded to provide a suitable surface for mouth contact or drinking. For example, neck edge 16 is shown as a curled neck edge, curling to the exterior of threaded neck 10. The exterior diameter of the neck and structures of the neck may be appropriately sized to allow the closure to function properly. According to an exemplary embodiment, the neck is sized per certain threading specifications (e.g., GPI glass finish designation number 2215, 465, etc.).

**[0032]** Referring to FIG. 4, a side view of metal container 1 is shown, metal container 1 having closure 40 (e.g., cap, cover, top, etc.) shown installed on a round threaded neck 10 of the previous FIGS., according to an exemplary embodiment. Closure 40 includes a closure top end 42, a round closure skirt portion 44 and a closure bottom rim 46. When closure 40 is installed onto threaded neck 10, closure bottom rim 46 is adjacent lower ring 12. Closure 40 may have a diameter of 40 millimeters (e.g., shown as diameter "D" on FIG. 4), but may be sized differently to fit differently sized or configured threaded necks. According to one alternative embodiment, closure 40 is a 48 mm diameter closure. According to an exemplary embodiment, relatively deep closures may be desirable for use with threaded necks having a single thread. According to an exemplary embodiment, closure 40 has a closure style of "40 DER" that may be described as having a diameter of 40 mm, a deep closure skirt, and a vacuum safety button that requires a 20 inch Hg vacuum to verify the seal is intact. According to various other exemplary embodiments, the closure may include other tamper evidencing features or no tamper evidencing features.

**[0033]** Referring to FIG. 5, a sectional view of threaded neck 10 and closure 40 are shown, according to an exemplary embodiment. Closure 40 is a press-on, twist-off type metal closure (i.e., push-on/twist-off cap, etc.). A press-on, twist-off closure refers to a closure that is initially coupled to a body by a press-on (i.e., push-on) movement, but then is later removed or reattached by a twisting motion. According to an exemplary embodiment, closure skirt portion 44 is smooth such that closure skirt portion does not have any threads or other metal structures that would prevent closure 40 from being pressed onto the threaded neck or threads of a container. According to various alternative embodiments, closure 40 may be a plastic closure or another closure other than metal.

**[0034]** According to an exemplary embodiment, the metal of closure 40 is between about 0.006 inches and 0.008 inches thick. Closure underside or interior surface 41, along at least some of the closure skirt portion 44, is coated with a gasket or gasket material 50. According to an exemplary embodiment, gasket 50 is a plastisol material or compound applied to the top and side surfaces of closure underside 41. Materials other than plastisol may serve as the gasket. Plastisol may provide sufficient resistance to acids of food products that may come into contact with the plastisol, may permit hot-fill processes to produce a vacuum seal, and may withstand a heat-based sterilization or cooking process. A sufficient amount of the gasket material coats closure underside 41 such that the outer diameter of thread 14 is larger than the inner diameter of gasket 50. The plastisol compound does not contain preformed thread indents or receiving structures. Rather, steam or another application of heat is used to soften the plastisol material prior to pushing the material onto the threaded neck of the container. The difference between the diameter of the gasket material and the structures of threaded neck 10 cause

the softened gasket 50 to move and flow around thread 14 so that many portions of threaded neck 10 are surrounded by gasket 50 such that the interface(s) between threaded neck 10 and gasket 50 form a hermetic seal. Following cooling of the plastisol, the plastisol stiffens or hardens to create a resilient foam that may act to maintain the hermetic seal with threads 14. The cooled plastisol may have a semi-permanent or permanent impression of the structures of the threaded neck such that the closure may be removed and/or reclosed or resealed with a twist-off or twist-on motion.

**[0035]** According to an exemplary embodiment, gasket 50 specifically comprises a plastisol compound that may be characterized as a "508 compound" or similar material. Gasket 50 may be a liquid applied gasket or any other suitable gasket material.

