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BICAMERAL CONTAINER

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Fig. 1.

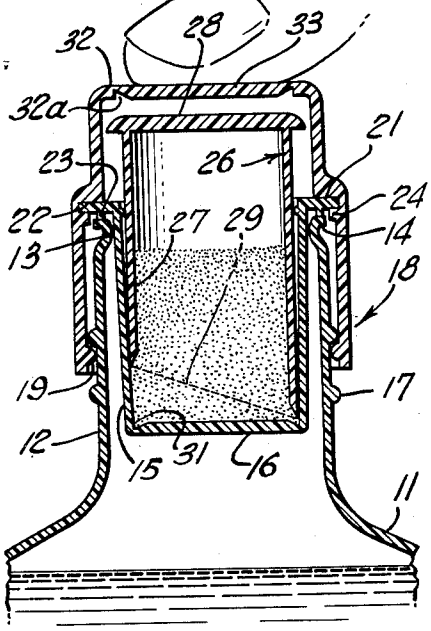


Fig. 2.

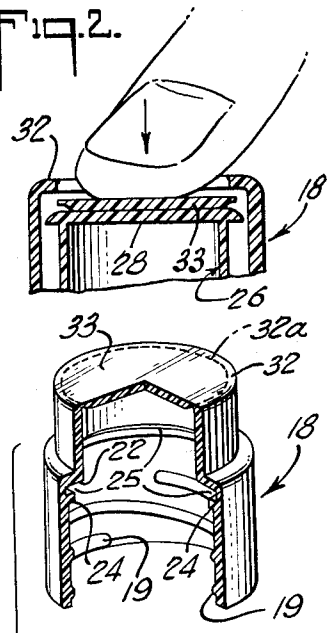


Fig. 3.

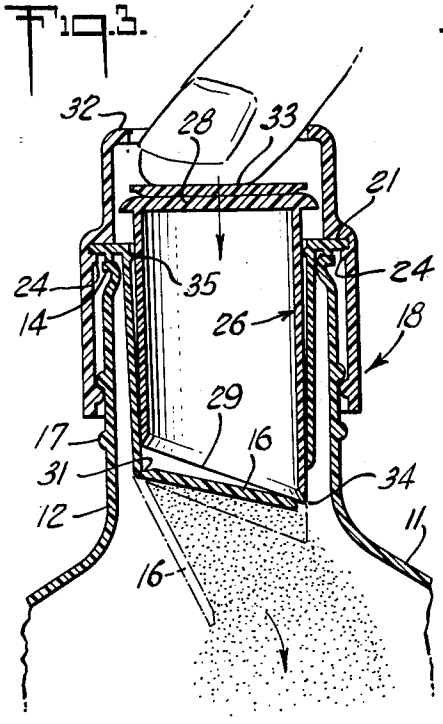
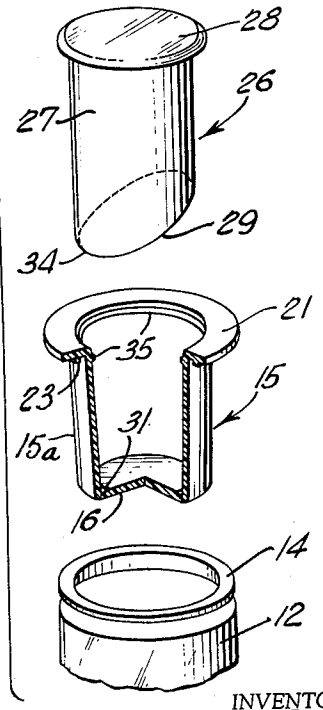


Fig. 4.



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BICAMERAL CONTAINER

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This invention relates to bicameral containers for storing, mixing and dispensing two different materials which are intended to be kept separate until just prior to the time they are to be used, and then mixed for use.

Containers of this type vary from simple holders having dual compartments separated by a divider, and which are suitable mainly for segregating two kinds or sizes of particles intended to be mixed at a later time, to containers capable of isolating one highly reactive liquid from another and then allowing the liquids to be mixed just prior to use.

