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(54) Title: MIXING CONTAINER WITH MULTIPLE COMPARTMENTS DIVIDED BY A FRANGIBLE SEPARATOR

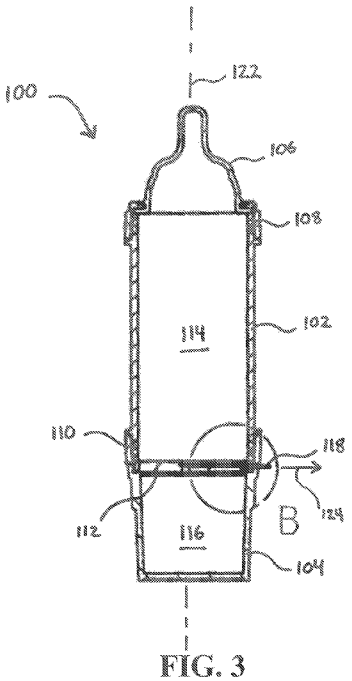

FIG. 3

(57) Abstract: A container having a first compartment configured to hold a first substance, a second compartment configured to hold a second substance, a frangible separator coupled to both the first and second compartments, and an actuator operably attached to the frangible separator. The second compartment is removably attached to the first compartment. The frangible separator forms a seal between the first compartment and the second compartment such that the first substance and the second substance do not mix. Actuating the actuator causes at least a portion of the frangible separator to rupture, which creates an opening in the frangible separator and allows the first substance and the second substance to mix. The actuator may be a string. The invention is particularly well-suited for mixing formula and water in baby bottles, but has many other uses.

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MIXING CONTAINER WITH MULTIPLE COMPARTMENTS DIVIDED BY A FRANGIBLE SEPARATOR

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority to United States Provisional Patent Application No. 61/333,144, filed May 10, 2010, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is directed to containers that can be used to separately store two substances and to mix the substances as needed. More specifically, the present invention is directed to a baby bottle for storing water and powdered formula separately until they need to be mixed to feed a baby.

2. Background of the Related Art

Baby formula is typically prepared by mixing a measured amount of powdered formula with a measured amount of water. This mixing must be done just prior to feeding the formula to the baby; otherwise, the formula will spoil. This presents a problem when parents are traveling and do not have a convenient way to store the water and formula separately.

Bottle designs that address this problem, having dual chambers and mixing systems, are known in the art. But the prior-art mixing systems often involve complex mechanical devices or specialized bottles that are expensive to manufacture and that must be cleaned and stored. In addition, prior-art designs may require special tools that must be used in conjunction with the bottle.

Accordingly, there is a need for a baby bottle with compartments for storing water and powdered formula separately, including functionality for mixing the water and

formula is a quick, safe, and reliable way. Additonally, there is a need for a simple mixing sytem that does not require any additional tools and that is disposable or recyclable. The mixing container with multiple compartments divided by a frangible separator, as described below and in the attached drawings, meets these needs.

SUMMARY OF THE INVENTION

Advantages of the present invention are set forth in the description that follows, as well as in the claims and the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the invention, as embodied herein, the invention includes a container having a first compartment configured to hold a first substance, a second compartment configured to hold a second substance, a frangible separator coupled to both the first and second compartments, and an actuator operably attached to the frangible separator. The second compartment is removably attached to the first compartment. The frangible separator forms a seal between the first compartment and the second compartment such that the first substance and the second substance do not mix. Actuating the actuator causes at least a portion of the frangible separator to rupture, which creates an opening in the frangible separator and allows the first substance and the second substance to mix together.

The invention also includes a bottle for storing and mixing liquid and powder. The bottle includes a first compartment assembly configured to store a liquid; a second compartment assembly removably attached to the first compartment assembly and being configured to store a powder; a frangible separator coupled to both the first compartment and the second compartment and forming a seal between the first compartment and the second compartment such that the liquid and the powder do not mix; and an actuator string operably attached to a central frangible portion of the frangible separator. A first end of the actuator string is attached to the central frangible portion, and a second end of the actuator string extends to through the wall of the bottle to the exterior of the bottle, such that pulling the actuator string in a direction away from the bottle causes the central frangible portion to rip, thus creating an opening in the frangible separator and allowing the liquid and powder to be mixed.

The invention also includes a frangible separator having a separator body and an actuator string partially embedded within the separator body and partially extending outward from the separator body. The actuator string is configured to partially rupture the separator body when the actuator string is pulled.