**[0036]** Referring to FIG. 6, a sectional view of a threaded neck and closure 40 is shown, according to an alternative exemplary embodiment. In the embodiment shown in FIG. 6, neck edge 17 is curled to the interior of the threaded neck. Sealing compound 61 may prevent a raw metal edge from exposure to moisture that may rust and/or corrode the raw metal.

**[0037]** Referring to FIGS. 7A and 7B, a side view of a threaded container neck having multiple independent threads is shown, according to an alternative embodiment. Multiple independent threads may allow the height of a closure to be decreased.

**[0038]** Referring to FIG. 8, a flow chart of a process of making and using a metal container such as metal container 1 shown in the previous FIGS. is shown, according to an exemplary embodiment. Metal container 1 may be made using a variety of methods. For example, metal container 1 may be formed using a drawn and ironed manufacturing process, a drawn and redrawn manufacturing process, and/or a variety of alternative manufacturing processes. According to the embodiment shown in FIG. 8, a drawn and ironed process is used to manufacture metal container 1. Raw material may come from a source in a variety of forms. For example, raw material may come from a metal supplier in a large coil. This coil may be unspooled or otherwise moved into a position to be unreeled by an unreele. The unreeled metal from the unreele may be fed into a lubricator. Lubricant may be applied to the unreeled metal by a series of rollers or otherwise. Lubricant improves the workability of the raw material later in the process.

**[0039]** A blank may be formed from the lubricated raw material or otherwise provided (step 802). The blank may be sized such that the blank may be formed to create the container body. Blanks may be formed using a variety of processes including cutting processes. For example, the blanks may be formed using a press cut-activity. A cupping press machine may cut a blank that is shaped like a disk. Once a blank has been formed or otherwise provided, the blank is formed into a cup (step 804). This cup forming activity may take place within the same machine and close-in-time to the blank cutting step. For example, a single machine may act in a double action; a first action may cut the blank and a second action may form the cup. A cup may then be ejected and advanced to the can handling system.

**[0040]** The cup formed from the blank may be a relatively short or squat cup. The bottom of the cup will be approximately the same metal thickness as the original blank. The sides of the cup may be worked slightly and may be thinner than the original metal of the blank. Depending on the target

height of the metal container, the cup will be subjected to a drawn and ironed process that forms the container body shape from the cup (step 806). The container body shape may be formed using a machine generally referred to in the art as a "bodymaker." This machine works or forms the cup with a punch and ironing rings in a progression to form the shape and size of the container's body walls. While this drawn and ironed process allows the container to be formed to a height taller than the cup, the ironing reduces the wall thickness and often results in the walls being too thin and/or brittle to reliably form fine and precise structures such as threads. The base of the formed container, however, is still approximately the same metal thickness as the original blank (i.e., the original cup base is still the base of the formed container as of this step, and is relatively unworked and un-thinned). This relatively unworked or un-thinned container base may be reliably formed into the thread. So, the base of the formed container shape, or the cup bottom, becomes the top of the final container body and the container neck is formed using the base of the formed container (step 808). During this step or another step, the container neck may be cut to create the primary container opening that the closure will cover. According to various exemplary embodiments, the primary container opening may be cut prior to forming the neck from the base of the formed container.

[0041] After the neck has been formed and the primary container opening has been cut, threading may be formed from the container neck (step 810). The threading may be formed using an interior press, an exterior press, and/or any other suitable thread forming process. The threads may be formed to fit a press-on twist-off closure. According to an exemplary embodiment, the thread or threads may also be formed such that a threaded neck and thread metal thickness of about at least 0.007 inches is maintained. In addition to maintaining a certain thickness of the metal, it may be important to maintain a certain low percentage of thinning. For example, while the sides of the container may be thinned during the drawing process down to about forty percent of the original thickness of the blank, the metal used to form the threaded neck and the threads should not be thinned by more than ten percent of the original blank thickness. According to an exemplary embodiment, no portion of the threaded neck and/or threads are thinned more than 12 percent and maintain a thickness of about at least 0.007 inches. According to various alternative embodiments, greater thinning percentages (e.g., thread thinning of greater than 12 percent, thinning of up to 30 percent, etc.) may be used to create the threaded neck and/or threads. According to yet other various embodiments, container wall and/or thread thickness may be less than 0.007 inches.