The present invention contemplates a container or package of this general type which comprises a mixing container, such as a glass jug, having a neck presenting a mouth portion; a cup fitting in said neck and adapted to be slidably removed therefrom; a cap adapted to fit over and mechanically engage the neck; and a plunger in the cup which, in turn, is adapted to be displaced toward the bottom of the cup to remove a portion thereof to allow the contents of the cup to be mixed with the other contents of the container. The cap engages the neck of the bottle through means such as mating threads on the cap and the neck, and performs the dual function of holding the cup in position and providing a shield above the cup which prevents the plunger from being displaced downwardly in the cap without fracture of the cap. The cap has a relatively rigid frangible top section above the plunger which is adapted to be broken to permit access to the plunger for displacing the plunger downwardly to open the bottom of the cup and allow the contents of the cup to be mixed with the other contents of the container.

The cap comprises means for engaging the cup and retaining the cup inside the cap so that access to the plunger for opening the bottom of the cup can only be attained by breaking the cap and removing a portion of the frangible section, even though the cap carrying the cup might be removed from the mixing container by unscrewing the cap from the neck of the container. Thus, a tamper-proof feature is provided which definitely indicates whether or not the cup has been used or tampered with. In other words, unless the frangible member is broken, it can be assumed that the contents of the cup have not been disturbed. Since the top of the cap is relatively rigid, it is not possible to depress the plunger by deforming the cap. Instead, a portion of the cap must be removed to allow the plunger to be depressed.

Preferably, the cup presents an outwardly extending peripheral flange which fits over the mouth portion of the neck of the container and the cap presents a shoulder which contacts the cap of the flange on the cup and presses it downwardly toward the mouth portion of the container to form a seal when the cap is fully engaged with the neck of the container as by screwing the cap on mating threads carried by the neck. In this form, the cap also presents an inwardly extending ridge spaced below the shoulder and forming therewith an annular retaining groove for receiving the peripheral flange of the cup and thereby retaining the cup in the cap. The peripheral flange of the cup may be forced into the retaining groove during manufacture and assembly of the container in such a way that it would be extremely difficult for a subsequent user to remove the cup from the cap.

The relatively rigid frangible section of the cap preferably comprises a removable portion defined by a breaking groove or score line of reduced thickness, and the width of the removable portion preferably is less than the width of the top of the plunger so that the plunger cannot be displaced from the cup through the opening formed in the top of the cap by the removable portion. In its preferred form, the frangible section is broken by pressing the removable portion thereof downwardly until this portion is displaced from the cap and contacts the top of the plunger. Thenceforth the removable portion is pressed downwardly with the plunger as the plunger is displaced toward and through a portion of the bottom of the cup.

Other and further objects of this invention will be apparent from the following description and claims together with the drawings wherein:

FIG. 1 is a sectional view of the neck of a mixing container according to one embodiment of the bicameral package of this invention, showing the cup and cap in position thereon;

FIG. 2 is a similar view of the top of the cap of the package of FIG. 1, showing the top of the cap just after the frangible section thereof has been broken by a finger of the user to press the removable portion of the cap into contact with the top of the plunger in the cup;

FIG. 3 is a sectional view of the package of FIG. 1, showing the parts thereof after the plunger has been pressed into contact with the bottom of the container to initiate removal of the bottom section thereof; and

FIG. 4 is an exploded view, partly in section and partly in elevation, showing the various parts associated with the neck portion of the package of the preceding figures.

Referring to FIGS. 1–4 of the drawings, there is shown a bicameral package according to one embodiment of this invention which comprises a mixing container **11** having a neck **12** presenting a mouth portion **13** including an external rim **14**, at the top of the neck. Fitting in the neck is a cup **15** having a cylindrical side wall **15***a*, a normally closed flat bottom **16** and an open top. The neck **12** of the container is provided with helical threads **17** and a cap **18** having corresponding threads **19** for mating with the threads **17** on the neck is provided for fitting over the cup **15** and holding it in position on the container.

