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(54) Title: CONTAINER APPARATUS AND METHOD FOR USING THE SAME

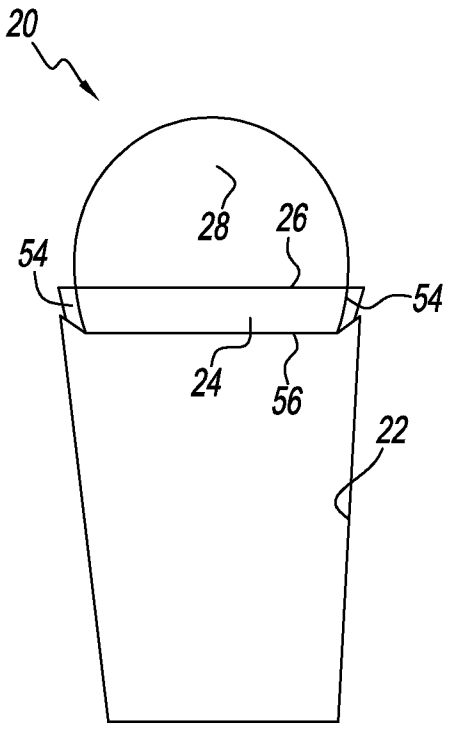

FIG. 1A

(57) Abstract: A container apparatus (20) and a method for using the container apparatus (20) are disclosed. The disclosed apparatus (20) can be implemented in a wide variety of ways, including but not limited to that of a food or beverage container (20). The container apparatus (20) can include a lid (28) and a body (22). Some configurations may include a plate (24), flaps (54), a reinforcement member (23), and/or other components.

WO 2012/069931 A2

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CONTAINER APPARATUS AND METHOD FOR USING THE SAME

RELATED APPLICATIONS

This PCT patent application claims priority to: (1) the U.S. provisional patent application titled "CONTAINER APPARATUS AND METHOD FOR USING THE SAME" (serial number 61/416,292) that was filed on November 22, 2010; and (2) the U.S. utility patent application titled ""CONTAINER APPARATUS AND METHOD FOR USING THE SAME" (serial number 13/080,912) that was filed on April 6, 2011; and the contents of both applications are hereby incorporated by reference in their entirety.

BACKGROUND OF THE INVENTION

The invention relates generally to containers. More specifically, the invention is a container apparatus (the "container") and a method for using a container.

Containers are an important part of the modern economy. Many products cannot be stored, transported, sold, and/or used without first being secured in some type of container. Some types of products, such as many types of food products and virtually all beverage products, require some type of container for the product to be handled or consumed. In many contexts, the container is an integral part of the experiencing the product held within the container. For example, in drinking a beverage, a human being often positions the beverage by positioning the cup that contains the beverage.

Different types of products require different types of containers. Different types of containers can have different purposes. For example, containers can be used to (1) protect the contained product; (2) protect users in utilizing the product; (3) facilitate the ability of users to experience the product, and/or combinations of (1) – (3) above. In the context of a coffee cup, the container serves to prevent the inadvertent disbursement of the coffee and in doing so prevents hot coffee from being spilled on the user.

The attributes of a product will often impact the attributes of the container used to house the product, and vice versa. For example, a container for a beverage product will typically need to be watertight while a container used for storing office supplies need not be watertight or even fully closable. Similarly, a container suitable for use in the context of sterilized medical supplies will have different attributes than a container used to store spare change or golf tees. Even relatively similar types of

products can involve significantly different types of containers. For example, at a quick service food restaurant, different types of cups are used to hold juice, milk, coffee, and soda. Different beverages have different attributes, and those different attributes can merit containers possessing different attributes.

Different containers can also have different anticipated users possessing different skill levels and even different physical capabilities. The proper usage of a container can vary widely depending on whether or not the anticipated user of the container is a consumer. For example, a beverage container used in restaurants will need to be suitable for use by individual consumers, a wide cross section of the population that includes persons with disabilities as well as individuals of below average physical and mental capabilities. In contrast, a container used by locksmiths or mechanics to store their tools can utilize far more complex designs and operating procedures.

Containers can also vary widely in terms of their anticipated duration of service. Many containers are disposed of after a single use. For example, a cup of ice cream sold in a grocery store or drug store is intended to be thrown away after the contents are consumed by a consumer. In contrast, a thermos can be emptied and filled over a lifetime of years or even decades.

Many popular consumer products are sold in disposable containers that are not biodegradable or that otherwise involve negative environmental implications. Many such containers end up as litter that is both an eyesore and damaging to the environment. For example, the Great Pacific Garbage Patch (which is also often referred to as the Pacific Trash Vortex) is made up of high concentrations of plastics and other debris trapped by the currents of the North Pacific Gyre. Whether or not the size of the Pacific Trash Vortex is currently as large as the state of Texas, there is no disputing the fact that the area is large and that the damage to that area is significant. Moreover, there are four other large places in the world's oceans where winds trap floating debris.

By definition, disposable containers become waste after their intended and inevitably brief use. Plastic lids for a paper cups and plastic water bottles exist far longer as waste than they do as useful consumer articles. A consumer typically enjoys a cup of coffee in a sitting lasting between 20 and 30 minutes. That lid can require years, decades, or even centuries to fully decompose.

Whether discarded in a landfill or on a body of water, containers can take centuries to degrade while doing significant damage to the surrounding eco-system in the interim. Billions of plastic bottles end in U.S. landfills each year. If those bottles are laid end-to-end, there are enough plastic bottles disposed of each year to circle the equator hundreds of times over or to reach the moon and back multiple times. As the population in developed countries grows and as less economically advanced nations grow economically, the environmental impact of disposable containers will only increase.

Old habits die hard, and it is difficult to change both business and consumer behavior with regards to disposable containers. The technical and business inertia impeding innovations in container design are particularly strong in the context of disposable beverage containers. There are thousands of coffee shops in the U.S. who in the aggregate sell millions of coffee servings each year with paper or Styrofoam cups that utilize plastics lids. Moreover, the underlying economics of such disposable containers coupled with manufacturing limitations affirmatively teach away from innovative container designs. In particular, preconceived notions relating to disposable cups produced with paperboard serve to stifle innovation by teaching away from potential advances.

It would be desirable for better containers to be used in conjunction with contained products. However, most purchasing decisions are typically based on the product, not the container. This basic and simple truth has unfortunate ramifications. Container-related attributes are often overshadowed by product-related attributes, a fact that greatly impedes innovation with respect to containers. By way of example, it is no accident that the conventional paper cup has changed very little over the course of recent decades. Such cups must be produced as inexpensively as possible. Potentially innovative designs are often too expensive to effectively manufacture. In many instances, innovative designs are literally impossible to manufacture on a mass-production basis.

The combined impact of design limitations, manufacturing constraints, and the economic reality of razor thin margins serve to lock in the status quo. Many aspects of the container described below are counter-intuitive to those in the business of designing and making containers.

SUMMARY OF THE INVENTION

The invention relates generally to containers. More specifically, the invention is a container apparatus (the "container") and a method for using the same.

The container includes a body and an attached lid. In many embodiments of the container, the body and lid are intended to be permanently attached to each other. In some embodiments, the lid can be configured in such a manner as to be removable. In many embodiments of the container that are intended to allow for users to open and/or close the container (as opposed to merely access the contents of the container while the container is in a closed state), a plate located between the body and the lid can be used to facilitate the opening and/or closing of the lid. Some embodiments of the container will have one hinge while other embodiments of the container will have two hinges.

The container can be implemented in a wide variety of different embodiments. Different embodiments can be adapted to contain different types of products and user experiences. Different embodiments can utilize a wide range of different materials. Some embodiments of the container can be reusable while others are designed to be disposable. Many disposable embodiments of the container will include paperboard as one of the materials.

BRIEF DESCRIPTION OF THE DRAWINGS

The following drawings illustrate different examples of various embodiments of the apparatus:

Figure 1a is a diagram illustrating an example of rear plan view of an open container that includes a plate.

Figure 1b is a diagram illustrating an example of a rear plan view of an open container that does not include a plate.

Figure 1c is a diagram illustrating an example of a rear plan view of a rectangular container that includes a plate.

Figure 2a is a diagram illustrating an example of an elevated rear view of a container in a fully closed state.

Figure 2b is a diagram illustrating an example of a elevated rear perspective view of a container in a fully closed state except for an open tab passageway.

Figure 2c is a diagram illustrating an example of an elevated rear view of a container in a partially open and partially closed state.

Figure 2d is a diagram illustrating an example of an elevated rear view of a container in a fully open state.

Figure 3a is a flow chart diagram illustrating an example of a method for opening a container.

Figure3b is a flow chart diagram illustrating an example of a method for closing a container.

Figure 4a is a flow chart diagram illustrating an example of a method for manufacturing a container.

Figure 4b is a flow chart diagram illustrating an example of a method for manufacturing a container.

Figure 5a is a diagram illustrating an example of a top blank used in the process illustrated by Figure 4a.

Figure 5b is a diagram illustrating an example of a bottom blank used in the processes illustrated by Figure 4a and Figure 4b.

Figure 5c is a diagram illustrating an example of a lid blank used in the process illustrated by Figure 4b.

Figure 5d is a diagram illustrating an example of a sidewall blank used in the process illustrated by Figure 4b.

Figure 6a is diagram illustrating an example of a plan view of the bottom portion of container with the internal cavity illustrated with dotted lines.

Figure 6b is a geometric diagram illustrating an example of a relatively large rim arc with respect to the body hinge.

Figure 6c is a geometric diagram illustrating an example of a relatively small rim arc with respect to the body hinge.

Figure 6d is a diagram illustrating an example of a plate that has flaps.

Figure 6e is a diagram illustrating an example of a plate that has skid locks.

Figure 6f is a diagram illustrating an example of a plate with a hinge break.

Figure 6g is a diagram illustrating an example of a top plan view of a lid with chevrons.

Figure 6h is a diagram illustrating an example of a top plan view of a lid with a lid stiffener score line.

Figure 6i is a diagram illustrating an example of a top plan view of a lid with a hinge break.

Figure 6j is a diagram illustrating an example of a top plan view of a lid with flaps but no plate.

Figure 7a is a geometric diagram illustrating an example of a substantially circular primary score line comprised of a substantially circular inner groove and a substantially circular body hinge.

Figure 7b is a geometric diagram illustrating an example of a substantially circular primary score line comprised of a substantially circular inner groove and a substantially straight body hinge.

Figure 7c is a bottom plan view diagram illustrating an example of a container with the primary score line illustrated in Figure 7a.

Figure 7d is a bottom plan view illustrating an example of a container with the primary score line illustrated in Figure 7b.

Figure 7e is a diagram illustrating an example of a top plan view of a lid.

Figure 7f is a diagram illustrating an example of a rear plan view of a body of a container in a cylindrical shape.

Figure 7g is a diagram illustrating an example of a rear plan view of a body of a container in a substantially elliptical shape.

Figure 8a is a diagram illustrating an example of a side plan view of a container in a fully open position.

Figure 8b is a diagram illustrating an example of side plan view of a container being moved from a fully open position.

Figure 8c is a diagram illustrating an example of portion of a body that includes a rim and an inner groove.

Figure 8c is a diagram illustrating an example of a side plan view of a container in a fully closed position.

Figure 8d is a diagram illustrating an example of an inner groove angle.

Figure 8g is a diagram illustrating an example of a tab moving from a closed position to an open position.

Figure 8f is a diagram illustrating an example of a front plan view of a container in a fully closed position.

Figure 9a is a perspective diagram illustrating an example of how skid locks can facilitate the stacking of containers in a fully closed position.

Figure 9b is a perspective diagram illustrating an example of stack of containers in fully open positions.

Figure 9c is a diagram illustrating an example of a side plan view of a stack of containers in fully open positions.

Figure 10a is a flow chart diagram illustrating an example of a method for manufacturing a container.

Figure 10b is a flow chart diagram illustrating an example of a method for manufacturing a container.

Figure 10c is a flow chart diagram illustrating an example of a method for manufacturing a container.

DETAILED DESCRIPTION

The invention relates generally to containers. More specifically, the invention is a container apparatus (the "container") and a method for using the same.

I. OVERVIEW OF DIFFERENT CONTAINER EMBODIMENTS

Figures 1a, 1b, and 1c illustrate examples of back plan views of different containers 20. In Figures 1a, 1b, and 1c a lid 28 is shown as attached to a body 22 of the container 20 even while the container 20 is in a fully open operating state.

The container 20 can be implemented in a wide variety of different shapes and operating configurations. Different embodiments of the container 20 can involve a wide variety of different components comprised of a wide variety of different materials. Different embodiments of the container 20 are suited for different types of contents.

A. Non-Aseptic Cup

Figure 1a is a diagram illustrating an example of rear plan view of an open container 20 that includes a plate 24. The container 20 in Figure 1a is intended for use as a non-aseptic container for beverages such as coffee, water, soda, and other similar beverages. The container 20 includes a body 22, a lid 28, and a plate 24 between the lid 28 and the body 22. The plate 24, along with the body hinge 56 and plate hinge 26 serve to facilitate the transition of the container 20 from a fully open operating state to a fully closed operating state. A non-aseptic cup container 20 can be implemented in both disposable and non-disposable embodiments. A disposable embodiment of the container 20 in Figure 1a can be comprised primarily of paperboard. Score lines, cuts, rolls, and other attributes can be implemented into the container 20. Adhesives and coatings of non-paperboard materials can also be used to reinforce the structure of the container 20. In many embodiments, such materials are applied exclusively to the exterior surfaces of the container 20 so that the beverage in

the container 20 does not come into contact with those materials. As illustrated in Figure 1a, the container 20 also includes two flaps 54, one on each side of the plate 24. Non-aseptic embodiments of the container 20 that are substantially cylindrical in shape (such as a cup) may benefit from having curved side score lines 55 between the plate 24 and flaps 54, and a curved body hinge 56.

The non-aseptic container 20 illustrated in Figure 1a can be implemented in both disposable and non-disposable embodiments. Whether or not a particular embodiment is disposable will be primarily impacted by the material composition of the container 20. Different embodiments of the container 20 can include many elements not illustrated in Figure 1a that are discussed below and illustrated in subsequent figures.

B. Aseptic Cup

Figure 1b is a diagram illustrating an example of a rear plan view of an open container 20 that does not include a plate 24.

The container 20 can be implemented to function as an aseptic container 20 for beverage products. Common examples of beverages requiring aseptic containers 20 are milk and juice. Many disposable aseptic containers in the prior art as well as the aseptic container 20 of Figure 1b is configured to be filled before it is aseptically sealed. Thus, the container 20 of Figure 1b is not necessarily intended to be opened and closed repeatedly as the container 20 of Figure 1a is configured to function. As a result, the container 20 of Figure 1b need not include a plate 24 or a plate hinge 26. The other noticeable difference between Figure 1a and Figure 1b is that Figure 1b discloses a flange 59 to aseptically seal the contents of the container 20. In some embodiments, the flange 59 will include score lines that bisect the edge of the flange. In other embodiments, there the flange 59 can include differently oriented score lines or no score lines whatsoever. The functionality of the flange 59 can be assisted by incrementally reducing the amount of material in the flange 59 as edge of the flange is approached.

Although not visible from the drawings, the aseptic container 20 of Figure 1b requires different materials than the non-aseptic container 20 of Figure 1a. Aseptic containers 20 will be comprised of combinations of paperboard, aluminum foil, metalized film, ethylene acrylic acid, low-density polyethylene, nylon, polystyrene, polyvinylidine chloride, ethylene vinyl alcohol, and/or other suitable materials. The method of manufacturing an aseptic container 20 will also differ from the method

used to manufacture a non-aseptic container 20. Aseptic containers 20 involve sterilization steps as various points in the process.

The container 20 illustrated in Figure 1b is intended primarily for disposable use. However, depending on the materials use, the container 20 can be implemented to support reusable use. Such embodiments will need to use a sealing mechanism different than the flange 59 illustrated in Figure 1b. Different embodiments of the container 20 can include many elements not illustrated in Figure 1b that are discussed below and illustrated in subsequent figures.

C. Other Container Embodiments

Figure 1c is a diagram illustrating an example of a rear plan view of a rectangular container 20 that includes a plate 24.

The container 20 is not limited to beverage products or even to products which are intended to be ingested or imbibed by human beings or other forms of living beings. Different embodiments of the container 20 can involve vastly different shapes, sizes, and materials. As illustrated in Figure 1c, such containers 20 have lid 28 attached to a plate 24 that is attached to a body 22. The parameters of the plate 24 are outlined by the body hinge 56 and the plate hinge 26.

II. CONTAINER ATTRIBUTES

A container 20 can be defined with respect to a variety of different attributes. Some of those attributes are discussed below.

A. Contents

Different embodiments of the container 20 can be used for the storage, transportation, and/or use of a wide variety of different products. A container 20 can be used to store a wide range of different food products and beverages, paper money and coins, office supplies, electronics components, tools, chemical products, cleaning detergents, fabric softeners, animals, and virtually anything else for the purposes of containment, storage, and/or transportation. Virtually any type or combination of solid, liquid, or even in certain circumstances, gas product can benefit from the use of a container 20. Some types of contents must be removed from a container to be accessible to the user of the contained item while in other instances such as with many liquid products, the container 20 is the means by which a user controls the contents of the container 20.

The configuration of a particular container 20 will depend on the intended contents of that container 20. For example, some embodiments of the container 20

can be configured for the purposes of storing beverages, food products, medicinal products, or other items intended to be ingested by a human being or other living being. A container 20 for ingested items will have different operating requirements than a container 20 for non-ingested items. Some containers 20 may need to store hot liquids such as coffee while other embodiments may need to store cold solids such as ice cream as well as cold liquids such as melted ice cream. In some instances, the contents of a container 20 must be kept dry while in other embodiments the contents of the container 20 are damp or even inherently wet.

B. Shape

Different embodiments of the container 20 can have widely different shapes. A variety of different factors can individually or in combination with other factors impact the shape of the container 20. Examples of potential factors can include but are not limited to the contents of the container 20, ease of use, material composition of the container 20, operating requirements of the container 20, cost concerns, durability requirements, transportation issues (including the ability to be effectively stacked), and manufacturing constraints.

For example, in the context of a cup, the container 20 is likely to be cylindrical in shape or at least substantially cylindrical in shape as is illustrated in Figures 1a and 1b. This is due primarily to user expectations and ease of use. In many other contents, a rectangular box shape as illustrated in Figure 1c is the most desirable shape. As illustrated in Figures 1a and 1b, many embodiments of cup containers 20 will be substantially cylindrical in shape rather than cylindrical in shape because the bottom portion of the container 20 will be slightly smaller than the upper portions of the container 20. This is to facilitate the ability to stack such containers 20 while they are in open and unfilled states.

As discussed below, the shape of the container 20 can also be impacted by the operating state of the container 20. For example, many embodiments of the container 20 will have a circular or substantially circular horizontal cross-sectional shape when the container 20 is an a fully open position, i.e. when the lid 28 is fully upright as illustrated in Figures 1a, 1b, and 1c. The shape of such a container 20 when in a closed or partially closed state can become less circular and more elliptical in shape. The change in shape results from the motion of the lid 28, the plate 24, and portions of the body 22 in the opening and closing of the container 20.

C. Lifespan

The container 20 can be implemented in ways that are consistent with ongoing non-disposable use, but many embodiments of the container 20 will be configured for disposable embodiments. The desired lifespan of a container 20 can also be influenced by the intended lifespan of the contents of the container 20 and the typical context of when a container 20 is loaded with its contents. For example, the cup in Figure 1a is intended for use in an environment where the cup is filled by the user of the cup (or a service provider serving the user). This is the typical context for soft drinks, coffee, tea, and other drinks. By contrast, the cup in Figure 1b is an aseptic container 20 that is filled and sealed prior to being distributed for consumption by users.

The innovative aspects of the container 20 may be most beneficial in the context of disposable containers 20 because disposable containers 20 raise the most significant environmental concerns due to the sheer number of such containers 20. For example, the number of disposable cups used and discarded each day is truly staggering. The high volume of such containers 20 coupled with the disposable nature of disposable containers also serves to make them extremely cost sensitive components in an efficient supply chain.

D. Material Composition

Different embodiments of the container 20 can be comprised of a wide variety of different materials. The container 20 was originally designed for use in the context of paper or paperboard disposable cups. However, different materials can be used For example, in the context of a container 20 serving as a cup the cup could be comprised of paper, paperboard, stainless steel, metal, ceramics, plastics, or other types of materials. Different types of coatings such as polymer coatings, high barrier polymer coatings (including but not limited to high carrier silver coatings), polyethylene coatings (including but not limited to polyethylene terephthalate coatings), biopolymer coatings (including but not limited to polylactide polymers), biodegradable polyester, and other types of coatings can be used with respect to the container 20. Any of the materials discussed above with respect to aseptic containers 20 can also be used to reinforce the structure of a container 20 that is not aseptically sealed.