[0042] According to various exemplary embodiments, the threading will be thick enough and resilient enough to withstand various typical thread forming and container handling processes. The threading should be prominent enough so that when human applied rotation of the closure relative to the container body occurs, the threads provide enough leverage in the plastisol to break the vacuum seal (e.g., around 20 inHg) holding the closure onto the container body. The threading may thereby be configured to allow the consumer easy initial access to the container contents and thereafter allow the consumer to reclose the container with sufficient thread-provided leverage and threading accuracy to create a liquid-type seal (i.e., substantially watertight) upon reclosure.

[0043] The container end opposite the neck (i.e., the can bottom end) may be fixably enclosed (step 812) after a variety of steps in the process. According to an exemplary embodiment, a container bottom end part is attached to the container end opposite the neck (i.e., the can bottom end shown in FIGS. 1 and 2) such that a bottom most portion of the container body side walls and the edge of a bottom end are interfolded together to create a fixed and hermetic seal.

[0044] After both the top end and bottom end of the container are formed, the container may be filled (step 814). While the open container may be filled with any variety of materials or contents, the container is filled with food according to an exemplary embodiment. The food may be pre-cooked, partially pre-cooked, warmed, or cool. According to an exemplary embodiment, the container is hot-filled.

[0045] Once the container has been filled, the closure may be pressed onto the threaded neck (step 816). Step 816 may include heating the closure prior to and/or during the activity of pressing the closure onto the threaded neck. According to an exemplary embodiment, the closure is a press-on, twist-off closure lined with a plastisol material. The plastisol may be partially fluid, softened, and/or heated prior to pushing the closure onto the threads such that the friction between the plastisol material and the threaded structures is low enough to allow the closure to be fully applied (i.e., installed, slidably installed, rotatably installed) and/or formed around the threads (e.g., pressed onto the threads). According to an exemplary embodiment, steam or hot air may be applied to the closure to adequately soften the plastisol material prior to pressing the closure onto the threads. According to various exemplary embodiments, the steam temperature applied to the closure is around 190 degrees Fahrenheit to 210 degrees Fahrenheit.

[0046] The container may be subjected to a thermal retort process (step 818). A thermal retort process may generally be characterized as a process of subjecting the filled and closed container to a cooking or sterilization process having different heat, time, and pressure variables sufficient to substantially sterilize the interior and contents of the food container. Some thermal retort processes may be overpressure thermal retort processes where pressure outside the container is substantially matched or slightly exceeded relative to the pressure that builds on the inside of the container due to heating a sealed container. Overpressure thermal retort processes may generally include inserting a filled and closed container (or group of containers) into a retort vessel that heats the container via steam, water, or a combination of steam and water and provides overpressure to prevent container deformation or breakage due to pressure build-up inside the container.

[0047] During a thermal retort process, the container and the food inside the container will be brought to a temperature of about at least 200 degrees Fahrenheit. According to various exemplary embodiments, a thermal retort process may include bringing the container to a temperature of between 220 degrees Fahrenheit and 260 degrees Fahrenheit. According to yet other embodiments, a thermal retort process includes bringing the container to a temperature of at least 240 degrees Fahrenheit. According to a preferred embodiment, the container and closure should be able to withstand a thermal retort process of about 250 degrees Fahrenheit with about 32 pounds per square inch of overriding pressure for a period of about 45 minutes and a 3 pounds per square inch differential between overriding pressure and internal pressure. Processing step 818 may also include steps of control-

lably ramping up temperature, cooking, and then controllably bringing temperature down or dropping temperature so that a strong vacuum (e.g., 20 inHg to 25 inHg,) is formed between the closure and container body that substantially holds the closure onto the neck and maintains the hermetic seal. According to various other exemplary embodiments, a weaker or stronger vacuum may be created and maintained.