The cup **15** presents an outwardly extending peripheral flange **21** which fits over the mouth portion of the neck of the container, and the cap **18** has a shoulder **22** which contacts the top of the peripheral flange **21** on the cup in such a way that when the cap is urged downwardly by threading the cap onto the neck of the container, it will press the peripheral flange **21** toward the rim **14** on the container neck. A deformable, cylindrical flange **23** depending from the peripheral flange **21** of the cup is provided for contacting the rim **14** and forming a hermetic seal therewith when the cap is fully engaged with the neck of the container.

To hold the cup **15** in position in the cap **18**, the cap presents an inwardly extending ridge **24** in the form of an annular flange spaced below the shoulder **22** to form with the shoulder an annular retaining groove **25** for receiving the peripheral flange **21** of the cup. The inside diameter of the ridge **24** presented by the cap is less than the outside diameter of the peripheral flange **21** extending from the cup, so that the peripheral flange **21** can only

be inserted in the retaining groove 25 by forcing the flange into the groove as the cap is deformed for this purpose. Once the peripheral flange of the cup is in position in the groove 25, it is extremely difficult, if not impossible, for the cup 15 to be removed from the cap 18.

As mentioned hereinbefore, the cup 15 is in the form of a hollow cylinder closed at the bottom. Positioned in the cup is a plunger 26 which comprises a hollow cutting cylinder 27 open at the bottom and closed at the top by a flat disc 28 integral therewith. The lower edge 29 of the cutting cylinder 27 is inclined as if cut along a plane inclined to the axis of the cutting cylinder and in the form of a sharpened cutting edge. The cutting edge 29 is formed by beveling the material of the plunger cylinder inwardly and upwardly from the outside surface of the plunger so that the cutting edge is located approximately at the outside diameter of the plunger.

The cup 15, itself, has a flat bottom 16 which is connected to the cylindrical side wall 15*a* of the cup by a circular groove 31 located adjacent the inside surface of the side wall 15*a* of the cup. The inside diameter of the cup 15 is approximately equal to the outside diameter of the cutting cylinder 27 of the plunger although it may be slightly greater or slightly less than the outside diameter of the plunger when resilient materials such as polyethylene or polypropylene are used for these parts. Under some circumstances, it might be desirable to have a tight fit between the plunger 26 and the cup 15 to minimize the likelihood of accidental displacement of the plunger with respect to the cup. It is preferred in accordance with this embodiment of the invention that the side wall of the cup 15 be tapered slightly toward the bottom of the cup as shown most clearly in FIGS. 1 and 3 and that the inside diameter of the cup at the bottom of the cup be equal to or slightly less than the outside diameter of the cutting cylinder 27 of the plunger 26. Under these circumstances, as shown in FIG. 3, when the plunger 26 is pressed downwardly, it distends the side walls slightly so that there is a tight fit between the cup and the cutting cylinder 27 of the plunger. The flat disc 28 forming the top of the plunger has an outside diameter slightly greater than the outside diameter of the cutting cylinder 27, so that the plunger can not pass into the mixing container 11 through the cup 15 when the bottom 16 of the cup is removed.