BRIEF DESCRIPTION OF THE DRAWINGS

So that those skilled in the art to which the subject invention pertains will readily understand how the mixing container functions without undue experimentation, preferred embodiments of the container will be described in detail below with reference to the following figures:

Fig. 1 is a perspective view of an embodiment of the invention, showing a bottle having a liquid compartment assembly, a powder compartment assembly, and a nipple assembly;

Fig. 2 is a side elevation view of the bottle shown in Fig. 1;

Fig. 3 is a cross-sectional view of the bottle of Fig. 2 taken along line A-A;

Fig. 4 is a detailed cross-sectional view of area B shown in Fig. 3;

Fig. 5 is a detailed cross-sectional view of area C shown in Fig. 4;

Fig. 6 is a top perspective view of an embodiment of a frangible separator for separating two compartments, according to an embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The container of the present invention facilitates storage of two substances in two distinct compartments to prevent mixing of the substances until a user actuates a mechanism to at least partially remove a separator between the compartments. Although the exemplary embodiment will be described with reference to a baby bottle used to mix powdered infant formula with water, the present invention has wide application and is not limited to this embodiment. A container with a frangible separator according to the present invention may be used to store any type of material, but is particularly well suited for storing materials separately and mixing the materials when needed. The materials to be stored an mixed may be any combination of liquids, solids, and gases. Similarly, although only two compartments are described in the exemplary embodiments, a container according to the present invention may include any number of compartments, with a frangible separator between each of the compartments.

Reference will now be made in detail to the present preferred embodiments of the container with multiple compartments and a frangible separator. The container includes functionality for both separately storing two substances and for mixing the two substances when desired. For purposes of explanation and illustration, and not limitation, an exemplary embodiment of the container is shown in Fig. 1. In this exemplary embodiment, the container is a bottle designated generally by reference numeral 100. Fig. 1 shows a perspective view of bottle 100, which includes three sections: a liquid compartment assembly 102, a powder compartment assembly 104, and a nipple assembly 106.

Fig. 2 is a side view of bottle 100; Fig. 3 is a cross-sectional view of bottle 100 taken along the line A-A in Fig. 2. As shown in Fig. 3, nipple assembly 106 may include internal threads configured to mate with upper exterior threads 108 on a top exterior

surface of liquid compartment assembly 104 to removably secure the nipple assembly to the bottle. Liquid compartment assembly 104 may also include lower exterior threads 110 on a lower exterior surface of the liquid compartment to removably secure powder compartment assembly 104 to liquid compartment assembly 102. Powder compartment assembly 104 may be removably secured to liquid compartment assembly 102 in any suitable manner, including a press fit or a snap fit. Additionally, although the exemplary embodiment shown in the figures shows liquid compartment assembly 102 and powder compartment assembly 104 as being removably attached to one another, liquid compartment assembly 102 and powder compartment assembly 104 may also be integrally formed as a single, unitary body.

As shown in Fig. 3, a separator 112 divides a liquid compartment 114 within liquid compartment assembly 102 and a powder compartment 116 within powder compartment assembly 104 such that liquid held within liquid compartment 114 cannot mix with powder held within powder compartment 116. In the exemplary embodiment shown, separator 112 is a frangible separator having an actuator 118 configured to rip or rupture a portion of the frangible separator 112 and thus allow the liquid held in compartment 114 to mix with the powder held in compartment 116. Actuator 118 may be a string, a rod, or a lever, or any other suitable actuating mechanism.

In one exemplary embodiment, actuator 118 is a string attached to frangible separator 112 and extending out to the exterior of bottle 100 such that when the string is pulled, the separator is ruptured and the liquid in chamber 114 and powder in chamber 116 can mix together. Fig. 4 shows a detailed cross-sectional view of frangible separator 112 and actuator string 118. In the exemplary embodiment shown, actuator string 118 is embedded within frangible separator 112 and extends to a central portion 120 of separator 112. When actuator string 118 is pulled in a direction perpendicular to the longitudinal

axis 122 (shown in Fig. 3) of bottle 100—represented by arrow 124 in Figs. 3 and 4—actuator string 118 rips a portion of frangible separator 112 to create an opening in frangible separator 112 and thus allowing the liquid and powder in compartments 114 and 116 to freely mix. Actuator string 118 may included a pull tab 128 attached to the end of the actuator string to assist a user in gripping the string and pulling it in direction 124 to rip frangible separator 112.