In many disposable embodiments of the container 20, the container 20 will be primarily comprised of paperboard or some similar material, but particular portions of the container 20 may be reinforced with one or more coatings.

Different material compositions for containers 20 can influence the different ways in which the different aspects of the containers 20 are shaped. For example, embossing (raising the material), debossing (recessing the material), stamping, folding, and cutting can be used to machine a container 20 comprised of paper, paperboard, or other materials. Such structural attributes can be critical to the functionality of the container 20, but such attributes can also be very much constrained by the manufacturing constraints involved in implementing certain design features.

Many disposable containers in the prior art involve plastic lids. Such lids are not typically biodegradable and they require significant quantities of oil for their production. Such lids are used once, often for mere hours or even minutes, and then spend decades in landfills or as floating debris in the ocean. The container 20 can be implemented in such a way as to be just as reliable as prior art containers, while being less expensive and less environmentally damaging at the same time.

E. Components and Component Configurations

In many embodiments of the container 20, all or substantially all of the components of the container 20 are integral with the container 20 and are not designed to be removable from the container 20. What distinguishes the boundaries of different components in such embodiments can include: geometric shapes and dimensions; relative positions within the container 20; function; relative movement capabilities; and embosses, debosses, score lines, and other types of folds, grooves, cuts, serrations, etc, (collectively "score lines").

The container 20 can be implemented in a wide variety of different component configurations. The container 20 includes a body 22, a lid 28, and a body hinge 56. All other components of the container 20 are optional.

In many embodiments of the container, the body 22 and the lid 22 are intended to be permanently integrated with each other (i.e. integral with each other). In other embodiments, the user 20 may have the option of either temporarily or permanently removing the lid 22.

Many embodiments of the container 20 (see Figures 1a and 1c) will also include a plate 24 that serves as an interface between the lid 28 and the body 22.

Similarly, many of embodiments of the container 20 (see Figures 1a and 1b) will include flaps 54 located near the base of the lid 28 that assist the user to seal the lid 28 in a closed position. Embodiments of the container 20 that are configured to be filled and sealed prior to being provided to users (such as aseptic containers 20 containing products such as juices) can include a flange 59 that is used to seal the container. Although not illustrated in any of the Figures, a container 20 not designed to be filled by users can include both a plate 24 and a flange 59.

F. Operating States

Containers 20 serve to selectively contain and selectively make accessible the contents of the container 20. Different containers 20 will have different operating states, different openings being capable of open or closed, and different components that will involved in transitioning from one operating state to another.

The container 20 has a lid 28 for opening and closing the container 20. Each container 20 will have two or more operating states. The plate 24, flaps 54, tab(s) 30, passageway(s) 32, and potentially other components can individually possess operating states that transition from open to closed or closed to open as the container 20 as a whole transitions from an operating state of a fully opened state to a fully closed state, and vice versa.

Figure 2a is a diagram illustrating an example of an elevated rear view of a container 20 in a fully closed state. The lid 28 is secured within an inner groove 52 in the body 22, the opening 32 is blocked by the tab 30, and the plate 24 and flaps 54 are in fully closed positions.

Figure 2b is a diagram illustrating an example of an elevated rear perspective view of a container 20 in a fully closed state except for an open tab passageway 32. As discussed below, the passageway 32 (which can also be referred to as an opening 32) allows a user to access the contents of the container 22 while the lid 28 is still in a sealed position. In the context of a cup, the passageway 32 can be used to insert a straw, or the user can cause the contents to pour out the passageway 32. In many embodiments, a horizontal cross section of the body 22 in Figure 2b is substantially more elliptical in shape than the illustrating in Figure 2c.

Figure 2c is a diagram illustrating an example of an elevated rear view of a container 20 in a partially open and partially closed state. The lid 28 is no longer secured within the inner groove 52, and the flaps 54 and plate 24 are neither substantially parallel with a bottom surface 40 of the container 20 nor substantially

straight up as when in a fully opened operating state. In many embodiments, a horizontal cross section of the body 22 in Figure 2c is substantially more elliptical in shape than the illustrating in Figure 2d.

Figure 2d is a diagram illustrating an example of an elevated rear view of a container 20 in a fully open state, such as the containers in Figures 1a, 1b, and 1c. In many embodiments, a horizontal cross section of the body 22 in Figure 2d is substantially circular in shape or at least substantially more circular in shape in comparison to the container in Figure 2b or even Figure 2c.

Operating states are discussed in greater detail below. Different examples of operating states are illustrated in the changes from Figures 2a-2d. Figures 8a-8c discloses similar states from a different view. Figures 8a-8c are discussed below.

G. Using the Container

Different embodiments of the container 20 can involve a variety of different methods for opening and closing the container 20. Moreover, as identified above and illustrated in Figures 2a through 2d, the container 20 can possess more than two operating states. Different components within the container 20 are capable of having opened, closed, or partially opened/partially closed individual operating states.

There are a variety of different ways to open and close the container 20. Different users may behave differently. For example, some users may tend to press down on the lid 28 to close the container 20 while other users may tend to press down on the plate 24. Similar variations may be practiced in terms of opening the container 20.

1. Opening the Container

Figure 3a is a flow chart diagram illustrating an example of a method for opening a container 20. At 200, the edge 51 of the lid 28 is dislodged from the inner groove 52 of the body 22. The process at 200 is analogous to the differences between Figure 2b and Figure 2c discussed above. At 200, the process unseals the container 20 and permits the various components to move as they are configured to move.

At 202, the plate 24 and flaps 54 flex. The process at 202 is illustrated by the differences between Figure 2b and 2d.

At 204, the lid 28 is lifted into a straight up position as illustrated in Figures 1a, 1b, 1c, and 2d.

The loading or filling to the container 20 could occur while in potentially any of the states identified above.

The closing/sealing process ends after the closing of the opening 32.

2. Closing the Container

Figure3b is a flow chart diagram illustrating an example of a method for closing a container 20. The process of Figure 3b can be characterized as the process of Figure 3a, except in reverse.

At 206, the plate 24 and flaps 54 are flexed while the lid 28 remains substantially upright.

At 208, the lid 28 is pressed downward.

At 210, the edge 51 of the lid 28 is secured within the inner groove 52 of the body 22.

Different users may close the container 20 applying pressure in different ways. For example, users could press down on the lid 28 or the plate 24 to initiate the closing process.

H. Manufacturing the Container

Different embodiments of the container 20 can utilize different manufacturing processes and different combinations of tooling. In some instances, a single design of a container 20 can be manufactured in a variety of different ways. With respect to embodiments of the container 20 comprised exclusively or primarily with some type of paper or paperboard, the process of manufacturing the container 20 involves creating blanks, flat two dimensional cutouts that are subsequently shaped and treated to ultimately form the container 20. Certain score lines, coatings, and other processing may be performed on a blank, while other processing can be performed after one or more blanks have been combined and shaped.

1. Two Blank Configuration

Figure 4a is a flow chart diagram illustrating an example of a method for manufacturing a container 20 from two blanks. Figure 5a is a diagram illustrating an example a top blank 100 and Figure 5b is a diagram illustrating an example of bottom blank 102.

Returning to Figure 4a, at 212, a bottom blank 100 and a top blank 102 are created.

At 214, the bottom blank 100 is fused together with the top blank 102 as the container 20 is shaped into a cup.

The manufacturing process is described in greater detail below. In many embodiments, all score lines except for the inner groove 52 and body hinge 56 are

implemented prior to the securing of the top blank 102 to the bottom blank 100. In other embodiments, all score lines can be added as part of the blank preparation process that occurs prior to combining the blanks.

There are advantages to machining the body hinge 56 and inner groove 52 after the blanks have been fused together and shaped. By doing so on the shaped and fused shell, the body hinge 56 can be implemented in the shape of a substantially curved arc rather than a straight line segment. A contrast of Figure 7a with Figure 7b illustrates this difference.

In Figure 7a, the curved body hinge 56 coupled with the inner groove 52 together form a single score line 61 that encircles all or substantially all of a horizontal cross section of the body 22. In Figure 7b, the body hinge 56 is straight, impacting the overall shape of the score line 61.

It is counterintuitive that use of a circular tool to create a circular score line (the combination loop 61 formed by the body hinge 56 and inner groove 52) is desirable, but such a process can be desirable and it can lead to superior results.

As discussed in greater detail below, a substantially circular combination loop 61 as illustrated in Figure 7a (in contrast to the ends of a substantially circular inner groove 52 mating with the ends of a substantially straight body hinge 56 as illustrated in Figure 7b) make the container 20 more circular in shape when the container 20 is in a fully opened state. This has useful features in terms of stackability and durability. However, the fact that such an implementation involves a circular or substantially circular body hinge 56 is a result that is not taught in the prior art, and is counterintuitive to those of ordinary or even superior skill in the applicable art.

By having the inner groove 52 and body hinge 56 machined as a singular circular loop, the flexural strength and crush resistance of the container 20 is enhanced as a result of the top to bottom compression strength. Various processing can be used to enhance the combination loop 61 and further strengthen the overall structure of the container 20.

2. Three Blank Configuration

Although the container 20 can be manufactured using a two blank configuration as described above, there are advantages to using a three blank configuration in which the loop 61 is machined into the container 20 after a lid blank 104 and a sidewall blank 106 are fused together, and then shaped around the bottom blank 100.

As described above, the three blank configuration of Figure 4b can also involve machining the primary score line 61 comprising the body hinge 56 and the primary groove 52 after the container 20 has been shaped into a substantially cylindrical shape. In other embodiments, all score lines can be machined into the blanks prior to the process of fusing them together.

Figure 5c is a diagram illustrating an example of a lid blank 104 used in the process illustrated by Figure 4b. Figure 5d is a diagram illustrating an example of a sidewall blank 106 used in the process illustrated by Figure 4b. Different embodiments of the container 20 can involve different component configurations with many of those differences manifesting themselves in the blanks used to make the containers 20. For example, Figure 5c discloses vertical creases 25 to reinforce the lid 28 of the container 20. A reinforcement member 23 is used to connect the lid blank 104 with the plate 24 of the sidewall blank 106, strengthening the container 20 as the container 20 is transitioned between open, semi-open/semi-closed, and closed operating states. Figure 5c also illustrates a cover 27 that is different than a tab 30. Other features that may be highly desirable are the curved side flaps 55 and a flap angle 97 of between about 35 degrees and about 70 degrees.

There are several advantages to the 3 blank manufacturing process of Figure 4b over the 2 blank manufacturing process of Figure 4a. The process disclosed in Figure 4b can prevent lid staining and wicking. The lid 28 can be better protected against humidity. Costs and waste is reduced by reducing the amount of scrap paper board that results because a three blank configuration requires fewer sheets of paperboard than a two blank configuration.

Figure 4b is a flow chart diagram illustrating an example of a method for manufacturing a container 20 utilizing 3 blanks.

At 216 a sidewall blank 106 and a lid blank 104 are prepared.

At 218, the sidewall blank 106 and the lid blank 104 are fused together into a fused blank.

At 220, a bottom blank 100 is prepared.

At 222, the fused blank is shaped into a shell around the bottom blank 100.

At 224, the bottom blank 100 is secured within the bottom portion of the shaped shell.

The process of machining the score line 61 that comprises the body hinge 56 and the inner groove 52 can be implemented at potentially any time after the lid blank

104 and the sidewall blank 106 are combined and shaped into the shape of the container 20. The shaping of the fused blank typically happens in conjunction with insertion of the bottom blank 100.

The manufacturing process is described in greater detail below.

I. Ancillary/Supplemental Functionality

Although containers 20 are used primarily with respect to the contents-related (i.e. product-related) functionality, containers 20 can be implemented in ways to serve additional functions.

Containers 20 can provide an excellent opportunity for businesses and other organizations to facilitate communications. In many instances, the container 20 can include text, graphics, and other indicia to communicate brand identity, product information, marketing information, or public service announcements. As miniature electronic components become increasingly easy and inexpensive to incorporate into containers, some containers 20 can be configured to provide audio communications using technology similar to that used to play music when someone opens a greeting card. A container 20 can also be configured to use powered electronics to flash lights or otherwise generate visual indicia. For example, a coffee cup 20 container could be configured to play a song, flash a light, and/or generate some other response upon the opening or closing of the lid. Containers 20 can also utilize connectivity and communication technologies such as RFID technology to track the movement and usage of the container 20.

Such configurations may involve specific compartments within the container 20 for hosting the ancillary/supplemental component. In some embodiments, a multiple body wall structure could include a cap within the wall to contain the particular component. In other embodiment, a specific compartment is shaped in the applicable location within the container 20 for use of the ancillary/supplemental component.

J. Prior Art Constraints

The prior art appears to affirmatively teach away from the innovative attributes of the container 20. Many applications of container technology exhibit relatively few changes in recent years. For example, the common disposable cups of 2011 are not all that different from the disposable cups that were manufactured in 2001, 1991, 1981, or even earlier. There are significant reasons for the lack of innovation in many areas of container design such as disposable cups. Disposable

cups are extremely high volume commodities that are subject to significant cost constraints and relatively high functional reliability requirements. When cost constraints and reliability requirements are coupled with intrinsic manufacturing limitations, it is easy to see why the conventional disposable cup has not changed much over the years. For example, to the extent that some individuals may have sought to design a paper cup with an attached lid not comprised of plastic, such designs were at best too expensive to manufacture or insufficiently reliable for consumer use. At worse, such approaches could actually be impossible to mass produce effectively.

The unfortunate interactions of economic, reliability, and manufacturing constraints have in many respects hampered innovation in disposable container technology. For example, the curved hinge 56 illustrated in Figures 2d, 6b, 6c, 7a, 7d, and 9b is believed to be actively taught away from by the prior art. Similarly, attributes such as the horizontal venting through ventilation gaps 29, a debossed cover 27, curved side score lines 55, the use of a plate 24, the use of a plate 24 in conjunction with flaps 54 and/or a reinforcement member 23 appear to run counter to the teachings of the prior art.

K. Alternative Embodiments

In accordance with the provisions of the patent statutes, the principles and modes of operation of the container have been explained and illustrated in a variety of embodiments and configurations. However, it must be understood that this inventive container 20 may be practiced otherwise than is specifically explained and illustrated without departing from its spirit or scope.

III. INTRODUCTION OF ELEMENTS AND DEFINITIONS

Figure 2a is a diagram illustrating an example of an elevated rear view of a container 20 in a fully closed state.

The container 20 illustrated in Figure 2a is a cup that can be machined from and/or into a single piece of paper, paperboard, or similar material. Different ways to manufacture the container 20 are described in detail below.

Different embodiments of the container 20 can involve different types of products, different material compositions, and different manufacturing processes. Each embodiment of the container 20 will include a container body (the "body") 22 and a lid 28. Some containers 20 can include more than one body 22 and/or more than one lid 28. The body 22 and lid 28 can be implemented in a wide variety of different

shapes and sizes using different materials and coatings. The container 20 will also include a body hinge 56. All other components in the various Figures are optional and need not be included in all embodiments of the container 20.

Most embodiments of the container 20 will include a plate 24 that is connected to both the lid 28 and to the body 22, with one end of the plate 24 being connected to the lid 28 and the other end of the plate being connected to the body 22. Embodiments that include a plate 24 will typically include a plate hinge 26 and flaps 54.

In some embodiments, the lid 28 and even the plate 24 can be configured to be removable from the container 20, such as through perforated edges to a paperboard or other material that can be removed by hand. In other embodiments, the body 22, lid 28, and plate 24 are integral to each other and are not configured to be intentionally separable from each other.

A. Body

The body 22 of the container 20 typically constitutes the majority of the surface area of the container 22. The body 22 of the container 20 also typically defines the shape, size, and contours of the container 20. For example, in Figure 2d, the container 20 is a cup that is substantially cylindrical in shape. The shape of the container 20 in Figure 2d is the result of a substantially cylindrical body 22. The body 22 of the container 20 may include various score lines for the purposes of reinforcing the structural strength and integrity of the container 20 as well as functions such as sealing the lid 28 in a closed position. As discussed both above and below, the shape of the container 20 can be significantly less cylindrical when the container 20 is a fully closed position. Various figures can be contrasted to visualize this attributes. For example, the containers 20 a stack of containers 20 illustrated in Figure 9b are in a fully open state and thus substantially cylindrical in shape (which facilitates better stacking capabilities) while the overall shape of the containers 20 stacked in Figure 9a are substantially more elliptical in shape. The difference being that the curved hinge 56 in the open position of Figures 9b and 9c is substantially straight when the container 20 is the closed position of Figure 9a.

In contrast to other components of the container 20, the body 22 is designed to be the least impacted by the transition of the container 20 from one state to another. Many portions of the body 22 such as the bottom surface or base 40 of the body 22 are totally unaffected by transitions in operating states. However, the portion of the

body immediately underneath the body hinge 56 can be significantly impacted by the transition of the container from a fully opened to a fully closed state, or vice versa. Figures 7f (the body 22 when the container 22 is in a fully open state) and Figure 7g (the body 22 when the container 22 is in a fully closed state) are discussed below.

The bottom portion of the body 22 typically serves as the base 40 of the container 20 with the lid 28 being placed in a vertical position that is higher than most or even all of the body 22, depending on the particular embodiment of the container 22 and the particular operating state of the lid 28. In Figure 2a, the uppermost portion of a tab 30 (which can extend off of and be part of the lid 28) represents the highest vertical point on the container 20 in a conventional orientation of the container 20 when the container 20 is in a fully closed operating configuration/state. Conversely, the lowest vertical portion of the container 20 illustrated in Figure 2a is a base surface 40 of the body 22 upon which the container 20 sits when placed on a substantially flat surface such as a table. The relative vertical directions of up and down, as well as the perspective of relative horizontal attributes versus relative vertical attributes are discussed from the perspective of a container 20 supported by the base 40 on a substantially flat surface.

In many embodiments of the container 20, the body 22 will be comprised primarily of paper or paperboard. Different embodiments of the container 20 may require additional linings, additional material, or entirely different material. For example, polyethylene can be used to reinforce certain portions of the body 22 or can be used to comprise the entire body 22. Moreover, in an aseptic embodiment of the container 20, the list of materials for use in the body 22 can include but are not limited to paperboard, aluminum foil, metalized film, ethylene acrylic acid, low-density polyethylene, liner low-density polyethylene, nylon, polypropylene, polystyrene, polyvinylidine chloride, and/or ethylene vinyl alcohol.

The body 22 of the container 20 can itself be broken down further into various components and elements. Some elements such as a cavity 46 are inherent to the concept of a container 20 while other elements such as a curled rim 34, a head wall 36 above the inner groove 52, and the plate support score lines 38 are optional.

1. Cavity

A cavity 46 (which can also be referred to as a chamber 46) is the empty space within the body 22 of the container 20 that is used to store the product. For example,

in the context of a coffee cup container 20, the cavity 46 is the space within the body 22 that houses the coffee.

The cavity 46 is illustrated in Figure 6a. Dotted lines are used to illustrate the contours of the cavity 46 because the wall 42 of the body 22 blocks the cavity 46 from view. The cavity 46 includes a bottom boundary which can be referred to as an internal floor surface 48 (which can also be referred to a cavity bottom 48) and interior walls 44.

In many embodiments of the container 20, the cavity 46 will be shaped in a substantially identical manner to the outer appearance of the body 22. However, in alternative embodiments, different shapes and configurations can be implemented, particularly if the container 20 requires structural reinforcements to maintain the integrity of the body 22. In such instances, reinforcing structures may be placed within the body 22, altering its interior shape, i.e. the shape of the cavity 46. Different shapes may also be utilized if some of the ancillary/supplemental components discussed above implemented for a particular embodiment of the container 20.

Some embodiments of the container 20 can include multiple cavities 46 for separating two or more products within the container 20. Such embodiments can include internal structures to mix the contents if desired, or to keep them permanently separate. For example a container 20 could be configured to hold 2 different and separate drinks, with the cavity 46 being split into two separate holding areas. Other containers 20 involving foodstuffs or contents having nothing to do with beverages or food can also involve partitioned cavities 46.