A frangible top section 32 of the cap is located directly above the disc 28 at the top of the plunger cylinder. The frangible section 32 is relieved on its underside to form a circular groove 32*a* which defines a circular removable portion 33. The frangible section 32 is reduced sufficiently in thickness above the groove that when the removable portion 33 of the frangible section is pressed downwardly, as by the finger of the user, the removable portion 33 within the circular groove is broken away from the cap and displaced downwardly into contact with the disc 28 presented by the top of the plunger. In this way the downward pressure of the finger is transferred to the plunger itself and begins to displace the plunger downwardly toward and into contact with the bottom of the cap. This is shown most clearly in FIGS. 1–3. As the lowermost portion 34 of the inclined cutting edge 29 of the cutting cylinder of the plunger comes into contact with the groove 31 around the bottom of the cup 15, it cuts through the cup at this point and begins to separate the bottom 16 of the cup from the sidewall thereof. As the downward movement of the plunger 26 continues, the cutting cylinder 27 cuts further through the cup until finally the bottom 16 of the cup swings downwardly, as shown in phantom in FIG. 3, to open up the bottom of the cup and allow its contents to fall into the mixing container 11. At this point the powdered contents of the cup may be mixed with the liquid contents of the mixing container by shaking the container. During the time the container is being shaken for this purpose, the liquid is prevented from splashing through the open cap by the presence of the plunger. A tight fit is assured between the cutting cylinder 27 of the plunger and the cylindrical side wall of the cup by an inwardly extending annular band 35 at the top of the cup. Preferably, this band 35 is formed from a resilient material so that it remains in yieldable contact with the sides of the plunger cylinder in such a way as to assure a tight fit therewith. The plunger, itself, is prevented from being displaced through the opening in the top of the cap by virtue of the fact that the disc 28 at the top of the plunger is considerably wider than the opening formed in the cap by removal of the removable portion 33. Once the contents of the container are thoroughly mixed, the cap, the cup, and all parts associated therewith may be removed from the container to allow its contents to be dispensed, merely by unscrewing the cap from the neck of the container.

Preferably, the cap 18, the cup 15, and the plunger 26, of this invention, are formed from a relatively rigid and resilient plastic material such as polyethylene or polypropylene. Preferably also, at least the cutting cylinder 27 of the plunger is formed from a relatively hard material such as polypropylene whereas the cup 15 is formed from a relatively soft material such as branched polyethylene to facilitate removal of the bottom 16 of the cup by the cutting cylinder 27.

Having now described the invention in specific detail and exemplified the manner in which it may be carried into practice, it will be readily apparent to those skilled in the art that innumerable variations, applications, modifications, and extensions of the basic principles involved may be made without departing from its spirit or scope.

The invention claimed is:

1. A bicameral package comprising mixing container having a pouring neck presenting a mouth portion, a cup fitting in said neck and adapted to be slidably removed therefrom, said cup having an outwardly extending peripheral flange fitting over said mouth portion, said peripheral flange having a greater diameter than said mouth portion and overlapping the peripheral edge of said mouth portion, a removable and replaceable cap adapted to fit over and mechanically engage said neck removably and replaceably, said cap having a shoulder contacting the flange on said cup and pressing it downwardly toward said mouth portion to form a seal when the cap is fully engaged with said neck, said cap having an inwardly extending ridge portion spaced below said shoulder and forming therewith a retaining recess for receiving the overlapping portion of the peripheral flange of said cup and retaining the cup in the cap when the cap is removed from the neck, and a plunger fitting in said cup and being displaceable toward the bottom of the cup to remove a portion of the cup, said cap having a relatively rigid frangible top section above said plunger and said frangible section being adapted to be broken to permit access to the plunger for displacing the plunger toward the bottom of the cup to remove a portion of the cup and allow the contents of the cup to be mixed with the other contents of the container while the cap is in position on the neck of the container, said frangible section comprising a removable portion having a transverse dimension less than the transverse dimension of the top of the plunger so that the plunger cannot be displaced from the cup through the opening left in the top of the cap by displacement of the removable portion, the top of the plunger having a transverse dimension greater than the inside diameter of the cup for preventing the plunger from being removed from the cup through the bottom of the cup, whereby the cap containing the cup and the plunger may be removed easily from the pouring neck by unscrewing the cap from the neck to allow some of the mixture to be poured from the mixing container and the mixing container may be reclosed by screwing the cap back on the pouring neck and the cup and the plunger retained therein to complete the closure.

2. A bicameral package according to claim 1, wherein the cup comprises a substantially cylindrical side wall and the plunger comprises a cutting cylinder and said cutting cylinder fits tightly inside at least an annular portion presented by said side wall to provide a tight fit between the plunger and the cup when the plunger is depressed with respect to the cup.

3. A bicameral package according to claim 2, wherein one of the side wall of the cup and the cutting cylinder is tapered to provide a tight fit between the plunger and the cup when the plunger is depressed with respect to the cup.

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