In one exemplary embodiment, frangible separator is permanently attached to powder compartment assembly 104 by an adhesive or other suitable means. This embodiment allows manufacturers of baby formula, for example, to sell pre-measured amounts of formula sealed within a powder compartment assembly 104 that is configured to be removably attached to liquid compartment assembly 102. This embodiment allows consumers to quickly assembly a ready- for-use baby bottle by simply attaching the pre-packaged powder compartment assembly and filling the liquid compartment assembly with water. This avoids any need to measure formula.

In another exemplary embodiment, as shown in Fig. 4, frangible separator 112 is a disposable separator, not permanently attached to powder compartment assembly 104. In this embodiment, separator 112 may rest on a lip 126 of powder compartment assembly 104 and be firmly secured between lip 126 and the walls of liquid compartment assembly 104 when the two compartment assemblies are removably coupled to one another. In exemplary embodiment, a washer or other seal may be used to facilitate the coupling.

Using an independent frangible separator 118 allows both compartment assemblies 102 and 104 to be reused by simply uncoupling the compartment assemblies, filling powder compartment assembly 104 with formula, inserting a new disposable separator 112, filling the liquid compartment assembly 102 with water, and attaching a lid or nipple assembly 106 to bottle 100.

Fig. 5 is a detailed cross-sectional view of the interface between liquid compartment assembly 102, powder compartment assembly 104, and frangible separator 112. As shown in Fig. 5, powder component assembly 104 includes a slot 130 that extends through the sidewall 132 of powder apartment assembly 104. Slot 130 is configured to allow actuator string 118 to extend outward to an exterior of bottle 100, such that tab 128 can be easily gripped and pulled by a user to rip frangible separator 112 and mix the substances within liquid compartment 114 and powder compartment 116.

As shown in Fig. 5, separator 112 creates a seal between liquid compartment assembly 102 and powder compartment assembly 104 such that no liquid held in compartment 114 will leak into powder compartment 116. Similarly, separator 112 seals off slot 130 such that no liquid or powder will leak from bottle 100 through slot 130. During operation, at least a portion of actuator string 118 remains embedded within separator 112, and the edges of separator 112 remain intact, thus preventing any leakage of liquid after separator 112 has been ruptured.

Fig. 6 is a top perspective view of the frangible separator 112. As shown, separator 112 may include a separator body 134 having a central frangible portion 136. Separator body 134 may be of any suitable shape and size, provided that it can sealingly divide liquid compartment 114 and powder compartment 116. In one exemplary embodiment, central frangible portion 136 is attached to a first end of actuator string 118, with the second end of actuator string 118 extending outward from separator body 134. Central frangible portion 136 may be of any suitable shape and size.

Fig. 6 shows a frangible portion 136 having a horseshoe shape—that is, a shape with a flat portion 138 configured to be near sidewall 132 of powder compartment assembly 104 while in use and a curvilinear portion 140 that extends outward from flat

portion 138 toward central portion 120 of the separator 112 and back to flat portion 138. In another exemplary embodiment, frangible portion 136 may be semicircular in shape.

Actuator string 118 may be attached to the borders of frangible portion 136 such that when actuator string 118 is pulled away from bottle 100 in direction 124, the borders of frangible portion 136 are ripped, thus creating an opening between liquid compartment 114 and powder compartment 116. In another exemplary embodiment, frangible portion 136 may include weakened areas along its border, with actuator string 118 attached to a central location within frangible portion 136. In this embodiment, pulling actuator string 118 will put stress on the weakened areas, causing the weakened areas to rupture and allowing the substances in compartments 114 and 116 to mix. Frangible separator 112 may be made from any suitable material. Because the process of ripping or rupturing separator 112 cannot be reversed, the separator may be made from materials that are inexpensive and easily disposable or recyclable.