2. Walls

The cavity 46 of the body 22 is shaped by the material surrounding the cavity 46 which can be referred to as a wall 42. In the context of a cylindrically shaped cavity 46, the wall 42 will be cylindrically shaped. Some embodiments of the container 20 can be implemented with a single-layer wall architecture. Other embodiments may involve a framework involving two, three or more layers. For example, in some embodiments, a three layered approach involving two layers of material surrounding a layer of air can be used to comprise the walls 42. Some attributes of the wall(s) 42 will be dependent upon manufacturing concerns. For example, in shaping a substantially cylindrical container 20 from a substantially flat blank or combination of blanks, an adhesive can be used to secure the shape of the cup. Temperature, pressure, folding, embossing, debossing, and other processes can

also be used in shaping and securing the wall(s) 42. Such processes will impact the attributes of the wall(s) 42.

In the context of containers 20 used for beverage or food products, the container 20 can be manufactured such that no adhesive is used on a portion of an interior surface 44 of a wall 42. This prevents such an adhesive from coming into contact with the contents of the container 20, which can be desirable in terms of complying with Food and Drug Administration ("FDA") regulations.

In aseptic embodiments of the container 20, the walls 42 will not be comprised primarily of paperboard. If paperboard is used, it will be used in conjunction with substantial portions of other materials.

3. Rim

As illustrated in Figure 2a, a rim 34 (which can also be referred to as a top curl 34) can represent the highest vertical position of the body 22. The rim 34 is typically a reinforced exterior surface at the top of the body 22. Some embodiments of the container 20 will not include a rim 34, but the rim 34 is often useful for strengthening and reinforcing the structural integrity of the container 20. Rims 34 can also aid users in the use of the container 20. For example, in the context of a cup container 20 used to hold a beverage, the rim 34 can assist a drinker in avoiding a spill as well as making the coffee cup container more comfortable to use. The rim 34 can also insulate the drinker from a beverage that is particular hot or particular cold. For example, a rim 34 with a serrated edge may serve to cool a hot beverage as the user drinks from the container 20. The rim 34 can also include a pinched end secured with a pinch lock.

As illustrated in Figure 2a, the rim 34 can comprised in the shape of a tube or a close geometric proximity to a full curl. In many embodiments of the container 20, the rim 34 is substantially in the shape of a hollow cylinder. In some embodiments, the rim 34 may have the shape of a partial cylinder with less than 360 degrees of surface

In the illustration of Figure 2a, the rim 34 is on top of a portion 36 of the body 22 that is vertically higher than the lid 28 when the lid 28 is in a fully closed configuration/state (i.e. when the lid 28 is secured within an internal groove 52). The top portion 36 of the body 22 often includes a variety of score lines, which can be vertical, horizontal, or a combination thereof. The portion 36 of the body 22 that is

vertically above the internal groove 52 can also be referred to as the head-wall 36 of the body 22. The rim 34 resides on top of the head-wall 36.

In some embodiments of the container 20, the rim 34 will cover the entire portion of the body 22 that is not covered by the plate 24 or a flap 54. In other embodiments of the container 20, coverage of the rim 34 is not comprehensive, allowing in certain embodiments, the portion 36 of the body 22 closest to the flaps 54 to be folded inwardly to reinforce the functionality provided by the flaps 54. To maximize the flexibility of the plate 24 and or flaps 54, it is often desirable for at least a couple of millimeters of the top portion 36 to not be covered by the rim 34.

In many embodiments of the container 20 that involve a cylindrical or substantially cylindrical body 22, the rim 34 forms an arc 41 between approximately 299 degrees and approximately 180 degrees. In alternative embodiments, the arc 41 could reach approximately 270 degrees or form significantly less than a 180 degree semi-circle. In Figure 6b, the arc 41 is approximately 270 degrees. In Figure 6c, the arc 41is approximately 180 degrees. Any variation between those two values can be implemented in various embodiments of the container 20. In many embodiments, it is desirable for the arc 41 to be between about 200 degrees and 240 degrees.

4. Head-wall

The head-wall 36 (which can also be referred to as a headwall 36 or head wall 36) underneath the rim 34 can provide Insulation and a barrio for safety, making the container 20 easier to use, particularly with respect to embodiments involving liquid beverages.

5. Exterior Surfaces

The walls 42 of the body 22 are made up of both exterior surfaces and interior surfaces. An exterior surface is a surface of the wall 42/body 22 that faces outward from the container 20. An interior surface 44 is a surface of the wall 42/body 22 that faces inward towards the body 22, typically the cavity 46 or in some embodiments, another interior surface that compartmentalizes the cavity 46. Figure 6a illustrates internal surfaces. The other figures focus on external surfaces.

In Figure 2a, one exterior surface 42 of the body 22 is the portion of the body 22 that is substantially cylindrical in shape that runs from a bottom to the top of the body 22. A corresponding interior surface 44 that is illustrated with a dotted line because it is not visible from the exterior of the container 20 is also cylindrical in shape and runs from a bottom to the top of the container 20.

The head-wall 36 of the body 22 that extends upwards from the closed lid 38 includes both an exterior surface as well as an interior surface. The rim 34 rests on the vertical protrusion 36.

The bottom portion of the body 22 includes both interior surfaces 48 (facing upwards towards the cavity 46) and exterior surfaces 40 (facing downwards towards the surface on which the container 20 rests). The bottommost exterior surface of the body 22 is referred to as a base 40. The bottommost interior surface of the body 22 (which can also be thought of as the bottommost exterior "surface" of the cavity 46) is referred to as a floor 48. The floor 48 of the cavity is illustrated with a dotted line in Figure 6a because the cavity 46 is not visible from the outside of the container 20. A wide variety of different designs can be incorporated into the base 40 of the container 20. The shape of the container 20 will typically impact the desirable shape and configuration of the base 40.

6. Score Lines

A score line is a fold or crease in the material of the container 20. Score lines can be implemented through the application of pressure, heat, or combinations of both. As illustrated in Figure 2a, the body 22 of the container 20 can include a variety of different score lines to reinforce the strength of the body 22 or for other purposes. Other parts of the container 20 such as the plate 24, the flaps 54, or the lid 28 can also include score lines for structural reinforcement purposes as well as for the purpose of facilitating the movement of the lid 28 between open and closed operating states.

In the context of the body 22, the purpose of a score line is typically to constrain movement or deformation. Score lines can be oriented vertically (see element 38) or horizontally (see element 56). Different embodiments of the container 20 can include fewer score lines or more score lines than the illustration in Figure 2a.

Score lines can fully encircle a cross section of the container 20 or be only partial in scope. For example, a substantially horizontal score line 61 could run across the entire circumference of a cylindrical body 22. In contrast, a partial horizontal score line may be limited to running under only through the portions of the body 22 that are directly under the plate 24, the plate 24 and flaps 54, the rim 34, or some other component or element. A horizontal score line 56 separating the body 22 from the plate 24 and flaps 54 can also be referred to a body hinge 56. It is often helpful to include horizontal score lines on the body 22 of the container 20 that are parallel to the score line serving as body hinge 56 between the plate 24 and the body 22 because

the connector 56 between the plate 24 and the body 22 is often important in supporting the ability of the plate 24 to support the movement of the lid 28.

Vertical score lines can similarly be full (running from top to bottom) or merely partial. As illustrated in Figure 1a, vertical score lines 38 (which can also be referred to as plate support score lines 38) in the body 22 can run extend upwards to the plate 38 to reinforce the structural integrity of the plate 24 and the ability of the plate 24 to assist in securing the lid 28 in a closed position. Some embodiments of the container 20 may include full vertical score lines spaced evenly throughout portion of the body 22 covered by the rim 34. For example, vertical score lines could be placed below the rim 34 every "X" number of millimeters to enhance the structural strength of the container 20. Horizontal score lines could also be distributed throughout the body 22 to reinforce the structure of the body. However, one particular horizontal score line 61 is particularly important. As illustrated in Figures 7a and 7b, the primary score line 61 can comprise the body hinge 56 and the inner groove 52. The body hinge 56 can have a significant impact on the functionality of the container 20 as well as the shape of the container 20.

a. Body Hinge

The horizontal score line 61 can include the body hinge 56 or in other words, the body hinge 56 can be part of a greater horizontal score line 61. The body hinge 56 can divide the body 22 of the container 20 from the plate 24 and flaps 54 of the container 20. The body hinge 56 it is attached to the body 22 of the container 20 and it serves as a hinge to facilitate the opening and closing of the lid 28. The body hinge 56 is one of the few components that is illustrated in Figures 1a, 1b, and 1c. In an embodiment of the container 20 that does not have a plate 24, the body hinge 56 connects the lid 28 to the body 22.

The body hinge 56 works in conjunction with the plate hinge 26 to facilitate the opening and closing of the lid 28. The body hinge 56 and the inner groove score line 52 can fully encircle a cross-section of the container 20 or in other embodiments, substantially encircle a cross-section of the container 20.

As discussed below, the inner groove score line 52 is typically circular in shape or substantially circular in shape in the context of a container 20 that is substantially cylindrical in shape. As illustrated in Figure 7b, the shape of the body hinge 56 can be in the shape of a substantially straight line segment connecting to a substantially curved inner groove score line 52. As is illustrated in Figure 7c, the

shape of the body hinge 56 can be that of a substantially curved/circular arc connecting a substantially curved/circular inner grove score line 52. In many embodiments of the container 20, the body hinge 56 is substantially circular in shape when the container 20 is in a fully open position and substantially straight in shape when the container 20 is in a fully closed position. In other embodiments, even an open state of the container 20 will involve a body hinge 56 that is substantially less circular.

The shape of the body hinge 56 will often depend on the manufacturing process. If the body hinge 56 is machined into the blank prior to the fusing of the blanks together, the body hinge 56 will be substantially straighter than it otherwise would be. If in contrast, the primary score line 61 is machined after the blanks have been fused together and shaped, the body hinge 56 can be substantially circular when the container 20 is in a fully open state.

In many embodiments, the body hinge 56 is a score line. However, in alternative embodiments of the container 20, different types of processing (i.e. not necessary score lines) can be implemented into the container 20 to provide for the functionality of the body hinge 56 or other types of hinges.

b. Inner Groove Score Line

Some embodiments of the container 20 can include horizontal score line 52 (the "inner groove score line" 52) that connects with the body hinge 56 to form a score line 61 that substantially circles or even fully encircles an outer surface cross section of the container 20. See Figures 7a and 7b.

The interior facing surface of the inner groove 52 can be used to help seal with lid in a closed position. This can be true in both aseptic and non-aseptic embodiments of the container 20. However, aseptic containers 20 with the aid of the flange 59 have less need of the inner groove 52. The exterior facing surface of the inner groove 52 serves to sustain the structural integrity of the container 20.

The cavity of the inner grove score line 52 can be referred to as the inner groove 52 or the lid channel seat groove 52. Figure 8c provides an example of the inner groove 52 serving to secure the lid 28 in a closed and sealed state. Figures 8d and 8e illustrate examples of an inner grove 52. In many embodiments of the container 20, an inner groove angle 64 of about 30 degrees is highly desirable. In alternative embodiments, the inner groove angle 53 can range as low as about 20

degrees and as high as about 60 degrees. In many embodiments of the container 20, the inner groove 52 will have a cross section that is substantially convex in shape.

In many embodiments, the inner groove 52 is formed as a score line. However, in alternative embodiments of the container 20, different types of processing (i.e. not necessarily score lines) can be implemented into the container 20 to provide for the functionality of a groove 52 that serves as a mechanism for securing the lid 28. For example a flange 59 could be used instead of the inner groove 52 or in addition to an inner groove 52.

c. Chevrons

A chevron can be embossed or debossed into any portion of the container 20, including the body 22, the plate 24, or the lid 28. Chevrons serve to structurally reinforce the applicable portion of the container 20. No chevrons are illustrated in the body 22 of the container 20 in Figures 2a-2d. Figure 6g illustrates chevrons 59 on the lid 28. Similar chevrons 59 can be placed elsewhere on the container 20 including the body 22 or the plate 24 to facilitate the structural integrity of the container 20.

B. Plate

A plate 24 is a surface area of the container 20 that is configured to support the movement of the lid 28. The plate 24 acts as an interface between a lid 28 that must move in order for the container 20 to be opened or closed and a body 22 that involves far less movement.

Just as the body 22 can have exterior surfaces facing in an outward direction and interior surfaces facing in an inward direction, the plate 24 can include both an outward surface and an inward surface. Similarly, the plate 24 can also include both vertical and horizontal score lines with the boundaries of the plate 24 being typically marked by score lines. A plate 24 can include side score lines 55 and horizontal score lines 56 and 26.

The plate 24 and two flaps 54 that are illustrated in Figure 2a facilitate the ability of users to open and close the lid 28 while facilitating the strength and tightness of the container 20. If the lid 28 cannot be secured in a closed position, then the ability to utilize the container 20 is compromised because an unfastened lid 28 can result in the unintended change of an operating configuration/state from closed to open. For example, in the context of a beverage container 20, a container 20 that cannot be closed and sealed in a watertight manner is of only limited use.

Embodiments of the container 20 that include a plate 24 allow for the lid 28 to be open or closed without altering the structure of the lid 28. By leaving the structure of lid 28 unchanged, the structural integrity of the lid 28 and the ability of a closed lid 28 to seal the contents of the cavity 46 are enhanced. The motion of the lid 28 is facilitated by the plate 24 or the plate 24 in conjunction with the flaps 54. A variety of score lines are typically used to delineate the boundaries of the plate 24 and flaps 54.

Just as the body 22 can be comprised of a wide range of different materials or combinations of those materials, so can the plate 24 be similarly comprised. In some embodiments, differences in materials composition, thickness, and/or other factors relative to the plate 24 and the body 22 can be used to enhance the functionality of the plate 24 in facilitating the movement of the lid 28 into open and closed positions.

As discussed above, different embodiments of the container 20 can utilize different types of score lines at different locations with different attributes

1. Body Hinge

The body hinge 56 connects the plate 24 to the body 22. The body hinge 56 is discussed above. The body hinge 56 in many embodiments of the container 20 represents the lowest part of the container 20 that is designed to move with the opening or closing of the lid 28. As discussed above and below and as is illustrated by contrasting Figure 7f with Figure 7g or Figure 7c with Figure 7d, the movement of the body hinge 56 involves moving the portion of the body 22 beneath the body hinge 56.

2. Plate Hinge

Returning to Figure 2a, a plate hinge 26 connects the plate 24 to the lid 28. The plate hinge 26 is a score line that traverses all or substantially the entire boundary between the plate 24 and the lid 28. It may also divide portions of the flaps 54 (if any) that may be in contact with the lid 28.

The plate hinge 26 and the body hinge 56 can function in conjunction with each other as a dual hinged closing/opening mechanism for the container 20. Examples of plate hinges 26 are illustrated in Figures 1a, 1c, 2a-2d, and 6d. Figure 6e illustrates an example of a plate hinge 26 that includes a hinge break 45.

3. Side Score Lines

Two side score lines 55 serve to connect the plate 24 from two exterior flaps 54 in embodiments of the container 20 that include the two flaps 54. As illustrated in

Figures 5c and 5d, the side score lines 55 can be curved. Curved side score lines 55 can form a substantially circular arc 41 along with the lid 28. The curved shape of the side score lines 55 can enhance a larger circular arc 41 and preserve a more circular or elliptical shape of the container 20 (if the container 20 is substantially circular or elliptical in shape in the first place) when the container 20 is in a closed position.

4. Flaps

Many embodiments of the container 20 will include two flaps 54, one to each side of the plate 24, to facilitate the sealing of the container 20 in a closed position. The flaps 54 can also assist users in moving the container 20 from one operating state to another. The flaps 54 can also serve to ventilate the cavity 46 of the container 20. A flap 54 is a surface horizontally adjacent to the plate 24, but separate from the plate 24 by a vertical or substantially vertical score line. The boundaries of the flaps 54 are often demarcated by vertical and horizontal score lines. As discussed above, one or more flaps 54 may be used to support and enhance the ability of the plate 24 to function as a hinge for the lid 28. Some embodiments of the flaps 54 can be configured to be further twisted or pushed in by the user to further secure the lid 28 in a closed position. Such twisting or pushing in may render the container 20 undesirable for subsequent opening and refilling.

An embodiment of the container 20 that uses a plate 24 need not include any flaps 54, but a combination of one plate 24 with one flap 54 on each side is often desirable. Some embodiments of aseptic containers 20 (see Figures 1b and 6j) will include flaps 54 but no plate 24.

As illustrated in Figure 5d, a flap angle 97 (the angle formed by the side score line 55 and a bottom score line 57) is often between about 35 degrees and about 70 degrees.

5. Flap Bottom Score Lines

Some embodiments of the container 20 will include a flap bottom score line 57 that connects the bottom portion of the flap 54 to a portion of the body 22 that is vertically higher than the body hinge 56 and the inner groove score line 52.

In some embodiments of the container 20, the bottom flap score line 57, the body hinge 56, and the inner grove score line 52 intersect with each other as illustrated in Figure 2a. In other embodiments, either the flap bottom score line 57 or the side score lines 55 will not be long enough to intersect. .

6. Skid locks

Some embodiments of the plate 24 can include one or more skid locks 58 to facilitate the ability of users to stack the containers 20 on top of each other even if the lids 28 are closed. Skid locks 58 in conjunction with the rim 34 serve to constrain the lower portion of the container 20 allowing the containers 20 to be vertically stacked onto each other even when the lids 28 are closed. Skid locks 58 can be implemented into the plate 24 using a wide variety of different manufacturing processes.

The ability of skid locks 58 to facilitate the stacking of closed containers 20 is illustrated in Figure 9a.

7. Hinge Break

As illustrated in Figures 6f and 6i, some embodiments of the plate 24 may include a hinge break 45. The hinge break 45 can facilitate the transition functionality of the plate hinge 26. The hinge break 45 can also provide an opening in which the tab 30 can be pressed into when the tab 30 is in a fully opened position. For example, instead of the tab 30 point upwards in Figure 2b, the tab 30 could be pushed into the opening resulting from the hinge break 45. It can provide a way to secure the tab 30 in a position that will prevent the tab 30 from interfering with the use of the container 20 while the container 20 is being used. For example, in an embodiment of the container 20 used for the purposes of storing and drinking beverages, the tab 30 can be secured in the hinge break 45 when the user is drinking from the container 20.

In Figures 6f and 6i, the hinge break 45 is a semi-circle cut out from the plate hinge 26. Many embodiments of the plate 24 will include differently shaped hinge breaks 45, differently positioned hinge breaks 45, or no hinge break 45 whatsoever.

8. Reinforcement Member

Some embodiments of the container 20 that include a plate 24 may also include a reinforcement member 23 that connects the lid 28 to the plate 24 and assists in the opening and closing of the lid 28. As illustrated in Figures 5c and 5d, the reinforcement member 23 can be part of the lid blank 104 that is mated, fixed, or fastened to the interior surface of plate 24 on the sidewall blank 106.

9. Ventilation Gaps

Some embodiments of the container that include a reinforcement member 23 may also include one or more ventilation gaps 29. Such gaps 29 facilitate the ventilation of the container 20. Ventilation of the container 20 can be particularly important in the context of containers 20 used to hold beverages. The ventilation

provided by the ventilation gaps 29 is in a horizontal direction when the lid 28 of the container 20 is closed.

10. Additional Score Lines and Chevrons

As discussed above, the purpose of the plate 24 is to insulate the body 22 from the magnitude of movement required to open and close the lid 28. A variety of additional score lines and/or chevrons can be used to further support the underlying functionality of the plate 24 and the flaps 54. Score lines, vertical creases, and chevrons can also be used to facilitate the ability of users to properly seal the lid 28 in a closed position by making it easier for users of the container 20 to properly manipulate the container 20.

The plate 24 and its subsidiary components act to insulate the body 22 of the container 20 relative to the significant motion by the lid 28 while at the same time facilitating the ability of the lid 28 to move in a manner that is required to open, close, and seal the container 20. The plate 24 also serves to make the opening, closing, and sealing of the lid as easy as possible for users to achieve while providing users with the features of reliability and reusability. Different embodiments of body hinges 56, lid hinges 26, flaps 54, and other plate 24 subsidiary components can be incorporated into the container 20.

C. Lid

A lid 28 is the means by which a container 20 is closed and in some cases, sealed (such as the case with watertight or substantially watertight containers). In some embodiments, a grove 52 in the body 22 helps secure the lid 28 when it is moved to a closed/sealed position. In other embodiments, a flange 59 is used. In some embodiments, both a flange 59 and an inner groove 52 shaped for the purposes of sealing the lid 28 are used.

Although the position of the lid 28 determines whether the container 20 is in a closed state/configuration or an open state/configuration, the change in the position of the lid 32 is not achieved through any structure change to the lid 32. To the contrary, it is the plate 24 (sometimes in conjunction with the flaps 54) that serve as the hinge upon which the lid 28 can be moved. In the example of Figure 2a, the lid 28 moves by being rotated around the plate hinge 26 and the body hinge 56.