**[0048]** The specifications of the thermal retort process will vary depending on the food being cooked, the machinery (e.g., retort vessel) being used, the amount of agitation used with the heat, and any number of other variables. It may be desirable to cook different types of food to certain different minimum temperatures for certain different minimum amounts of time to ensure sterilization. A container and closure of the present application should be able to withstand a variety of typical temperature, time, and pressure levels such that the container may be considered suitable for use with a thermal retort process for a wide variety of foodstuffs, including, for example, adult nutritional drinks, to those skilled in the art of food sterilization using a retort process.

**[0049]** During the manufacturing process, the metal container may also be washed and coated as required for workability, cleanliness of the container, and longevity of the container surfaces when subjected to container contents, liquids, and/or air.

**[0050]** Referring to FIG. 9, a profile view of a container body prior to forming the threading is shown, according to an exemplary embodiment. As discussed above with reference to the process of FIG. 8, a container neck 90 will be formed using the base of the formed cup or container shape. Container neck 90 may be formed prior to or after cutting a primary container opening into the container. Unformed container neck 90 may be taller than a formed threaded neck as the forming process will generally shorten the neck as it bends or otherwise uses the material of the neck in shaping the thread or threads. Furthermore, excess material may be cut or otherwise removed from the top of container neck 90 and/or the edges may be rolled or folded over to create the outward or inward rolls of FIGS. 5 and 6. Referring still to FIG. 9, bottom end flanges 92 may be formed or created by machinery of the container's manufacturing process to provide a beginning interface or structure that a bottom end part may be interfolded with to create a fixably attached and hermetically sealed (e.g., dry-sealed) bottom end.

**[0051]** According to one alternative embodiment, it may be desirable to pre-coat the interior of a metal food container to ensure that a thorough and even application of protective coating is applied to the interior of the container. Using pre-coated blanks of material, however, it may be desirable to form the container using a process other than a drawn and ironed process described above. In this process, a container may be formed using one or more steps to form the basic shape of the container. More particularly, a metal container using pre-coated material may be made by the process of forming a container body from a blank of pre-coated metal, forming a threaded neck from a top end of the container body to create an integrally formed thread configured to receive a closure, and filling the container body with foodstuffs. Once filled, the process may further include pushing a closure onto the threaded neck, the closure and the threaded neck creating a hermetic seal when subjected to a heating and cooling process such that a plastisol material lining the interior of the closure resiliently engages the threads and a vacuum provides a physical force to hold the closure onto the container top end.

**[0052]** According to various other exemplary embodiments, the interior and/or exterior of the container are coated with a preservative coating after the container is formed or substantially formed. According to yet other exemplary embodiments, the container is pre-coated and then coated with one or more post-forming coats. Coating may be applied via spraying or any other suitable method. Different coatings may be provided for different food applications. The coating material may be a vinyl, polyester, epoxy, and/or other suitable preservative spray. The coating, for example, may be a spray epoxy such as PPG Z12215L, sold by PPG Industries, Inc. According to other embodiments, the coating may be a coating such as sold by Valspar Coatings (e.g., coating number 6256-069, etc.).

**[0053]** According to various exemplary embodiments, a user of various embodiments of a metal container described throughout this application may open the container by applying an opening torque to the closure, container body, and/or other structures of the container to rotatably remove the closure. Using the thread indents or molds created in the plastisol, the thread surfaces should be able to slide along the interfacing plastisol such that the closure is directed upward by the spiral or helix nature of the threads. With enough twisting, the closure will be directed upward until the hermetic seal between the closure and the container will be broken and the vacuum inside the container will be released. If the closure has a safety-button type incorporated, a safety-button formerly depressed when the vacuum was maintained will pop-up to indicate to the user that the seal has been broken.