As any parent can attest, time is often of the essence when a baby is hungry. In use, bottle 100 greatly simplifies the storage and mixing of baby formula with water and allows parents to very quickly and easily put together a baby bottle that can be carried securely and mixed on demand. The bottle can be prepared in a few easy steps: first, powder compartment 116 is filled with a pre-determined amount of infant formula. In one exemplary embodiment, powder compartment assembly 104 includes gradations or other indications on the its interior sidewalls to aid a parent in determining the correct amount of formula to add. Second, frangible separator 112 is placed on lip 126 of powder compartment assembly 104, with actuator string 118 extending outward through slot 130. Third, liquid compartment assembly 102 is coupled to powder compartment assembly 104, and in the process, frangible separator 112 is sealingly secured between the two compartments. Fourth, a predetermined amount of water or other liquid is added to liquid

compartment 114. As with powder compartment assembly 104, the liquid compartment assembly may also include gradations or other indicators to assist the parent in determining the appropriate amount of water to add. Finally, nipple assembly 106 is secured to a top portion of liquid compartment assembly, and the bottle is ready to go. When it is time to feed the baby, the parent simply has to pull actuator string 118 in a direction 124 away from bottle 100 to create an opening in frangible separator 112, thus allowing the water and formula to be mixed. If necessary, the parent may shake the bottle to further facilitate thorough mixing.

The present invention, as described above and shown in the drawings, provides for a container for with multiple compartments divided by a frangible separator. The container allows a user to carry two substances, such as liquid and powder, in separate compartments and to quickly and easily mix the two substances when the need arises. Carrying the substances in separate compartments is essential for applications such as baby formula, which must be fed to the baby or refrigerated shortly after being mixed to prevent spoilage. The present invention allows a parent to carry the formula in a ready-to-use bottle without the need for refrigeration or other special handling. It will be apparent to those skilled in the art that various modifications and variations can be made to the container of the present invention without departing from the scope of the invention as outlined in the appended claims and their equivalents.

The invention claimed is:

1. A container comprising:
   a first compartment configured to hold a first substance;
   a second compartment configured to hold a second substance;
   a frangible separator coupled to both the first compartment and the second compartment and forming a seal between the first compartment and the second compartment such that the first substance and the second substance do not mix; and
   an actuator operably attached to the frangible separator, such that actuating the actuator causes at least a portion of the frangible separator to rupture, creating an opening in the frangible separator and allowing the first substance and the second substance to mix.

2. The container of claim 1, wherein the second compartment is removably attached to the first compartment.

3. The container of claim 1, wherein the second compartment and the first compartment and integrally formed in a single unitary body.

4. The container of claim 1, wherein the actuator comprises a string.

5. The container of claim 4, wherein the string is attached to a portion of the frangible separator at a first end of the string, and wherein a second end of the string extends outside of the exterior of the container.

6. The container of claim 4, wherein the frangible separator further comprises a frangible portion, and wherein the string wraps around the frangible portion such that the frangible portion of the frangible separator is ripped when the string is pulled.

7. The container of claim 5, further comprising a pull tab attached to the second end of the string, configured to facilitate gripping and pulling of the string.

8. The container of claim 4, wherein the string is embedded within the frangible separator.

9. The container of claim 1, wherein the frangible separator further comprises a frangible portion.

10. The container of claim 9, wherein the frangible portion is horseshoe-shaped.

11. The container of claim 9, wherein the frangible portion has a semicircular shape.

12. The container of claim 9, wherein the frangible portion includes pre-weakened borders such that the frangible portion rips along the borders when the actuator is actuated.

13. The container of claim 1, wherein the first substance is a liquid and the second substance is a powder.

14. The container of claim 1, wherein both the first substance and the second substance are liquids.

15. A bottle for storing and mixing liquid and powder, the bottle comprising:
a first compartment assembly configured to store a liquid;
a second compartment assembly removably attached to the first compartment assembly and being configured to store a powder;
a frangible separator coupled to both the first compartment and the second compartment and forming a seal between the first compartment and the second compartment such that the liquid and the powder do not mix; and
an actuator string operably attached to a central frangible portion of the frangible separator;
wherein a first end of the actuator string is attached to the central frangible portion, and a second end of the actuator string extends to the exterior of the bottle, such that pulling the actuator string in a direction away from the bottle causes the central frangible portion to rip, creating an opening in the frangible separator and allowing the liquid and powder to be mixed.

16. The bottle of claim 15, further comprising a nipple assembly configured to be removably attached to the first compartment assembly.

17. A frangible separator comprising:

a separator body; and

an actuator string partially embedded within the separator body, and partially extending outward from the separator body;

wherein the actuator string is configured to partially rupture the separator body when the actuator string is pulled.