In many embodiments of the container 20, the lid 28 is substantially circular in shape and need not be very thick. In many embodiments of the container 20, the lid 28 is substantially parallel to the surface on which the container 20 rests when the lid is in a closed operating configuration/state. For example, in a typical beverage cup embodiment of the container 20, the lid 28 is a closed position in substantially parallel to the to the ground surface on which the base 40 of the container 20 can rest.

The lid 28 can be in an open position, a closed position, or in some instances, a partially open/partially closed position. In many embodiments of the container 20, the lid 28 is integral to the plate 24, and the plate 24 is integral to the body 22. The lid 28 can be comprised of the same material as the plate 24 and body 22. Examples of lids 28 illustrated in Figures 1a-1c, 2a-2d, 6g-6j, and 7e. Figure 5c also illustrates examples of lid-related attributes such as tabs 30 that are not covers 27, covers 27 that are not tabs 30, openings 32, vertical creases 25, debossed covers 27, and a connection to a reinforcement member 23 to assist in the opening and closing of the lid 28.

In some embodiments, the lid 28 is thicker than other portions of the container. In other embodiments, the edge 51 of the lid 28 may be thicker than other portions of the lid 28. In still other embodiments, the thickness of the lid 38 is equal to the thickness of the walls 42 of the container 20.

The ability to machine to a separate lid blank 104 makes it easier to include a lid 38 that is thicker than other portions of the container 20.

1. Edge

Different embodiments of the lid 28 can include a potentially wide variety of different subcomponents. However, one common function of the lid 28 is the ability to close the container 20 and secure contents within the container 20. One attribute of the lid 28 that can facilitate the ability of the lid 28 to secure a closed position is the edge 51 of the lid 28. The edge 51 can also be referred to as a lid edge 51. In many cup embodiments of the container 20, the lid 28 is secured within an inner groove 52 of the container 20. The geometric configuration of the edge 51 and the inner groove 52 can enhance the functionality of the lid 28. For example, in some embodiments, the edge 51 of the lid 28 includes one of a wide variety of wave rule shapes. The geometry of the inner groove 52 can similarly be configured to enhance the functionality of the lid 28. Figure 8d illustrates an example of lid groove geometry. In many embodiments, the inner groove 52 will have a convex shape, and an angle 64

of about 30 degrees. In different embodiments, different shapes and different angles 64 can be incorporated into the inner groove 52.

In many embodiments of the container 20, it may be useful to treat the edge 51 of the lid 28 with a material stronger than the material comprising the lid 28 generally or even the container 20 generally. For example, in the example of a cup comprised primarily of paperboard, it may be desirable to treat the edge 51 with polyethylene. In other embodiments, the entire lid 28 could be treated with polyethylene or some other material.

2. Tab

Some embodiments of the lid 28 can include a tab 30 which serves as a handle for opening and closing the lid 28. Different embodiments of the tab 30 can include a different number of score lines. In many embodiments, the number of score lines in the tab 30 will depend on whether the tab 30 is used to seal an opening 32 (see Figure 2b) in the lid 28. As illustrated in Figure 2a, the tab 30 includes a score line 48 at the base of the tab 30 as well as a score line at the segment 50 of the tab 30 that transitions from a primarily horizontal orientation to a primarily vertical orientation. This allows the tab 30 to facilitate the sealing and closing of the opening 32 (which can also be referred to as an opening 32) as well as the opening and closing of the lid 28. In many beverage embodiments of the container 20, an additional third tab score line 60 (see Figure 7e) can be used to facilitate the ability of the user to push the tab 30 down into the opening 32 (also referred to as a passageway 32) so that the tab 30 does not interfere with the comfort of the user in drinking the beverage in the container 20. In other embodiments, the tab 30 can be secured in the hinge break 45.

Returning to Figure 2a, the tab 30 is fastened to the lid 28 at a tab base 48. The location of the tab base 48 can depend on whether or not the lid 28 includes an opening 32. If the lid 28 does include an opening 32, then the tab base 48 is typically the innermost edge of the opening 32. If the lid 28 does not include an opening 32, then the tab base 48 is typically located close to the outermost edge of the top surface of the lid 28.

The container 20 illustrated in Figure 2a includes both a tab 30 and an opening 32. The shape of the tab 30 can vary widely, but the tip of the tab 30 should serve to facilitate movement by the user and the shape of the lower portion of the tab 30 will typically depend on the shape of the opening 32.

The tab 30 can be located in a wide variety of different locations on the lid 28. In Figure 5c, the tab 30 is positioned closed to the edge 51 of the lid, midway between the opening 32 and the plate hinge 26. In many embodiments, the tab 30 will be oriented approximately 90 degrees differently than the illustration in Figure 5c, to allow the tab 30 to sit flush unto the lid 28 when containers 20 are nested together.

3. Opening/Passageway

Some embodiment of the lid 28 will include a passageway 32 to selectively expose the contents of the container 20. The passageway 32 can also be referred to as an opening 32 or a movable lid partition 32. The passageway 32 can be open, closed, and sealed without otherwise moving the lid 28. For example, in the context of a beverage container, the passageway 32 can allow the user to drink the contents of the container 20 (through use of a straw or by simply tipping the container in close proximity to an open mouth) while the lid 28 remains in a closed position. The passageway 32 can be closed/sealed using the tab 30. The passageway 32 in Figure 2a is illustrated with a dotted line because the passageway 32 is not visible. The passageway 32 in Figure 2a is filled up and sealed by the tab 30. The bottom portion of the tab 30 in Figure 2a from the tab base 48 to the fold 50 is substantially parallel to the bottom surface of the container 20 and the top portion of the tab 30 from the fold 50 upwards protrudes straight upwards in the air where it can be most easily grasped.

The shape of the opening 32 and of the portion of the tab 30 used to plug the passageway 32, can vary widely from embodiment to embodiment. Some embodiments of the container 20 can include more than one passageway 32. For example, some embodiments of a beverage container 20 could include two or more openings 32 for the insertion of straws.

Additional illustrations of the movement of the tab 30 and the opening 32 covered by the tab 30, can be seen in Figure 2b and Figure 7e.

Figure 5c shows a debossed cover 27 over an opening 32. The configuration illustrated in Figure 5c may be particularly desirable in the context of containers 20 used in conjunction with warm beverages, such as hot chocolate, tea, coffee, etc.

4. Chevrons

As illustrated in Figure 6g, the lid 28 can also include chevrons 49. Chevrons 49 in the lid can serve a variety of purposes that relate to assisting users in closing and opening the lid 28. For example, as illustrated in Figure 6g, chevrons 49 can assist

users in centering the application of force to the lid 28 in closing the lid 28. Chevrons 49 can also serve to increase the stiffness of the lid 28 as it is being pushed or pulled by a user.

The lid 28 of the container 20 can be comprised of a wide variety of different materials or combinations of materials, as discussed with regards to the body 22 and the plate 24.

5. Lid Stiffener Score Lines

As illustrated in Figure 6h, one or more lid stiffener score lines 63 can be used to reinforce the lid 28 immediately to the interior of the edge 51. This can assist the sealing process, and make the lid 28 more durable (i.e. properly function after many openings and closings).

6. Hinge Break

Figure 6i is the mirror image of Figure 6f, with the hinge break being in the form a semi circle. As discussed above, the hinge break 45 is an optional component but it can perform a variety of functions.

7. Vertical Creases

Figure 5c illustrates an example of vertical creases 25 in the lid 28 that serve the structurally strengthen the lid 28, particularly through the process of being opened or closed.

D. Additional Elements/Components

Different embodiments of the container 20 can include a wide variety of additional elements/components. As discussed above, different score line configurations can be incorporated into the container 20. In some embodiments, a tear back adhesive can be place on the lid 28 to facilitate the pulling open of the lid 28. The structure and shape of the lid channel seat groove 52 can be modified to provide extra reinforcement analogous to that of a girdle. For example, additional structural components could be added to prevent the lid 28 from moving beyond a particular closed position. Components such as chevrons 49 can be placed at various locations of the container 20 to enhance structural strength at those locations. As illustrated in Figures 1b and 6j, the lid 28 may not always be attached to a plate 24 or a plate hinge 26, but components such as a flange 59 can be added to assist the functionality of sealing the container 20.

In some embodiments, an additional vertical body seam running up from the bottom of the body 22 to the outermost portion of the lid 28 and the location of the tab

30 could be used to further strengthen the container 20. In some embodiments, the vertical body seam can include a lateral tab to facilitate the opening and closing of the container 20.

For embodiments involving the storage of food, the flaps 54 can include a cold seal adhesive that is water based. Pressure from the fingers of the users can then form a bond that will enhance the ability of the container 20 to satisfy specification 276.170 FDA compliance as it pertains to direct food contact with respect to aqueous and fatty foods.

IV. OPERATING CONFIGURATIONS/STATES/POSITIONS

Depending on the product that a container 20 is designed to secure, the container 20 can be configured in a variety of different states or positions. For example, in the context of a beverage container 20, the container 20 can be in a fully closed and sealed position to minimize the ability of the beverage to escape from the container. An example of the fully closed and sealed configuration is illustrated in Figure 2a, where the lid 28 is closed and the opening 32 is also sealed by the tab 30 which can include a variety of score lines designed to facilitate the ability of the tab 30 to fill the opening 32.

Figure 2b illustrates an example of a lid 28 that is fully closed, but an opening 32 that is not blocked by the tab 30, permitting the beverage to be consumed, but otherwise limiting the ability of the beverage to be spilled. As illustrated in the Figure, the tab 30 is straightened out into a vertical or substantially vertical position as the opening 32 is unsealed. As discussed below with respect to Figure 7e, some embodiments of the tab 30 will include an additional score line 60 designed to facilitate the pushing of the tab 30 into the opening 32 so that the tab 30 does not interfere with the drinking of the beverage through the opening 32. In other embodiments, a hinge break 45 is used to secure the tab 30. The transition from Figure 2a to Figure 2b can occur solely with the movement of the tab 30.

Figure 2c illustrates an example of a lid 28 that is partially open. Although the position of the plate 24 in Figure 2c is identical to the position of the plate 28 in Figure 2b and Figure 2a because the plate 24 is fixed, the lid 28 is nonetheless not in a closed position. In many contexts, the filling or refilling of the beverage container 20 is performed while the container 20 is in the configuration of Figure 2c. In some contexts, a user may drink from the container 20 while in the state illustrated in Figure

2c. The transition from Figure 2b to Figure 2c involves movement of the lid 28 but not the movement of the plate 24.

Figure 2d illustrates an example of a container 20 in a state of maximum openness. The illustrated configuration can be highly desirable for the purposes of stacking empty containers 20 on top of each other. The illustrated configuration can also be desirable in the filling or refilling of the container 20, and in some instances, such as trying to clear out a cup of the remaining portions of a milk shake, for consuming the contents of the container 20. The transition from Figure 2c to Figure 2d involves primarily the moving of the plate 24 from its substantially horizontal position to its substantially vertical position.

Figures 8a, 8b, and 8c also illustrate different operating states from different points of view.

Different embodiments of the container 20 can include a wide variety of different positions, states, and operating configurations.

V. SHAPE CHANGE

As discussed above, the transition from one operating state to another operating state can impact the shape of the container 20 by impacting the shape of the body 22 underneath the body hinge 56. When the body hinge 56 is moved forward to transition the container away from a fully opened state towards a fully closed state, the shape of the body 22 of the container in the aggregate is impacted. The magnitude and nature of the shape change can be impacted by the geometry and configuration of the components used in the particular embodiment of the container 20.

Figure 7a is a geometric diagram illustrating an example of a substantially circular primary score line 61 comprised of a substantially circular inner groove 52 and a substantially circular body hinge 52. In many embodiments of the container 20, this is the shape of the body 22 when the container 20 is in a fully open position. The shape is also illustrated in Figures 2d (in contrast to Figure 2a), 7c (in contrast to Figure 7d), 7f (in contrast to 7g), and 8b and 9c (in contrast to Figure 9a).

Figure 7b is a geometric diagram illustrating an example of a substantially circular primary score line 61 comprised of a substantially circular inner groove 52 and a substantially straight body hinge 56. In some embodiments where the primary score line 61 is initially imprinted on a blank instead of being added on after the fused blank is shaped around the bottom blank 102, even in an open state, the shape of container 20 will be directionally closer to Figure 7b. However, with respect to

embodiments involving a primary score line 61 added after the fused blank is shaped, Figures 2a, 7d, 7e, 7g, and 9a illustrate a container 20 that is substantially elliptical in shape because the plate hinge 56 is less curved than when in a fully open state.

Figure 7c is a bottom plan view diagram illustrating an example of a container 20 with the primary score line 61 illustrated in Figure 7a when the container 20 is in a fully open state.

Figure 7d is a bottom plan view illustrating an example of a container 20 with the primary score line 61 illustrated in Figure 7b in a fully closed state.

In addition to the use of a curved body hinge 56, the use of curved side score lines 55 can also have a substantial impact on the geometry of the container 20, particularly in conjunction with the use of a reinforcement member 23 and a larger arc 41.

VI. STACKING

Figures 9a, 9b, and 9c illustrate examples of how similar containers 20 can be stacked.

Figure 9a discloses a stack 90 of closed containers 20. Skid locks 58 on the plate 24 are used to facilitate the stacking of the containers 20. Different numbers, locations, and configurations of skid locks 58 can be used to facilitate the functionality of container 20 stacking.

Figure 9b discloses a stack 94 of open containers 20 in a perspective view from which the substantially circular shape of the containers 20 is clearly evidence. Figure 9c discloses a similar stack 94 from a different view.

The ability to effectively stack containers 20 can have important implications for how the containers 20 are shaped. For example, the reason why the bottom 40 of a disposable coffee cup has a smaller diameter than the lid 28 is because it is necessary to stack the cups. As discussed above, the timing in the manufacturing process by which the primary score line 61 is machined into the container 20 can have a significant impact on the shape of the container 20. It is more difficult to stack cups when the primary score line 61 is not substantially circular in shape when the cups are in fully open operating states.

VII. METHODS OF USING

Figure 3a discloses an example of a method for opening a container 20 and Figure 3b discloses a mirror image of Figure 3a for closing a container 20.

There are many different alternative embodiments for transitioning the container 20 from a fully opened state and a fully closed state. As discussed above, different embodiments have a different number of tabs 30 located in different positions on the container. Chevrons 49 can be added in certain places to encourage users to press down on certain services rather than others. The geometries of the horizontal score lines and the thickness. Different coatings can be applied to different locations on the exterior surface of the container 20 to encourage different user activities for opening and closing the container 20.

Different containers 20 can involve different components and different steps for the opening and closing of the container 20.

VIII. ADDITIONAL VIEWS

A. Top view

Figure 7e is a diagram illustrating an example of a top view of container 20 that is in a closed and sealed state. In this example of the container 20, the tab 30 includes three score lines (48, 60, and 50) to facilitate the ability of a user to push the tab 30 down into the opening 32 (also referred to as a passageway 32) so that the tab 30 does not enter the users mouth or otherwise interfere with the consumption of the beverage.

The illustration in Figure 7e also includes two skid locks 58 to facilitate the stacking of closed containers 20 as illustrated in Figure 9a.

B. Bottom view

Figure 7c is a diagram illustrating an example of a bottom view of a container 20 with a substantially circular primary score line 61 when the container 20 is in an opened state. Figure 4d is a diagram illustrating another example of a bottom view of a container 20 in which the primary horizontal score line 61 is not substantially circular in shape because the container 20 is either in a closed position and/or the score line 61 was machined into the applicable blank prior to the shaping of the applicable blank around the bottom blank 102. Both Figure 7c and 7d show the base 40.

As illustrated in the Figures, different base 40 configurations can be incorporated into different embodiments of the container 20. The type of material used to comprise the container 20 and the type of contents anticipated to be held in the container 20 can influence the appropriate design of the bottom of the container 20.

C. Side view

Figure 8a is a diagram illustrating an example of a side view of a container 20. The container 20 in Figure 8a is in a similar operating state/configuration as the container 20 in Figure 2d, but from a different perspective. In this position, the portions of the tab 30, lid 28, and plate 28 that are most exterior to the container 20 form a substantially vertical line segment extending upwards from the exterior surface 42 of the body 22.

Although the lid 28 is substantially flat when closed, the curvature of the container 20 does not appear substantially flat as a line segment in a side view of the container 20 when the lid 28 is in a full upright position. Figure 5a illustrates only a small portion of the body hinge 56, but the impact of the curved body hinge 56 does manifest itself in the fact that the lid 28 is not a simply a straight line as is illustrated in Figure 8b.

As illustrated in Figure 8b, as the lid 28 moves more closely to a closed position, the side view of the lid 28 takes on a more two-dimensional appearance. This occurs because the originally curved body hinge 56 becomes straighter as the lid 28 and plate 24 moves forward.

Figure 8c is a diagram illustrating an example of a side view of an interior body surface that includes a lid channel seat groove 52 to secure the lid 28 in a closed position. Different geometric shapes can be incorporated into the groove 52. Additional structures can also be added to preclude the lid 28 from moving beyond an optimal closed position. Figure 8d illustrates a close up view of the inner groove 52, with Figure 8e illustrating an example of the inner groove angle 64, which in many embodiments is about 30 degrees. In other embodiments the angle 64 can range from as low as about 15 degrees to as high as about 65 degrees.

D. Front view

Figure 8f is a diagram illustrating an example of a front view of a container 20 that is in a fully closed operating state.

E. Side Tab View

Figure 8g illustrates the different positions of the tab 30 as the container 20 transitions from closed and sealed (Figure 2a), to closed and unsealed (Figure 2b), open lid/plate secure (Figure 2c), and fully open (Figure 2d).

IX. METHOD OF MAKING

As discussed above, the container 20 can be manufactured in a wide variety of different ways using a wide variety of different tools. The materials used to

manufacture the container 20 will have a significant impact on the manufacturing processes used with respect to the particular container 20. In the context of the disposable containers 20, many embodiments of the container 20 will be comprised primarily of some type of paper or paperboard. Various coatings and adhesives can be used to secure and/or strengthen certain portions of the container 20. For example, the lid 28, the edge 51 of the lid 28, or other parts of a disposable container could be coated with polylactic acid (PLA) or some other type of material. Disposable embodiments of aseptic containers 20 will necessarily include significant materials in substitution of or in addition to paperboard-type material.

A. Blanks

As discussed above with respect to Figures 4a-4b and Figures 5a-5d, containers 20 can be manufactured through the assembly of blanks. Blanks comprise flat pieces of material capable of being further shaped, such a paperboard-type material as well as plastics.

Many embodiments of the container 20 will involve either a 2 blank manufacturing process (See Figure 4a) that comprises a top blank 100 comprising the entire surface of the container 20 except for the bottom blank 102 which comprises the bottom surface 48 and/or base 40 of the container 20.

Other embodiments will involve a 3 blank configuration (See Figure 4b), with a lid blank 104 and a sidewall blank 106 comprising the portions of the container that would be comprised of the top blank 100 in a 2 blank configuration.

In different embodiments of the container, different processes can be performed on the container 20 when it is in the form of blanks, while other processes are performed after the blanks have been fused together and/or shaped at least partially into the form of the container. In many embodiments of the container, the primary score line 61 is not machined into the top blank 100 (2 blank configuration) or onto the sidewall blank 106 (3 blank configuration) until after the applicable blank has already been shaped around the bottom blank 100. By machining the primary score line 61 (which is the substantially horizontal score line which comprises the body hinge 56 and the inner groove 52) after the blanks have been shaped, the primary score line 61 can maintain a substantially circular shape and the overall structural integrity of the container 20 is enhanced. In some embodiments, the primary score line 61 can be machined directly into the applicable blank. In still other

embodiments, multiple elements can be machined into a substantially shaped container 20 rather than the flat blanks.

B. Blank Preparation

Paperboard blanks can be prepared in a variety of different ways that involve either punching or cutting a roll of material such as paperboard or plastic. Blanks can be formed from a roll that is subject to a coating/lamination process to reinforce certain areas of the container 20, a print process for displaying indicia such as words or graphics on the container 20, a slitting process, and then a blanking or punching machine that results in the prepared blanks. Many paperboard embodiments of the container 20 can be machined from either pre-printed, pre-punched blanks, and/or optional pre-printed roll stock

A variety of different machines can be used to actually cut or punch the blanks. Rotary dies, RP rotary dies (which is sometimes referred to as crossover technology), steel-rule die cutting, solid steel blanking dies, and other suitable machines can be used. It is often desirable to avoid using tools that avoid metal to metal contact that provide a clean cut, eliminating the standard crush-type cut. Thus RP rotary dies (which can also be referred to as "Bernal" rotary dies) are often desirable. Use of a shear-type cut can reduce or eliminate chaff, slivers, ragged cuts, and other undesirable outcomes that result from a more punch-type approach.