**[0054]** According to any preferred embodiment, although the container includes a closure at the top end, and a bottom end part at the bottom end, the container embodies a 2-piece can in that one continuous blank of material forms the container body, neck, and threads and a vertical seam or weld line does not run down the side wall of the container. According to various alternative embodiments, the container may be a three-piece can wherein a flat blank or sheet of material is shaped or bent until a first side and a second side of the shaped sheet may be welded together.

**[0055]** As the container and the food inside the container are heated, the inside of the container is sterilized so that the food does not spoil. When the container begins cooling, the closure is fixed to the threads by the plastisol cooling and a negative pressure relationship or a vacuum that develops on the container interior. As the plastisol cools, it hardens and forms around the threads of the container and resembles a resilient foam. As the container interior cools, a vacuum creates a physical force that provides a seal between the closure and the rest of the container interior.

**[0056]** It should be understood that the phrase "food" used to describe various embodiments of this disclosure may refer to dry food, moist food, liquid, or any other drinkable or edible material, regardless of nutritional value.

**[0057]** According to various other embodiments, a container kit may be provided utilizing various containers and closures described herein.

**[0058]** While the exemplary embodiments illustrated in the figures and described herein are presently preferred, it should be understood that these embodiments are offered by way of example only. Accordingly, the present application is not limited to a particular embodiment, but extends to various modifications that nevertheless fall within the scope of the

appended claims. The order or sequence of any processes or method steps may be varied or re-sequenced according to alternative embodiments.

**[0059]** It is important to note that the construction and arrangement of the container as shown in the various exemplary embodiments is illustrative only. Although only a few embodiments have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited in the claims. For example, elements shown as integrally formed may be constructed of multiple parts or elements, the position of elements may be reversed or otherwise varied, and the nature or number of discrete elements or positions may be altered or varied. Accordingly, all such modifications are intended to be included within the scope of the present application. The order or sequence of any process or method steps may be varied or re-sequenced according to alternative embodiments. In the claims, any means-plus-function clause is intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Other substitutions, modifications, changes and omissions may be made in the design, operating conditions and arrangement of the exemplary embodiments without departing from the scope of the present application.

**[0060]** It should be noted that although the figures herein may show a specific order of method steps, it is understood that the order of these steps may differ from what is depicted. Also, two or more steps may be performed concurrently or with partial concurrence. It is understood that all such variations are within the scope of the application.

What is claimed is:

1. A food or drink container kit, comprising:
  - a metal container including a round threaded neck having at least one integrally formed thread; and
  - a metal press-on, twist-off closure comprising a round skirt including a gasket material located on at least a portion of the interior of the skirt, a seal forming between the neck and skirt when the closure is placed on the container and heated.
2. The container kit of claim 1, wherein the threaded neck comprises a single continuous thread.
3. The container kit of claim 2, wherein a beginning of the single thread and an end of the single thread overlap relative to a vertical axis of the threaded neck.
4. The container kit of claim 1, wherein the threaded neck comprises multiple independent threads.
5. The container kit of claim 1, wherein the threaded neck, threads, closure, and gasket material are sized and configured so that mating threads are formed in the gasket material when the skirt is placed on the container and heated.
6. The container kit of claim 1, wherein the skirt of the closure is smooth such that a metal structure of the skirt does not prevent the closure from being pressed onto the threaded neck.
7. The container kit of claim 1, wherein the threaded neck comprises metal that is about 0.007 inches to 0.009 inches thick.
8. The container kit of claim 1, wherein the threaded neck comprises metal that is about at least 0.007 inches thick.

9. The container kit of claim 1, wherein metal forming the threaded neck and the at least one threads has been thinned less than about 12 percent.

10. The container kit of claim 1, wherein metal forming the threaded neck and the at least one threads has been thinned less than about 10 percent.