18. The frangible separator of claim 17, further comprising a pull tab attached to an end of the actuator string that extends outward from the separator body, the pull tab being configured to facilitate gripping and pulling of the actuator string.

19. The frangible separator of claim 17, wherein the frangible separator body further comprises a frangible central portion having pre-weakened borders such that the central frangible portion rips along the borders when the actuator string is pulled.

20. The frangible separator of claim 17, wherein the frangible central portion is horseshoe-shaped.

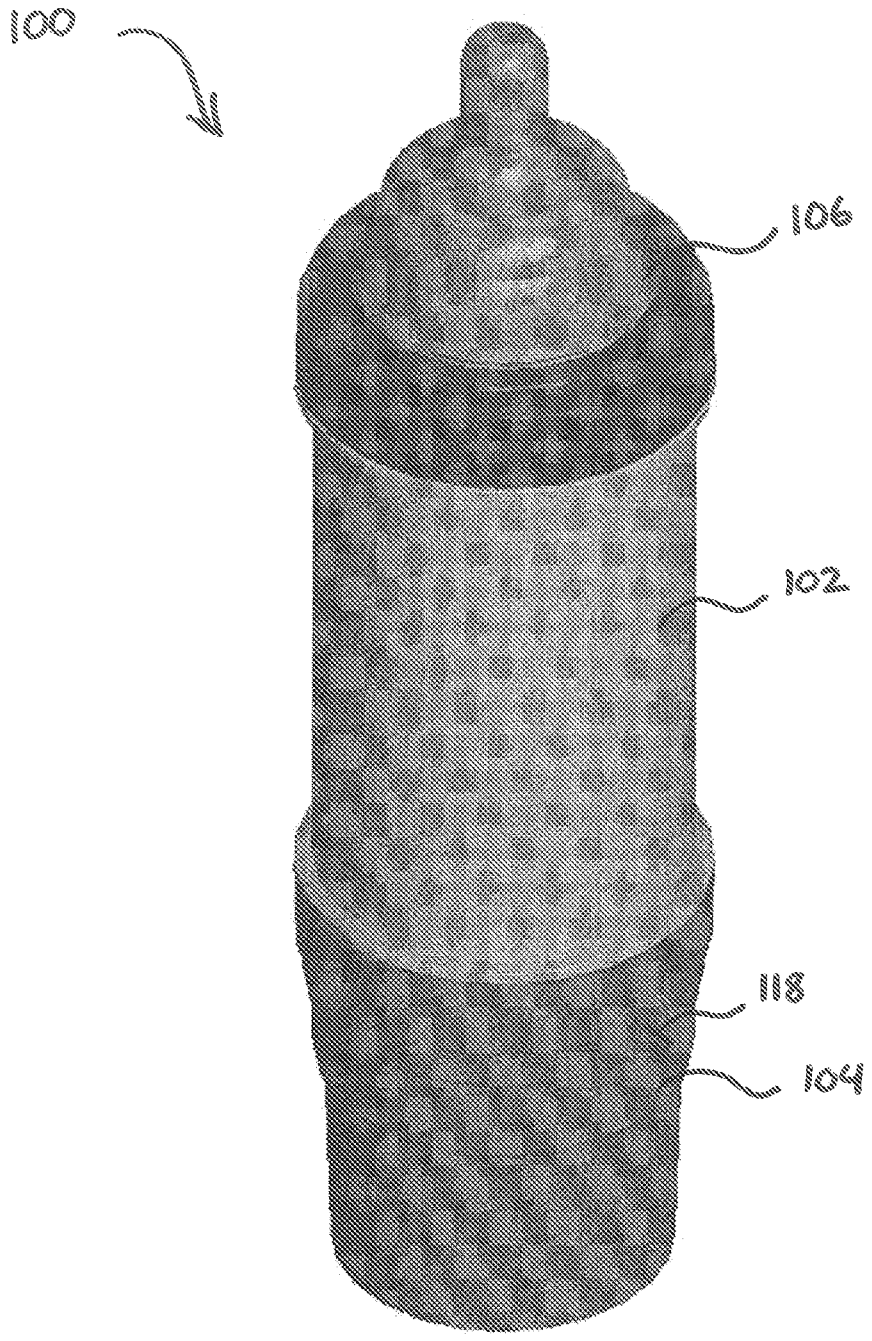