Many manufacturers prefer solid-steel blanking dies however tools are not well suited in many embodiments of the container 20 for embossing, forming, and creasing/folding elements into the container 20. The quality of the cut and the defects in the printing/blanking web registration can shut down a manufacturing process and render the machining of the container 20 with the use of a solid-steel blanking die impracticable in some but not all embodiments of the container 20.

C. Blank Fusing

Many different machines can be used in the process of fusing the blanks together and shaping the container 20. Roll stands, printers, roll feeders, heating applications, pressure applications, folding applications, and other tools can be used to fuse the blanks together. In a 3 blank embodiment, the lid blank 106 and the sidewall blank 104 are typically fused together before any shaping occurs. The fusing of blanks with the bottom blank 102 typically occurs simultaneously with the shaping of either the top blank 100 or the sidewall blank 106 that has already been fused to the lid blank 104.

D. Forming/Shaping

A variety of different tools and processes can be used in forming/shaping the container 20.

Blank feeders, transfer turrets, shuttle table, hoppers, timing belts, bottom feeders, forming stations, mandrel turrets, bottom reformers, sealers, pre-heaters, heating stations, incurl stations, top curl stations (in some instances 3 top curl stations are used), finishing stations, rimming turrets, folding stations, tamper/lubricating stations, folding plates, clamping bars, shell distributors, rotating nozzles, calibration stamps, vacuum nozzles, and other devices are used to shape either the top blank 100 or the fused blank (comprising the sidewall blank 106 and the lid blank 104) around the bottom blank 100.

Blanks can be precisely positioned and tightly wrapped around the folding mandrel. The design of some cup embodiments of the container 20 allows for the body 22 wrapping with the punched and drawn cup bottom inserted prior to sidewall sealing or optional insertion of the cup bottom after the side wall sealing. Sealing of the side-seam and bottom seam can be completed by utilizing flame, hot air or ultrasonic heating. Sealing parameters related to temperature, pressure and registration are important within the forming process. The container shells (the shaped containers 20) can be designed to facilitate easy transfer between multiple turret stations positioned on the cup forming machine.

E. Post-Shaping Processing

In many embodiments of the container 20, there are processes performed on the container 20 after the container 20 is fully shaped. For example, it is often desirable for the process of top curling the rim 34 (which in some instances can involve 3 iterations of curling stations) and the machining of the primary score line 61 can both be done after the container 20 is fully shaped.

The partially finished container 20 can be transferred to the top curl turret, incorporating multiple stations to form the top curl rim 34, lubrication, pre-curl, finishing curl and calibration.

F. Manufacturing Method – Example #3

Figures 4a and 4b provide two examples of a method for manufacturing a container 20. Figure 10a provides a third example.

At 300, blanks are cut. This typically involves a rotary die or an RP rotary die. The number of configurations of blanks cut per container 20 can vary from embodiment to embodiment.

At 302, a sidewall blank 106 can be top load fed onto a continuous motion conveyer. This can include a rotary pick and place feeding module that is seamlessly integrated with the container 20 forming machine. The sidewall blanks 106 can pass through the rotary pick and place module that includes lid hopper stations where the rotary pick motion can place the lid blank 104 in alignment with the sidewall blank 106.

At 304, the side wall blank 106 is fused to the lid blank 104. This process can include low-density polyethylene heating and pressure technology. For container 20 embodiments involving cups for hot beverages, the inner surface of the sidewall blank 106 can be lined with a thin layer of polyethylene on the top and bottom surfaces. When the sidewall blank 106 and the lid blank 104 are fused together, the aggregate package structure can have greater strength and stability. The use of separate lid blanks 104 and sidewall blanks 106 has several advantages, including: (1) lid 28 staining/wicking; (2) cup stacking after filling; (3) strengthening the lid 28 generally and against humidity specifically; and (4) reduction of waste/scrap because more aggregate containers 20 can be fit into less roll sheets.

At 306, the fused blank is shaped into a shell around the bottom blank 102. This process usually involves both heat and pressure.

At 308, the bottom blank is secured within the bottom portion of the shell (either the shaped top blank 100 or the fused lid blank 104 and sidewall blank 105).

At 310, the primary score line 61 is machined into the container 20. This step can be immediately preceded but is typically followed by the curling of the rim 34. In some embodiments, three top curl stations can be used to curl the rim 34.

Then the process ends.

G. Manufacturing Method – Example #4

Figure 10b is a flow chart diagram illustrating an example of a process that can be used to manufacture the container 20.

At 320, the bottom blank 102 is heated. This can involve the use a mandrel turret to index the bottom blank 102 into a bottom re-former station where the bottom skirt is heated and re-formed into a shape more suitable for wrapping.

At 322, the edges of the top blank 102 or a fused blank (the sidewall blank 106 and the lid blank 104) are heated. This can be accomplished through the use of a transfer turret that indexes the sidewall blank 106 into a sidewall sealer and bottom preheat station where the edges of the blanks 104 and 106 are heated in preparation of the shell forming.

At 324, the top/fused blank is wrapped around the bottom blank 100 forming a shell. This can be accomplished using a transfer turret to index the sidewall blank 106 into the folding station, releasing the blank after the lower clamp clamps the blank against the mandrel. The mandrel turret can index the bottom blank 102 into the folding station. The folding wings can wrap the sidewall blank 106 around the bottom blank 102, forming the cup shell. The mandrel turret can then index the shell to the bottom heat station.

At 326, the bottom area of the shell is heated. This can involve heating the inside skirt of the bottom blank 102 and transporting the shell to the bottom incurl station.

At 328, the bottom blank 102 is heated.

At 330, bottom blank 102 is moved downward in the shell.

At 332, lubricant (typically vegetable oil) is applied to the outside of the shell.

At 334, the bottom edge of the shell is curled over the bottom skirt of the bottom blank 102. This can be done through the use of a bottom incurl station where the bottom edge of the sidewall blank 106 is curled over the bottom skirt of the bottom blank 102.

At 336, the bottom is finished, knurled, and squared. A mandrel turret can index the shell to the bottom finishing station where this process is performed.

At 338, the shell is moved pneumatically. This can be done using a mandrel turret that indexes the shell to the rimming turret, where the shell is pneumatically removed from the mandrel and transferred to the rimming turret.

At 340, the shell is pushed down a pocket 340. The shell is indexed from the rimming turret to the tamper/lubricator station.

At 342, lubricant is applied to the top of the shell.

At 344, the first curl is applied to the top of the shell. In some embodiments, there can be three iterations of curling the rim 34 before the rim 34 is finished.

At 346, the rim 34 is finished.

At 348, the primary score line 61 comprising a body hinge 56 and an inner groove 52 are formed in the container 20.

Then the process ends.

H. Manufacturing Method – Example #5

Figure 10c is a flow chart diagram illustrating an example of a process for manufacturing the container 20.

At 350, the fused blanks (blanks 104 and 106) are fanned. This can involve jacket blanks (segments) that are placed in a blank hopper with the printed side facing down. The segments are fanned using an air blast to prevent sticking

At 352, the fused blank is pre-folded. Pre-folding can be applied to the side of the blank that lies inward after being rolled.

At 354, the fused blank is heated. The seam surface of the fused blank can be heated at the same time in which the pre-folding process at 352 is performed since the two dies of the blank are different.

At 356, the fused blank is subjected to a final folding process. This occurs before the clamping bar closes on the side seam area.

At 358, the bottom blank 102 is positioned with respect to the fused blank. The shell is taken off the folding turret in an upper vertical position. The clamping bar opens and the pusher moves the shell off the folding mandrel. The shell is then moved to the shell distributor.

At 360, the bottom portion of the fused blank is heated and the bottom blank 102 is heated. This occurs after the container 20 bottom is brought together with the shell.

At 362, the bottom shell is incurled and sealed into the shell of the fused blank.

At 364, lubricant is sprayed by a rotating nozzle to aid the top curl processing.

At 366, the upper edge of the container 20 is preformed. This will ultimately become the rim 34.

At 368, the rim 34 is curled. The process can involve multiple curl processes. In some embodiments, there are three top curl stations for curling the rim 34.

At 370 the container 20 is calibrated using a calibration stamp.

At 372, the primary score line 61 is machined into the container 20. As discussed above this involves the inner groove 52 and the body hinge 56. In many

embodiments, the primary score line 61 is circular or substantially circular in shape while the container 20 is in an open position.

Then the process ends.

X. ALTERNATIVE EMBODIMENTS

The container (20) can be implemented in a wide variety of different embodiments, configurations, and contexts. In accordance with the provisions of the patent statutes, the principles and modes of operation of this invention have been explained and illustrated in a variety of embodiments and configurations. However, it must be understood that this invention may be practiced otherwise than is specifically explained and illustrated without departing from its spirit or scope. The container and methods for using the container can be implemented in a wide variety of different components, component configurations, and component compositions.

CLAIMS

In the claims:

1. A container (20), comprising:

a body (22), said body (22) including a substantially horizontal score line (61);

a plate (24);

a body hinge (56) connecting said plate (24) to said body (22), wherein said substantially horizontal score line (61) includes said body hinge (56);

a lid (28), said lid (28) including a lid edge (51);

a plate hinge (26) connecting said lid (28) to said plate (24);

wherein said substantially horizontal score line (61) includes an inner groove (52), and wherein said inner groove (52) provides for securing at least a portion of said lid edge (51) when said lid (28) is in a fully closed position.

2. The container (20) of claim 1, wherein said body hinge (56) is substantially curved when said lid (28) is in a fully open position.

3. The container (20) of claim 1, wherein said substantially horizontal score line (61) substantially surrounds a cross-section of said body (22).

4. The container (20) of claim 1, further comprising a plurality of flaps (54) and a plurality of side score lines (55), wherein said side score lines (55) are substantially vertical when said lid (28) is in a fully open position, said plurality of flaps (54) including a first flap and a second flap, said plurality of side score lines (55) including a first side score line and a second side score line, wherein said first side score (55) line connects said first flap (54) to said plate (26), and wherein said second side score (55) line connects said second flap (54) to said plate (26).

5. The container (20) of claim 4, wherein said plurality of flaps (54) includes a flap angle (97), and wherein said flap angle (97) is between about 35 degrees and about 70 degrees.

6. The container (20) of claim 4, wherein said plurality of side score lines (55) are curved.

7. The container (20) of claim 6, wherein said side score lines (55) form a substantially circular arc (41) with said lid (28) when said lid (28) is in a fully open position.

8. The container (20) of claim 7, wherein said substantially circular arc (41) that is greater than about 200 degrees and less than about 240 degrees.

9. The container (20) of claim 4, further comprising a plurality of bottom score lines (57) connecting said flaps (54) to said body (22).

10. The container (20) of claim 1, wherein said lid edge (51) is a wave rule edge and wherein said inner groove (52) includes a convex groove for securing said lid edge (51).

11. The container (20) of claim 1, wherein said body (22) further includes a head wall (36) and a rim (34) attached to said head wall (36), wherein said rim (34) includes a serrated edge.

12. The container (20) of claim 1, wherein said lid (28) further includes an opening (32), a cover (27), and a tab (30), wherein said cover is not said tab (30), and wherein said cover is positioned above said opening (32) but does not block said opening.

13. The container (20) of claim 1, further comprising a reinforcement member (23), wherein said reinforcement member (23) is a portion of a lid blank 104 fastened under the exterior surface of said plate (24) on a sidewall blank (106).

14. A container (20), said container comprising:

a body (22), said body (22) including a inner groove (52), a head wall (36) above said inner groove (52), and a rim (34) above said head wall (36);

a lid (28), said lid (28) including an opening (32), a cover (27), and a lid edge (51);

a plate (24) connecting said lid (28) to said body (22);

a plurality of flaps (54) connected to said plate (24) and said body (22);

wherein said inner groove (52) provides for securing said lid edge (51) when said lid (28) is in a fully closed position.

15. The container (20) of claim 14, wherein said body (22), said plate (24), said lid (28), and said flaps (54) are comprised of a substantially identical biodegradable material, wherein said container (20) is substantially water tight when said lid (28) is in a fully closed position, wherein said container (20) does not include an interior adhesive, wherein said rim (34) includes a serrated edge, and wherein said lid edge (51) is wave rule edge.

16. The container (20) of claim 14, wherein said inner groove (52) has an inner groove angle (64) of between about 25 degrees and 35 degrees, wherein said plurality of flaps (54) have a flap angle (97) of between about 35 degrees and 70 degrees, and wherein said container (20) is comprised substantially of paperboard.

17. A container (20), comprising:

a body (22), said body (22) including an inner groove (52), a cavity (46), a head wall (36), a rim (34), an inner wall (44) and an outer wall (42) separated by a layer of air, wherein said rim (34) includes a serrated edge;

a lid (28), said lid (28) including a lid edge (51), an opening (32), a tab (30), and a cover (27), wherein said lid edge (51) has a wave rule edge;

a flap (54), said flap (54) including a bottom score line (57), wherein said bottom score line (57) connects said flap (54) to said body (22);

a plate (26), said plate (26) including a body hinge (56), a plate hinge (26), and a side score line (55), wherein said body hinge (56) connects said plate (26) to said body (22), wherein said plate hinge (56) connects said lid (28) to said plate (24), and wherein said side score line (55) connects said flap (54) to said plate (24).

18. The container (20) of claim 17, further comprising a reinforcement member (23) connecting said plate (24) to said lid (28), and wherein said side score line (55) is curved.

19. The container (20) of claim 17, wherein said tab (30) is not said cover (27), and wherein said lid (28) includes at least one of: (a) a plurality of chevrons (59) and (b) a plurality of vertical creases (25).

20. The container (20) of claim 17, further comprising a plurality of ventilation gaps (29) that facilitate ventilation of said cavity (46) when said lid (28) is fully closed.