11. The container kit of claim 1, wherein the gasket material is a plastisol material.

12. The container kit of claim 1, wherein the container body further comprises a preservative coating lining its interior surfaces.

13. The container kit of claim 1, wherein container and closure are configured to maintain the seal during a thermal retort process.

14. The container kit of claim 13, wherein the thermal retort process is a process wherein the container with closure sealably installed onto the threaded neck and at least partially filled with perishable material is heated to a temperature of about at least 220 degrees with overriding pressure.

15. The container kit of claim 1, wherein the threaded neck includes a top neck edge wherein metal of the top neck edge has been curled toward the exterior of the threaded neck.

16. The container kit of claim 1, wherein the threaded neck includes a top neck edge wherein metal of the top neck edge has been curled toward the interior of the threaded neck.

17. The container kit of claim 1, wherein the threaded neck includes a top neck edge wherein metal of the top neck edge has been curled toward the interior of the threaded neck and wherein the interior of the curl is sealed with a sealing compound.

18. The container kit of claim 1, wherein a top end of the container includes a frusto-conical portion uniformly angling toward a center of the container before forming a substantially vertical structure from which the threaded neck is formed.

19. A method for creating a metal container of the type closable with a press-on, twist-off closure, comprising:

- providing a blank of material;
- forming a cup from the blank of material, the cup having a closed cup end, side walls, and an open cup end;
- forming the closed cup end to create a neck and a primary container opening;
- forming at least one thread in the neck; and
- attaching a bottom part to the open cup end to form a metal body that is closed except for the primary container opening, such that once the metal container is filled, once the press-on, twist-off closure is pressed onto the neck, and once the container is heated, a seal is formed between the closure and the metal container.

20. The method of claim 19, wherein the seal is formed by heating the closure as it is pressed onto the neck and the seal is maintained by processing the container.

21. The method of claim 19, further comprising coating the interior of the container with a preservative material prior to filling the container with food.

22. The method of claim 19, further comprising at least partially filling the metal body with food through the primary container opening.

23. The method of claim 19, further comprising pushing a press-on twist-off closure onto the at least one thread formed in the neck.

24. The method of claim 19, wherein the filled container is suitable for use with a thermal retort process so that a seal may be maintained during and after the thermal retort process.

**25.** The method of claim **24**, wherein the thermal retort process is a process wherein the container with closure sealably installed onto the threaded neck and filled with food is heated to a temperature of about at least 250 degrees.

**26.** The method of claim **24**, wherein the thermal retort process is a process wherein the container with closure sealably installed onto the threaded neck and filled with food is heated to a temperature of about at least 220 degrees for a time period of more than 20 minutes.

**27.** The method of claim **24**, wherein the thermal retort process is a process wherein the container with closure sealably installed onto the threaded neck is heated to about 245 degrees Fahrenheit with about 30 pounds per square inch of overriding pressure for a period of at about 40 minutes and about a 3 pounds per square inch differential between overriding pressure and internal pressure is maintained.

**28.** A container made by the process of:

filling a metal container with food, the container comprising a preservative coating lining interior surfaces of the container and a threaded neck having at least one integrally formed thread configured to receive a closure;

pressing a press-on, twist-off closure onto the threaded neck, the closure comprising an interior surface and a plastisol gasket material lining at least a portion of the interior surface, wherein the closure and the threaded neck are configured to maintain a seal when subjected to a heating and cooling process such that the plastisol gasket material lining the interior surface of the closure resiliently engages the at least one integrally formed threads; and

heating the container to sterilize the food contained within the container and to create a vacuum that provides a physical force that helps securably hold the press-on, twist-off closure onto the container.

**29.** A food or drink storage apparatus, comprising:  
a metal container including a round threaded neck having at least one integrally formed thread; and  
a metal press-on, twist-off closure comprising a round skirt including a gasket material located on at least a portion of the interior of the skirt, a seal forming between the neck and skirt when the closure is placed on the container and heated.

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