FIG. 1

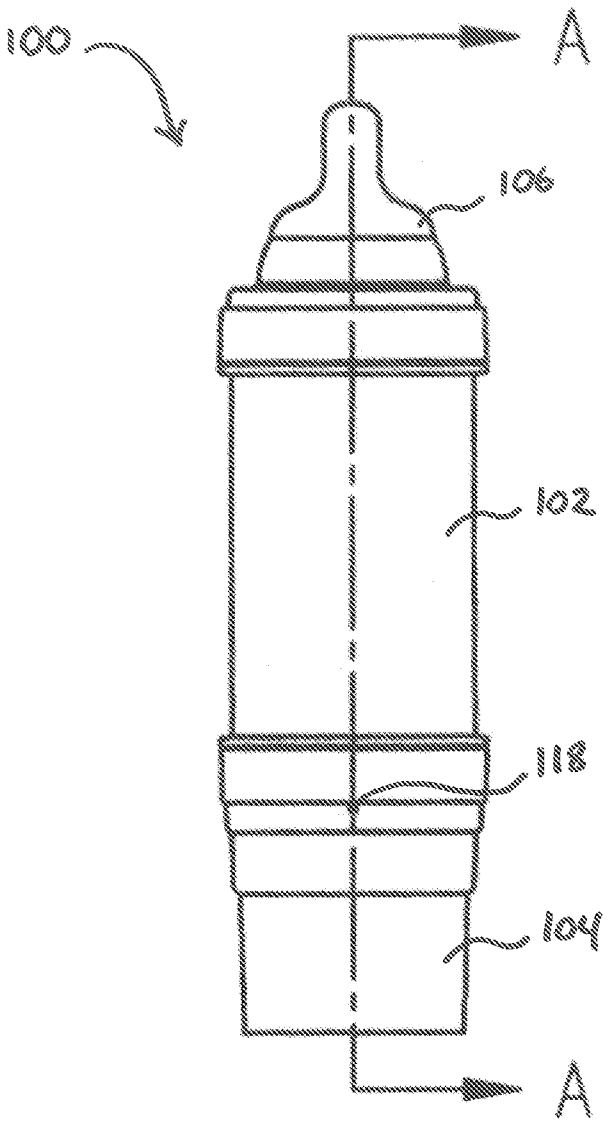

FIG. 2

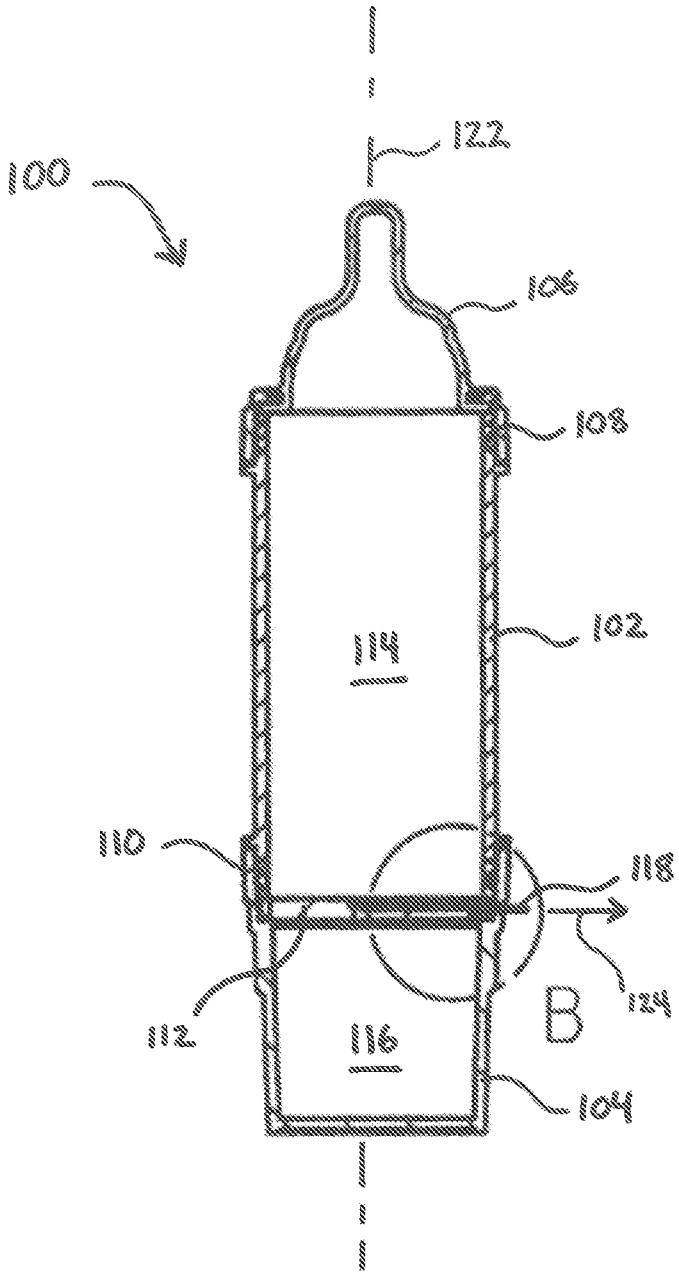

FIG. 3

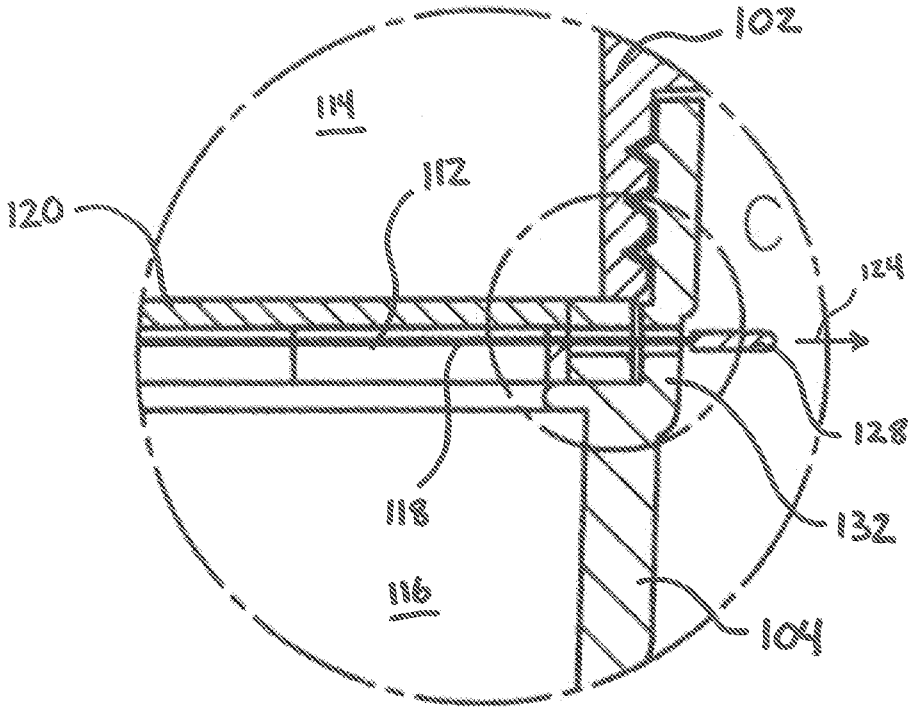
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FIG. 4

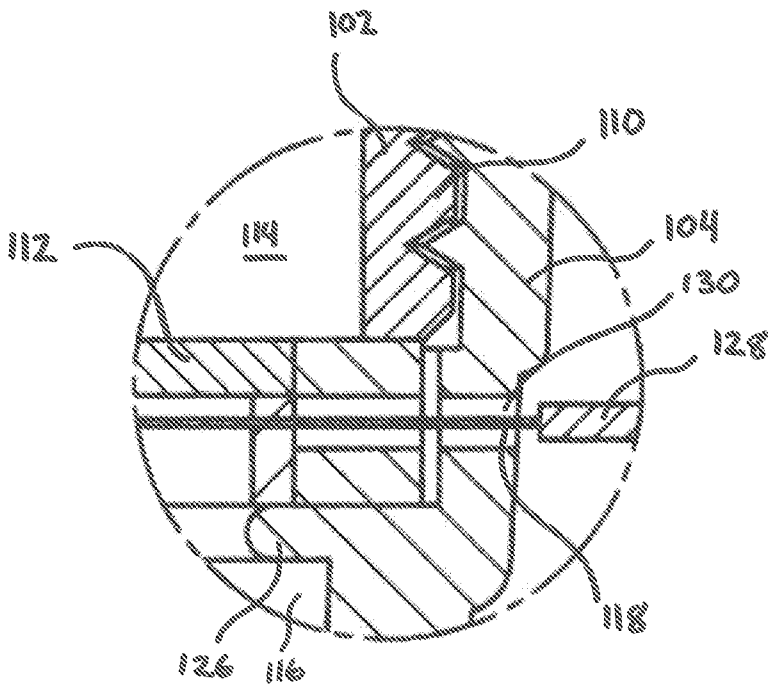
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FIG. 5