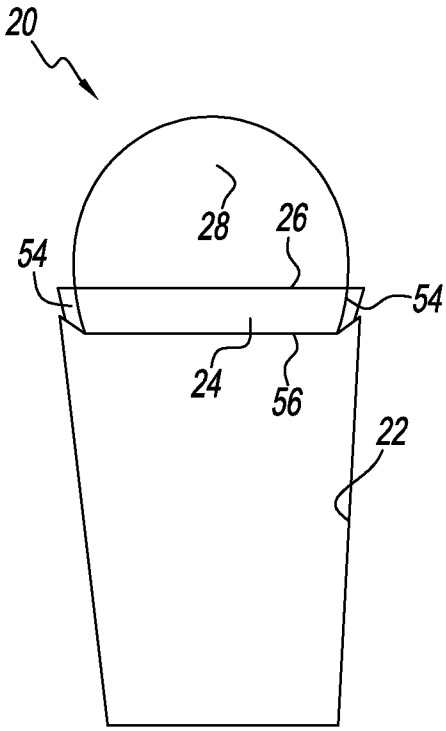

FIG. 1A

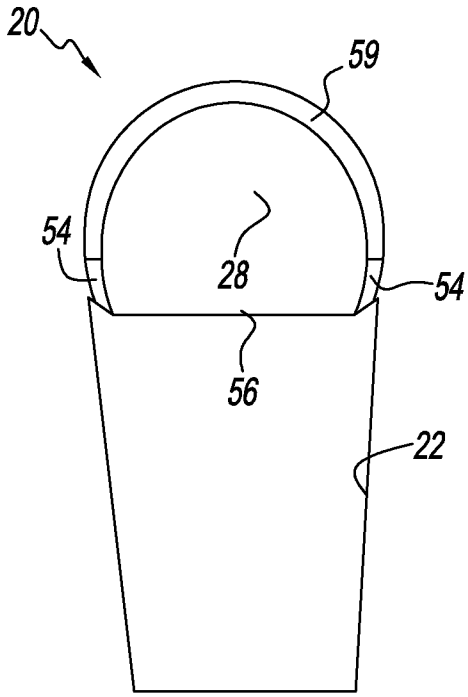

FIG. 1B

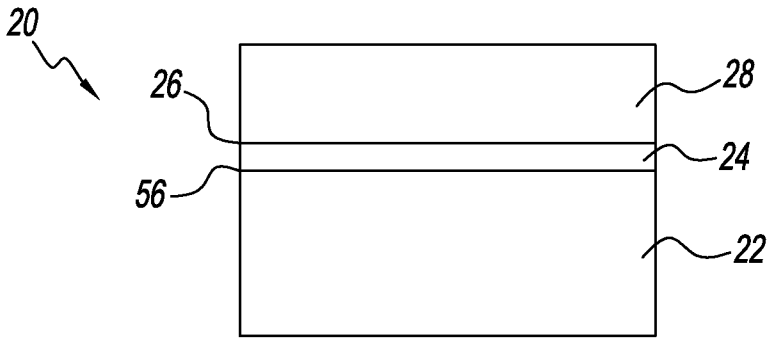

FIG. 1C

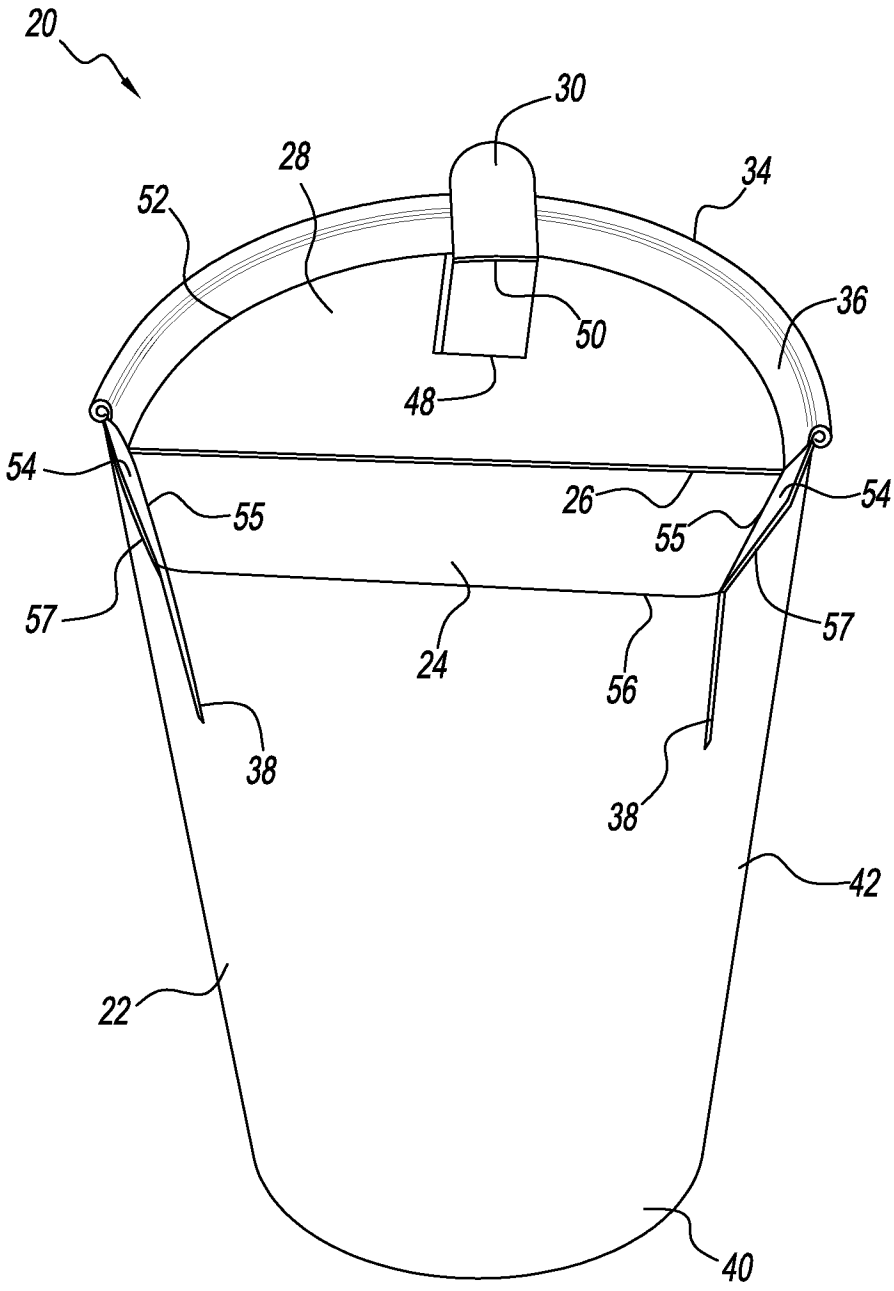

FIG. 2A

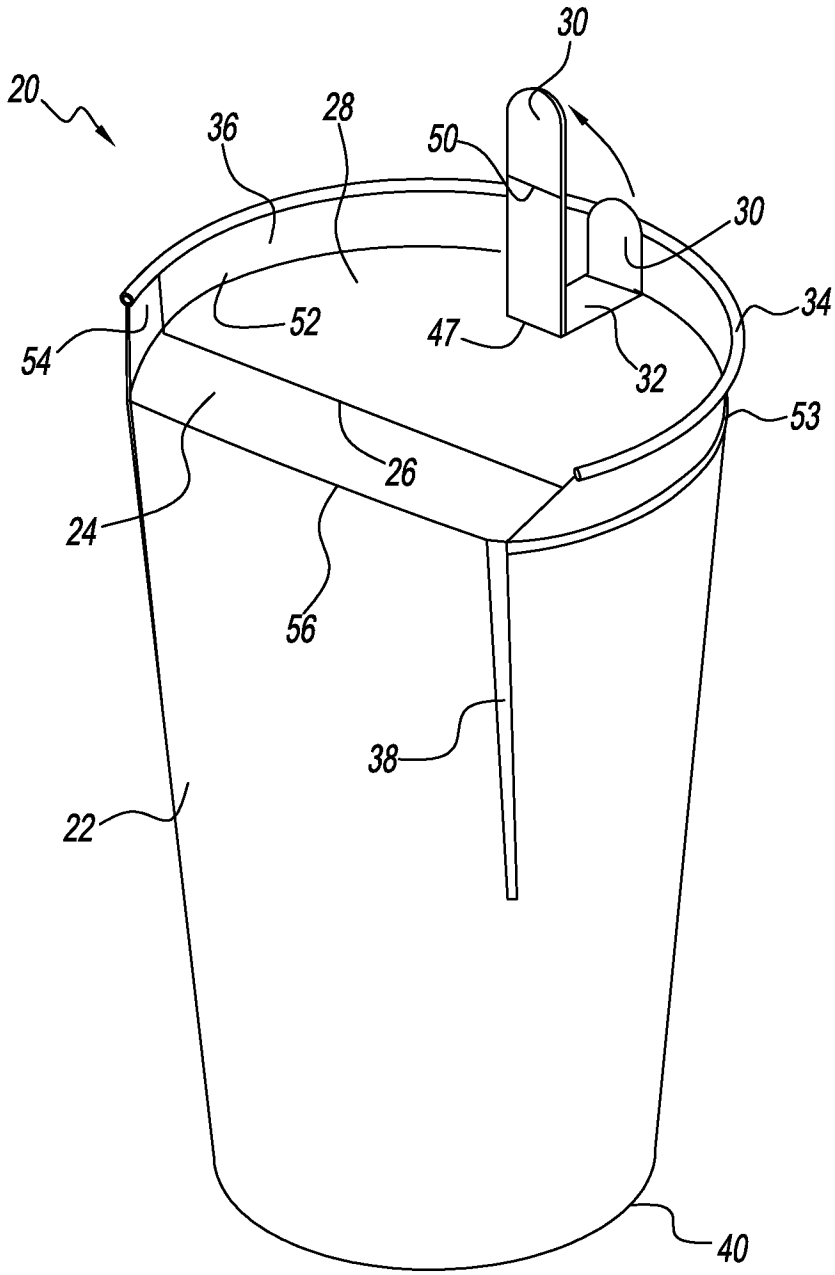

FIG. 2B

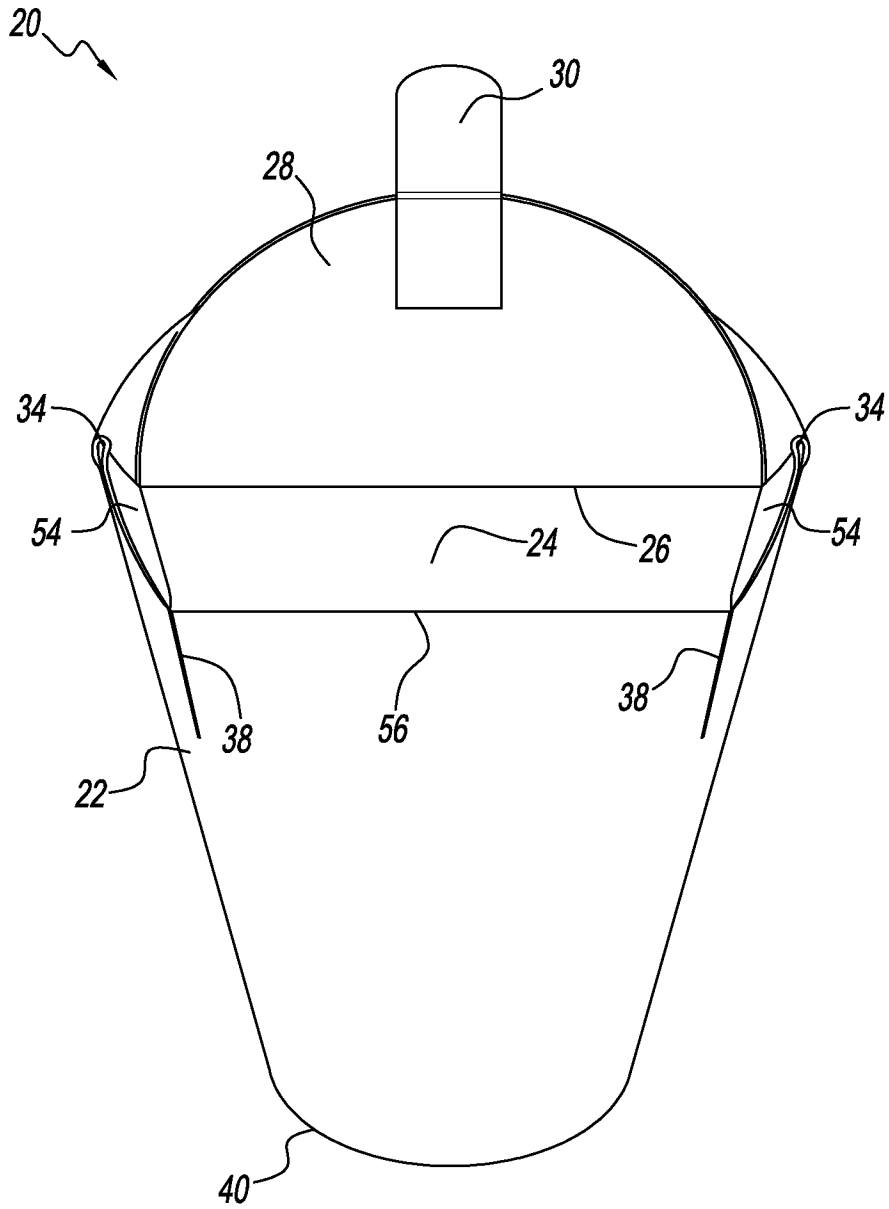

FIG. 2C

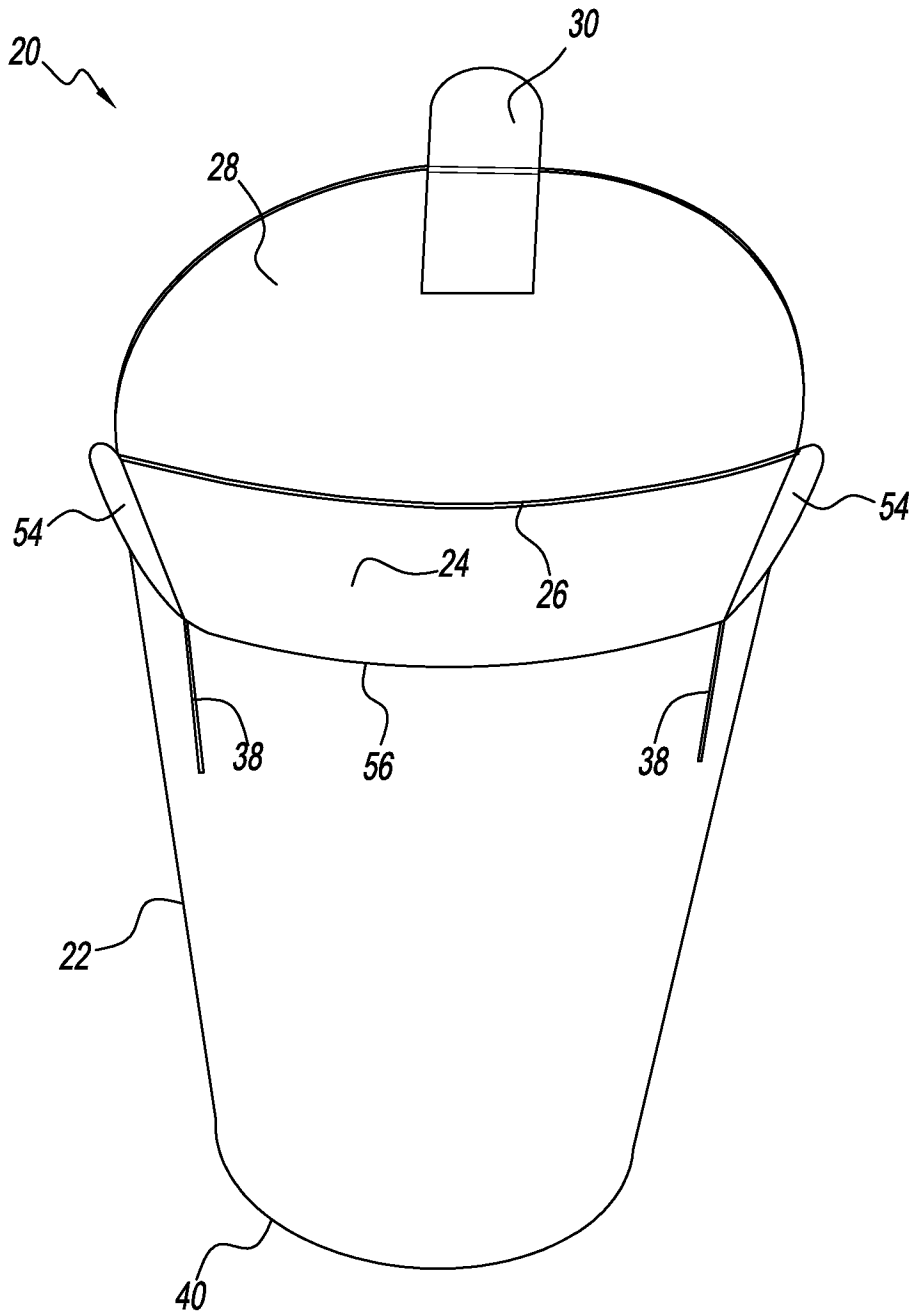

FIG. 2D

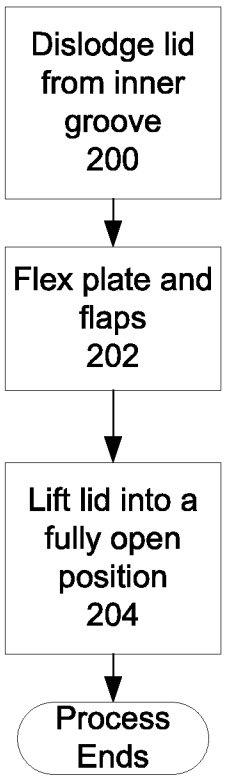

Figure 3a

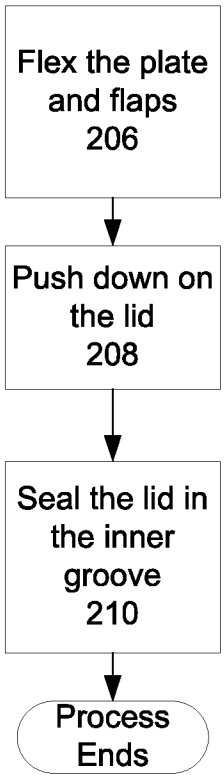

Figure 3b

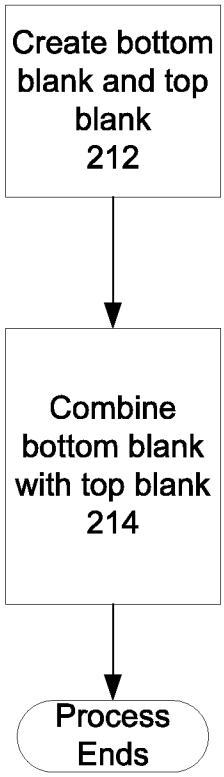

Figure 4a

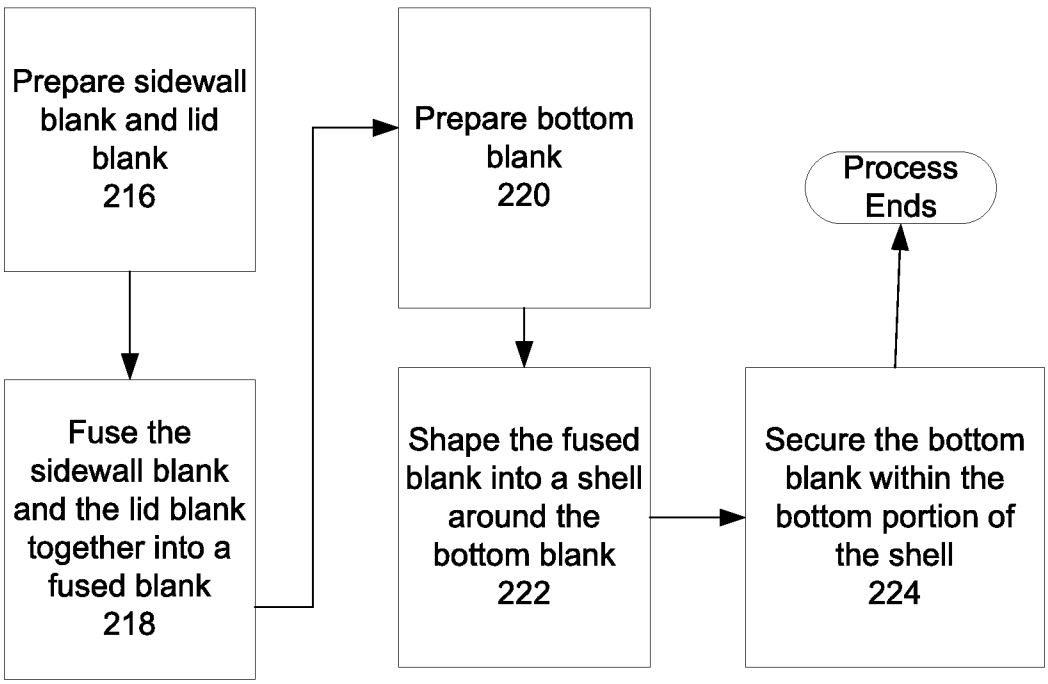

Figure 4b

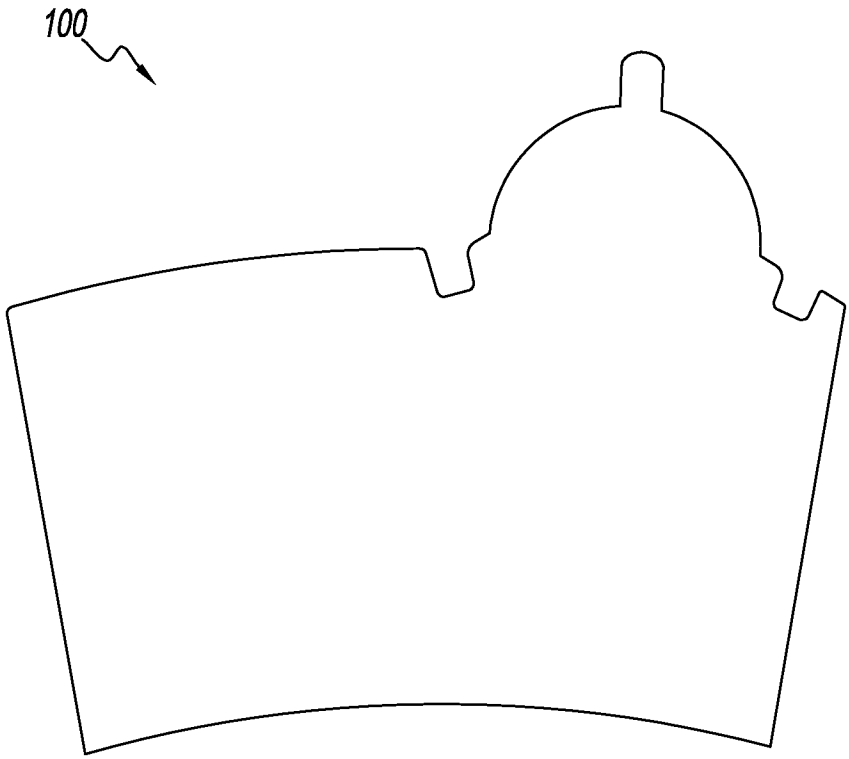

FIG. 5A

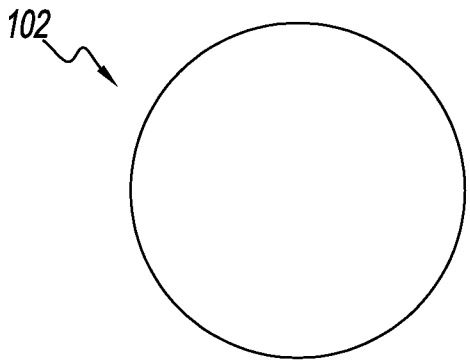

FIG. 5B

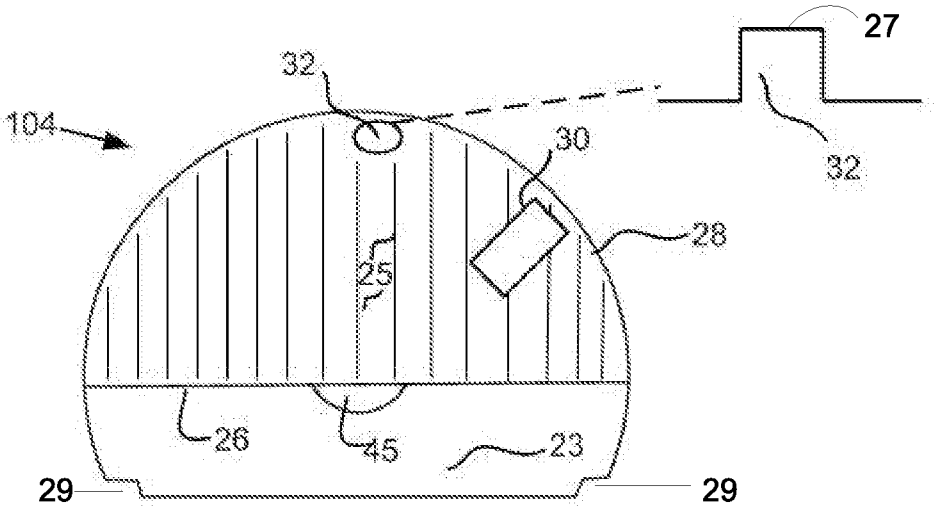

Figure 5C

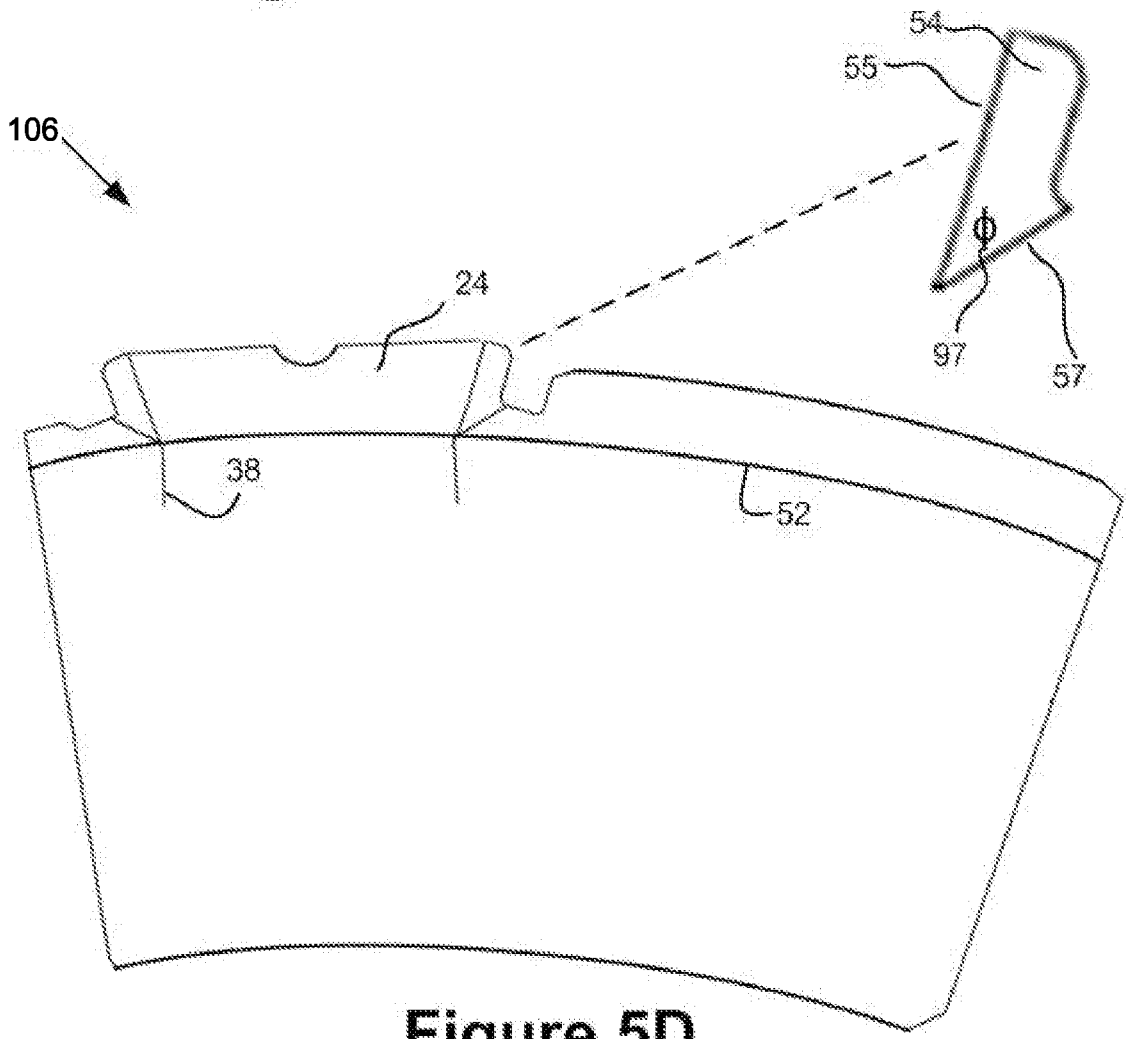

Figure 5D

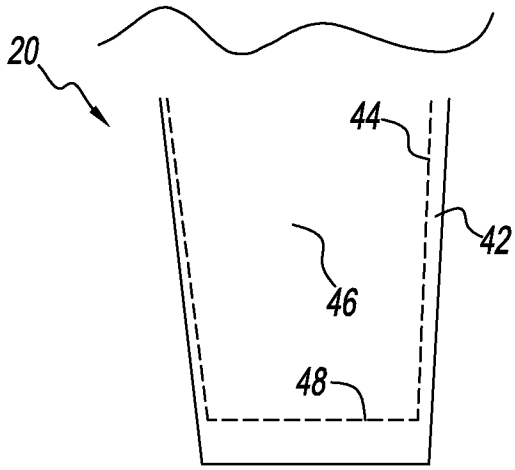

FIG. 6A

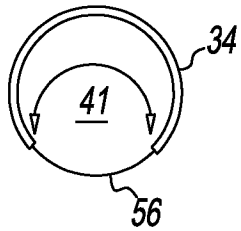

FIG. 6B

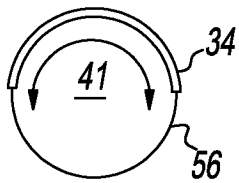

FIG. 6C

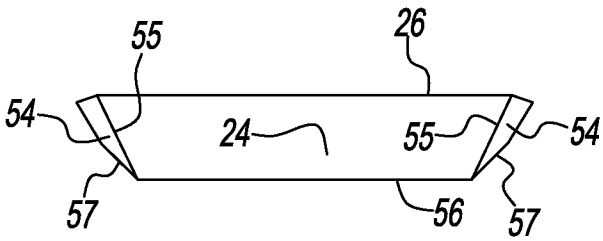

FIG. 6D

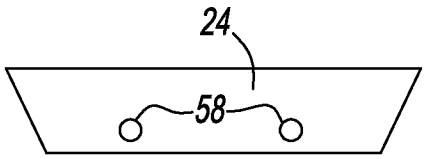

FIG. 6E

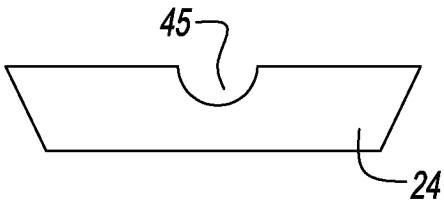

FIG. 6F

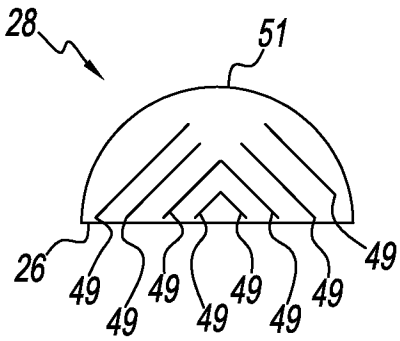

FIG. 6G