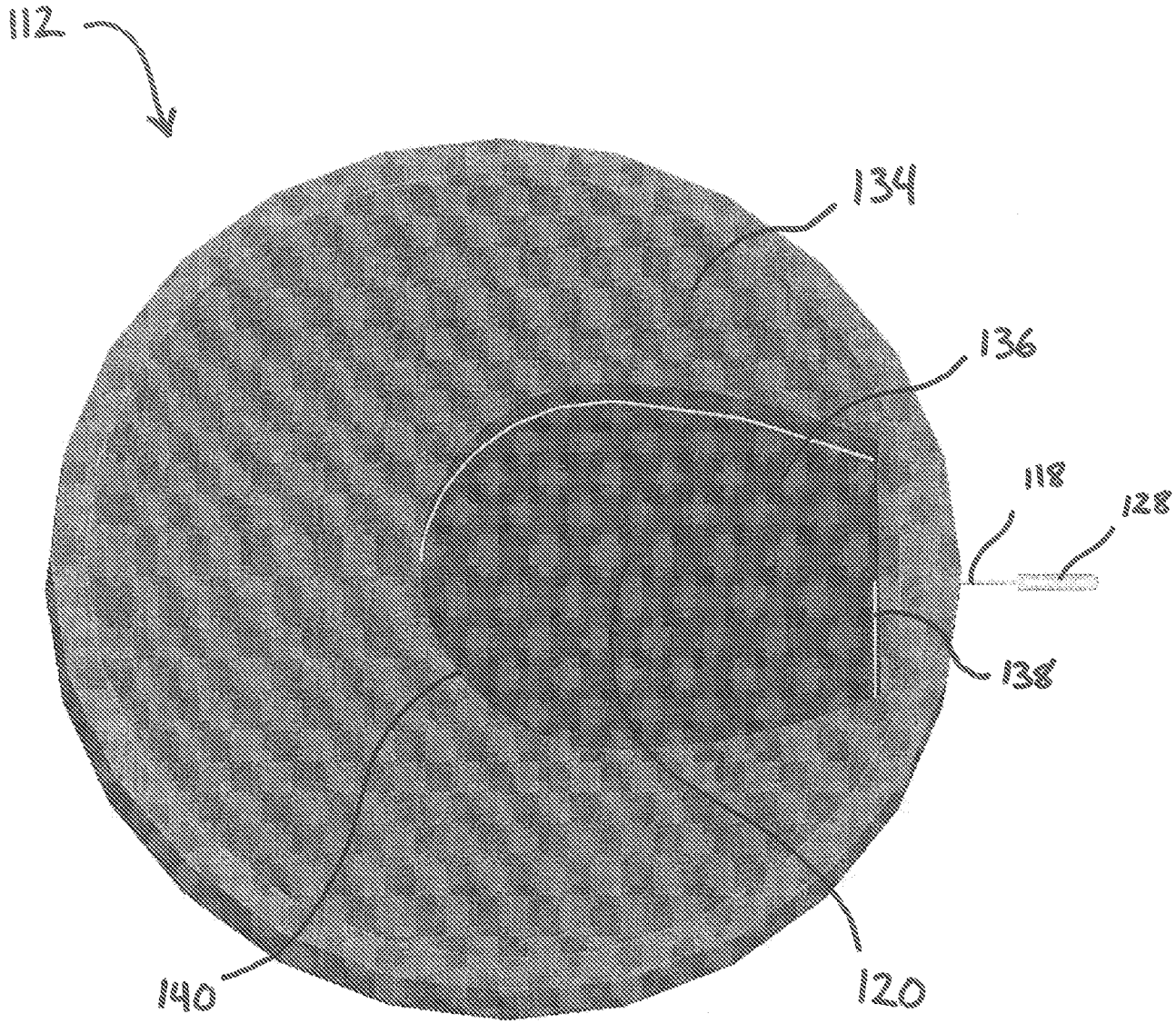

FIG. 6