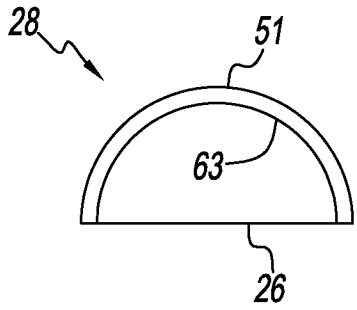

FIG. 6H

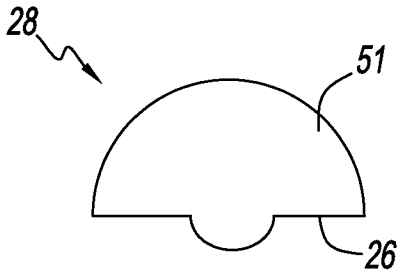

FIG. 6I

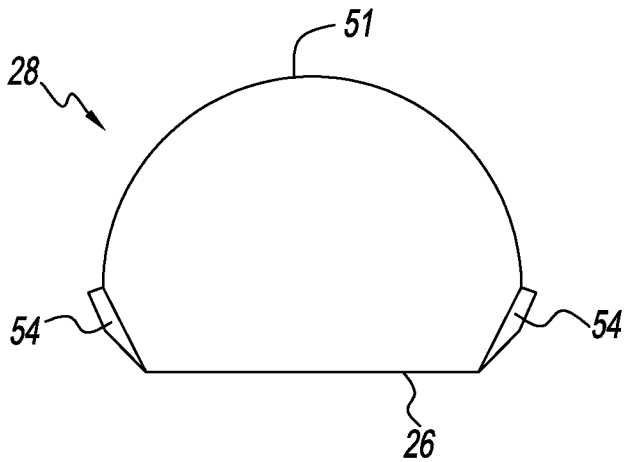

FIG. 6J

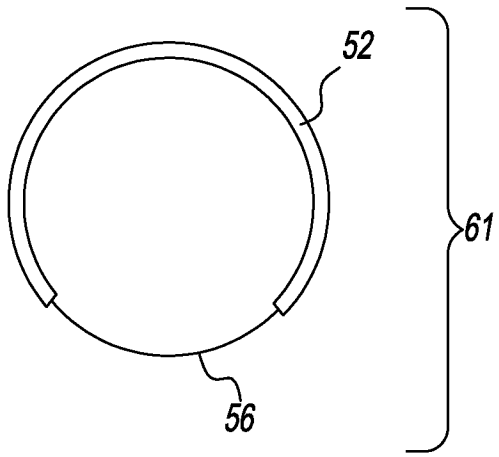

FIG. 7A

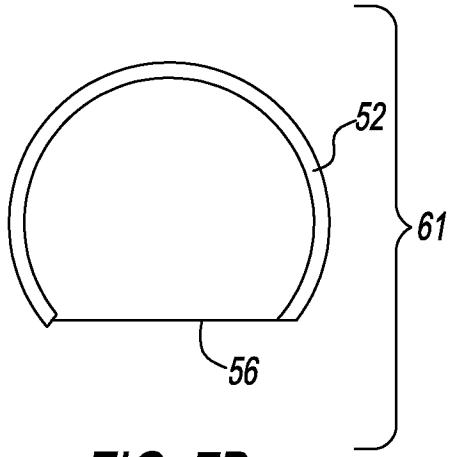

FIG. 7B

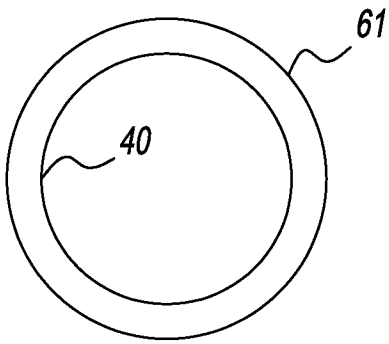

FIG. 7C

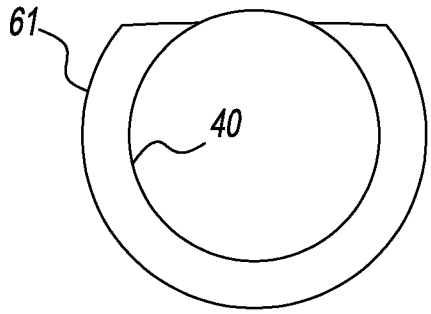

FIG. 7D

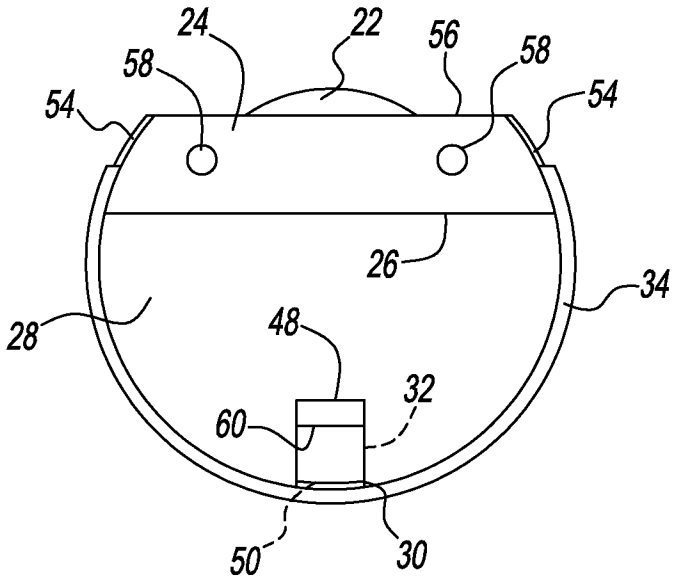

FIG. 7E

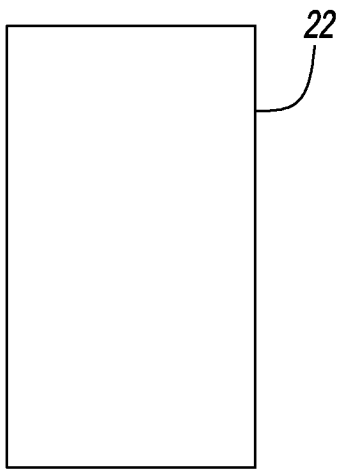

FIG. 7F

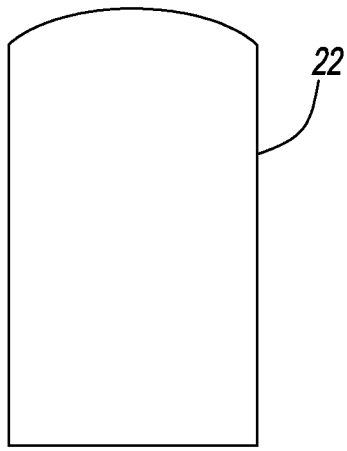

FIG. 7G

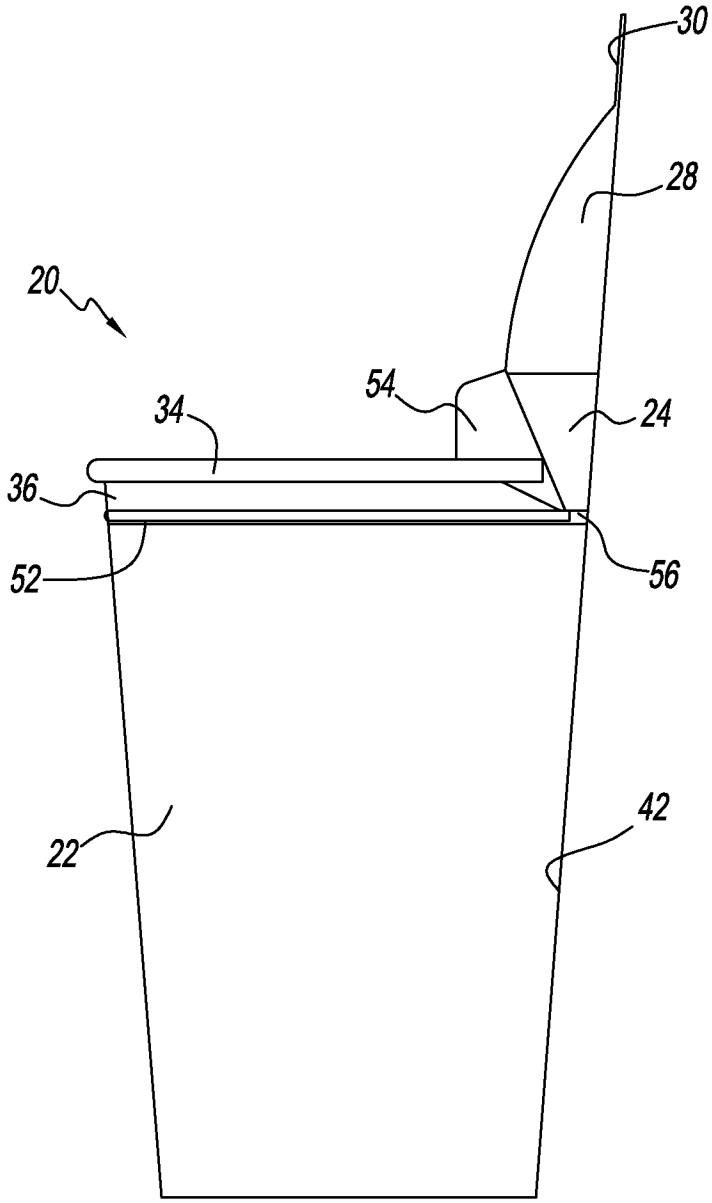

FIG. 8A

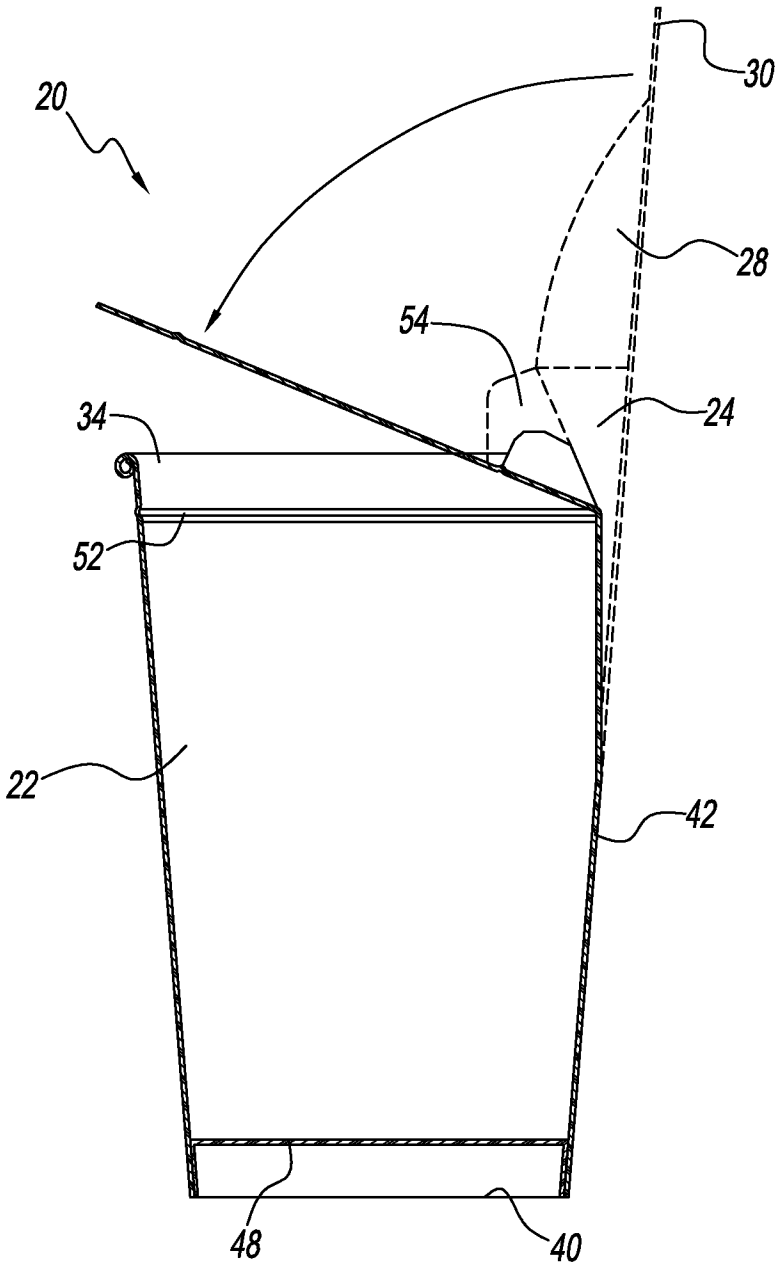

FIG. 8B

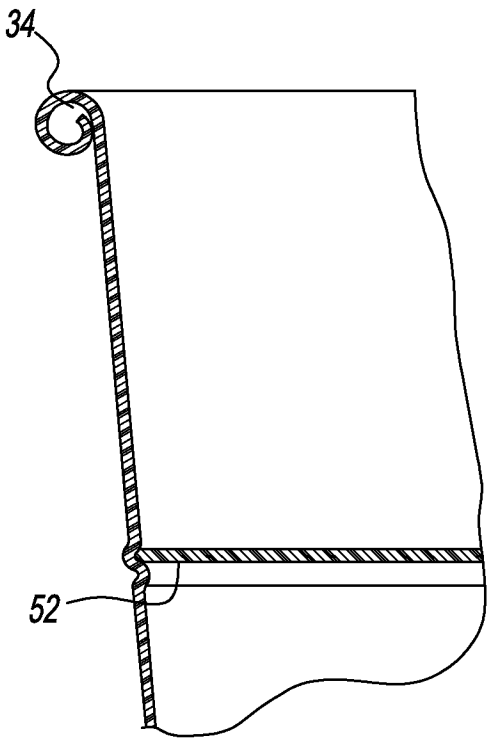

FIG. 8D

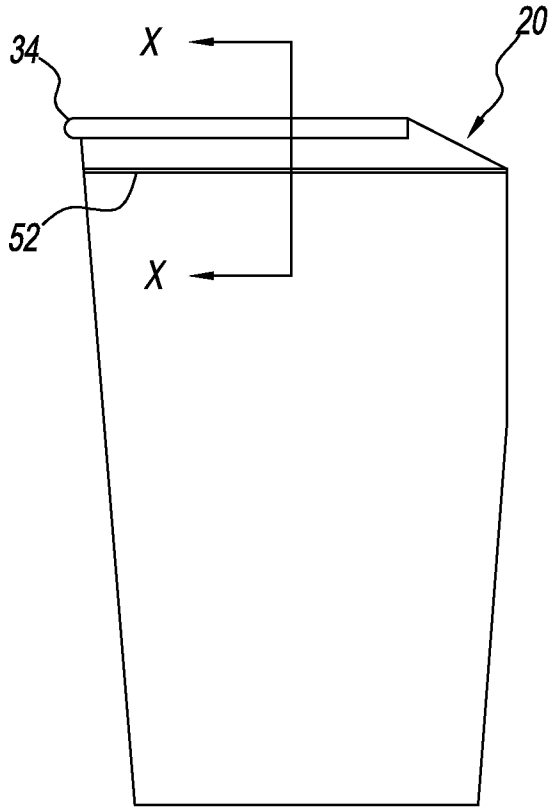

FIG. 8C

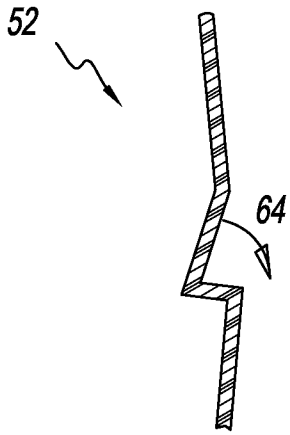

FIG. 8E

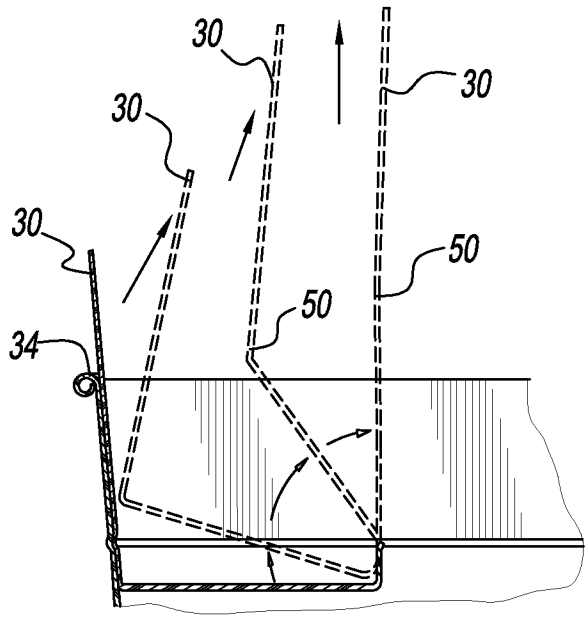

FIG. 8G

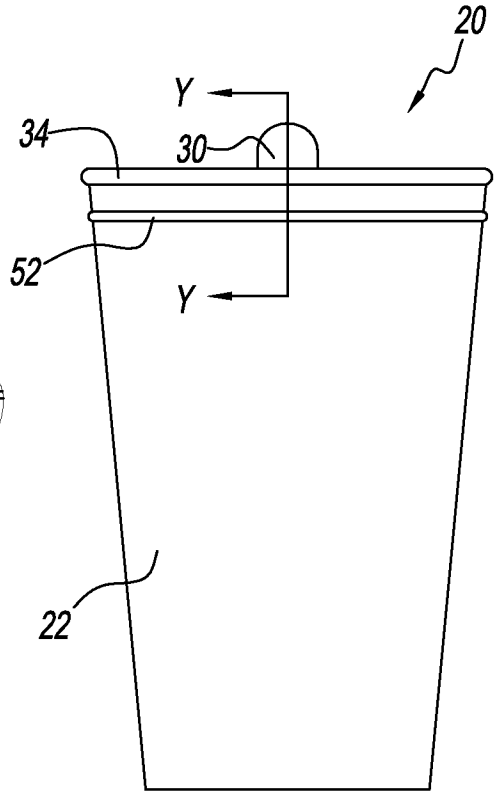

FIG. 8F

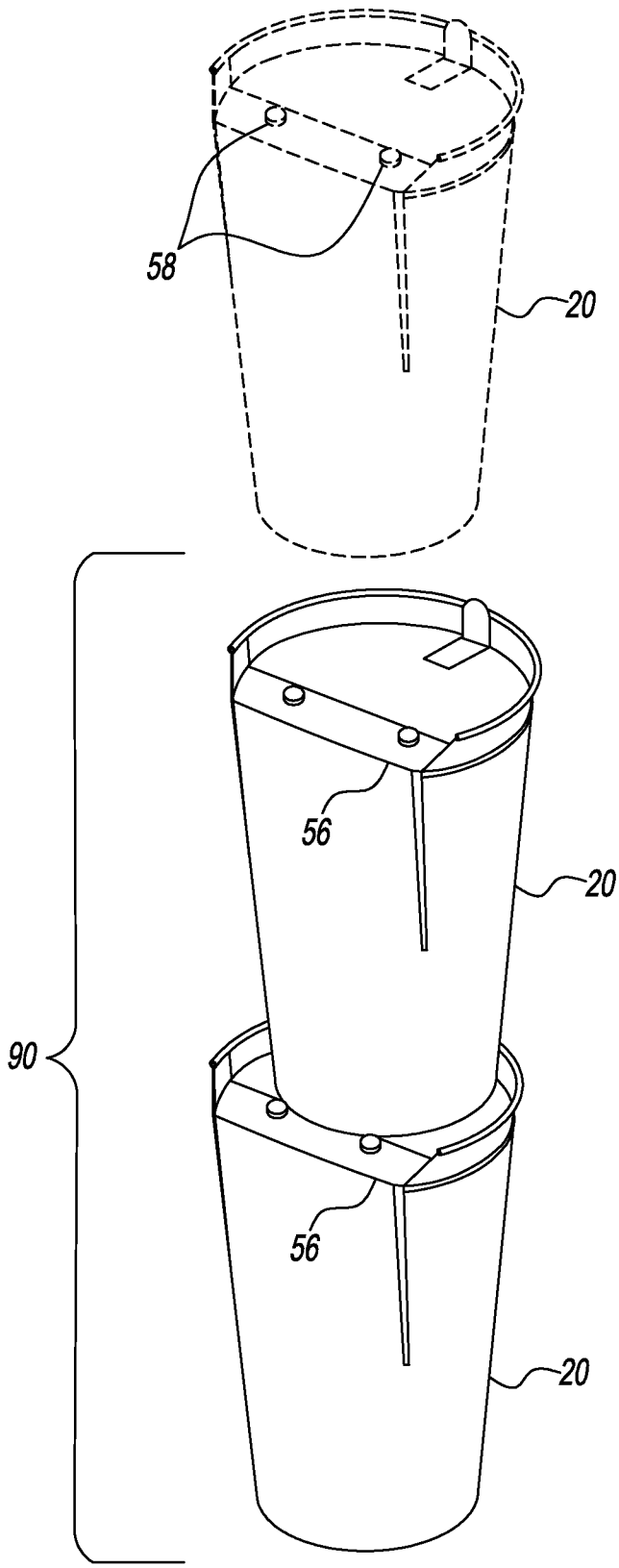

FIG. 9A

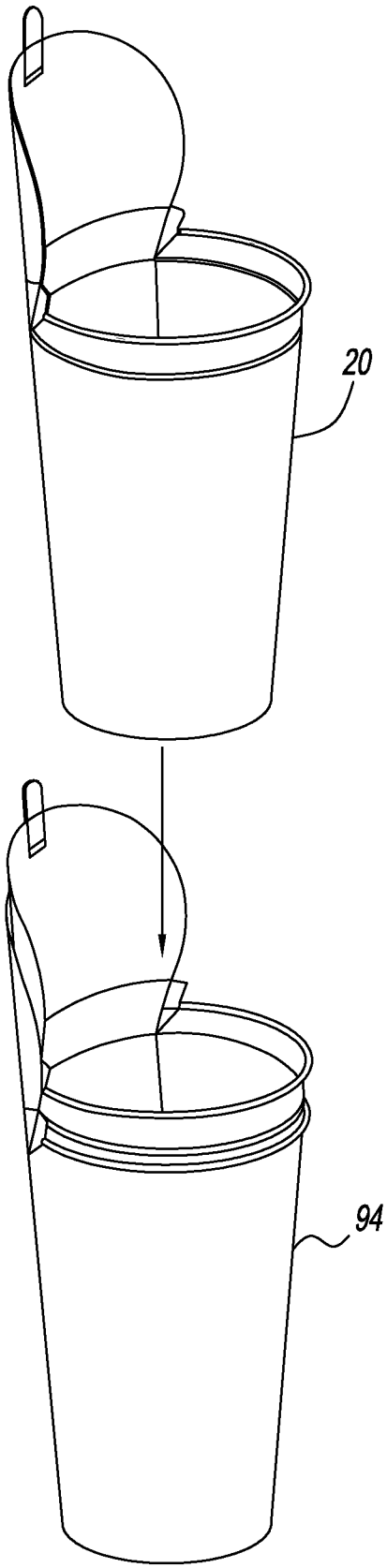

FIG. 9B

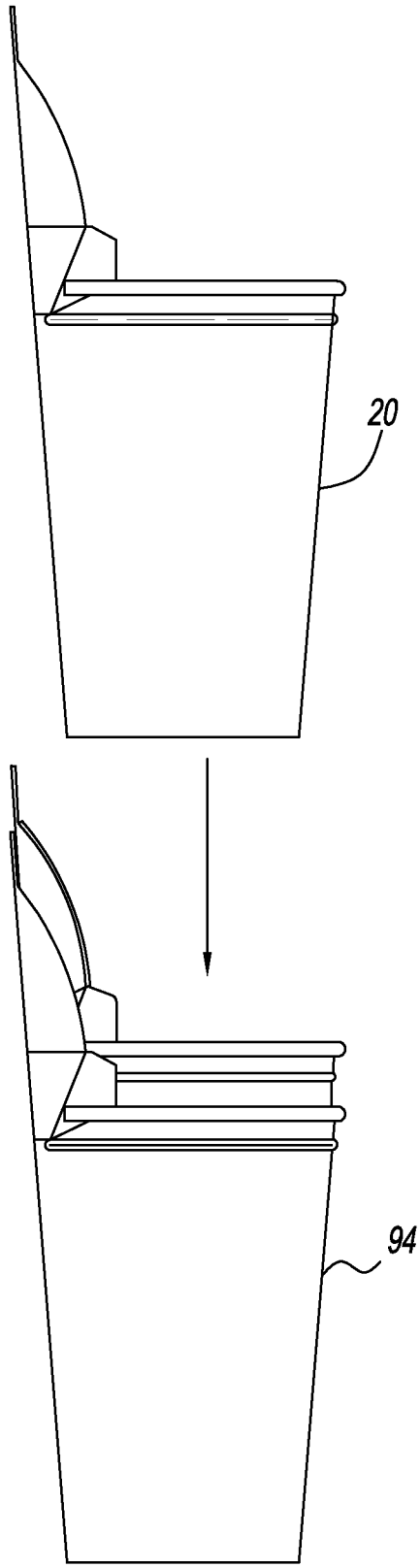

FIG. 9C

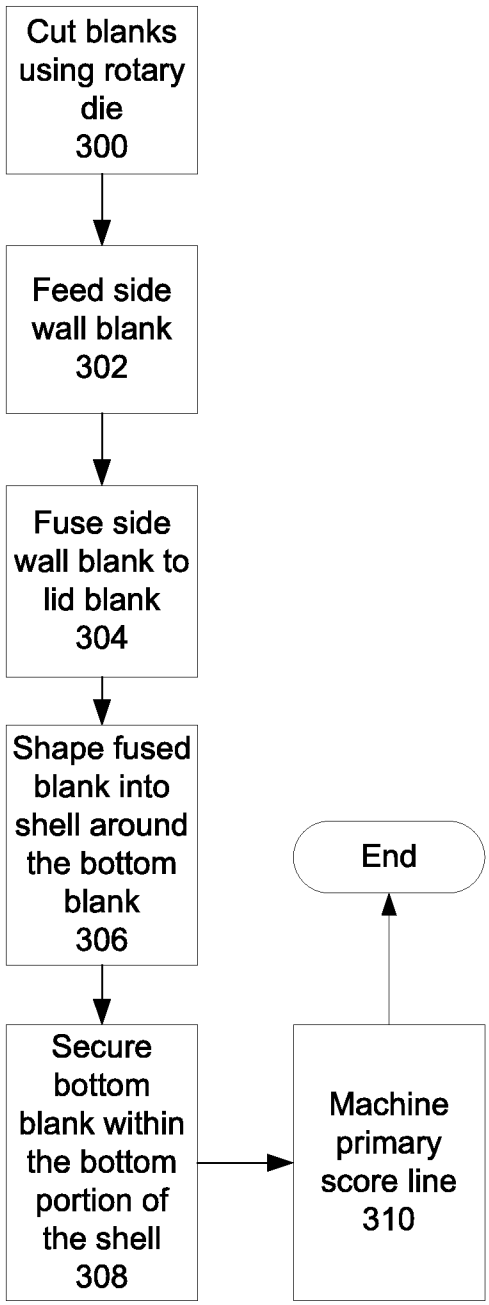
Cut blanks using rotary die 300
Feed side wall blank 302
Fuse side wall blank to lid blank 304
Shape fused blank into shell around the bottom blank 306
Secure bottom blank within the bottom portion of the shell 308
Machine primary score line 310
End

Figure 10a

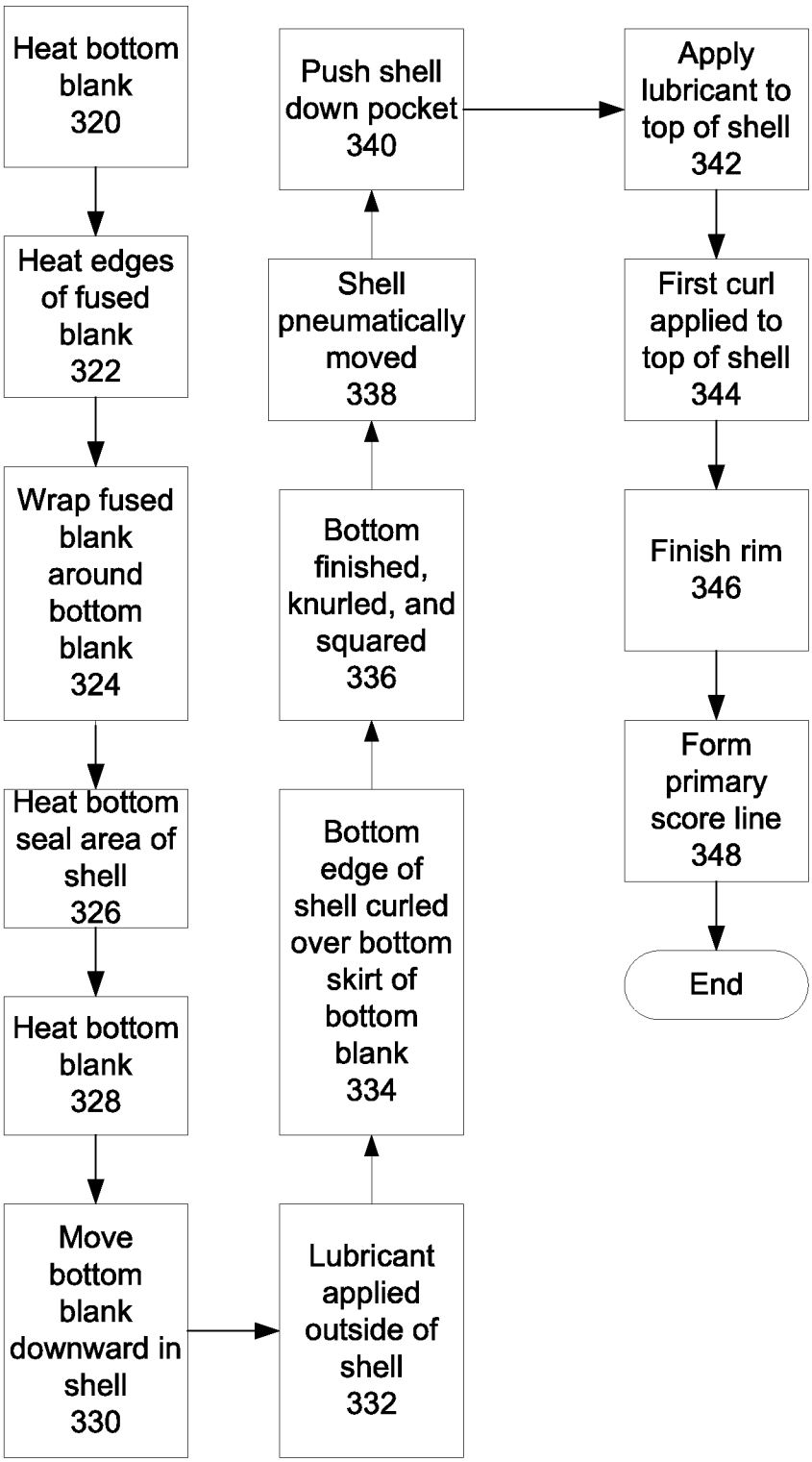
Heat bottom blank 320
Heat edges of fused blank 322
Wrap fused blank around bottom blank 324
Heat bottom seal area of shell 326
Heat bottom blank 328
Move bottom blank downward in shell 330
Lubricant applied outside of shell 332
Bottom edge of shell curled over bottom skirt of bottom blank 334
Bottom finished, knurled, and squared 336
Shell pneumatically moved 338
Push shell down pocket 340
Apply lubricant to top of shell 342
First curl applied to top of shell 344
Finish rim 346
Form primary score line 348
End

Figure 10b

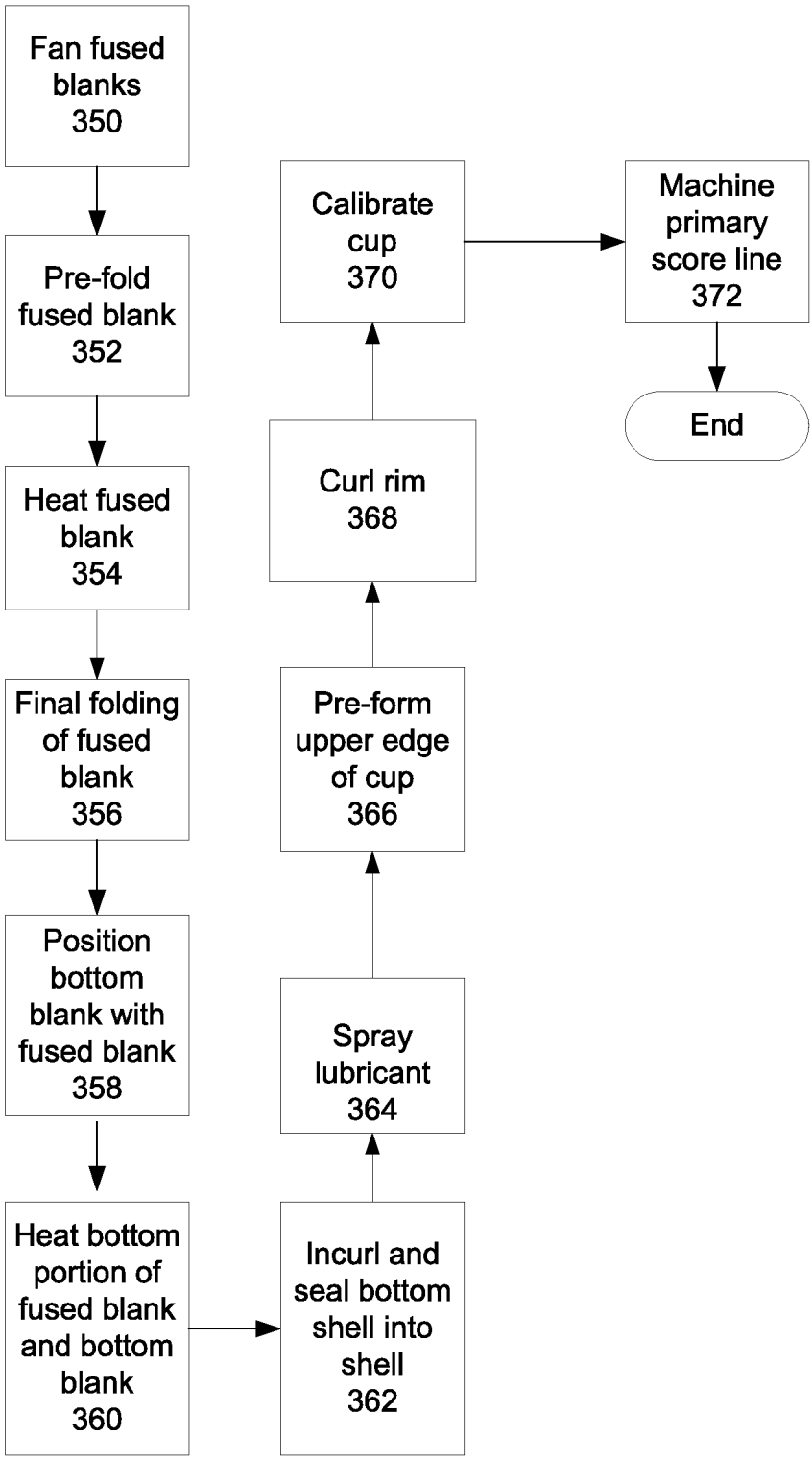
Fan fused blanks 350
Pre-fold fused blank 352
Heat fused blank 354
Final folding of fused blank 356
Position bottom blank with fused blank 358
Heat bottom portion of fused blank and bottom blank 360
Incurl and seal bottom shell into shell 362
Spray lubricant 364
Pre-form upper edge of cup 366
Curl rim 368
Calibrate cup 370
Machine primary score line 372
End

Figure 10c