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[54] COMPARTMENTALIZED CONTAINER

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[51] **Int. Cl.** **B67d 5/56**

[58] **Field of Search** .....128/218 M, 272; 206/47 A; 220/20.5; 222/129, 136, 142.5, 145, 209, 420

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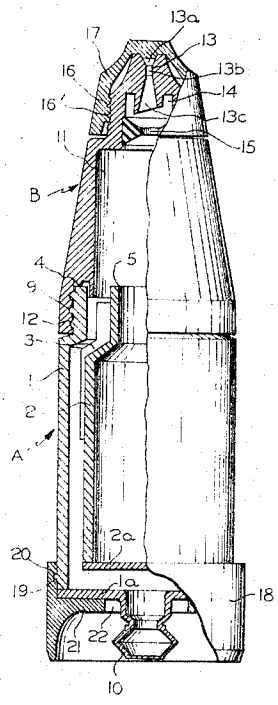
[57] **ABSTRACT**

This invention relates to a compartmentalized container for preservation, mixing and distribution of a plurality of incompatible liquid chemicals or medicaments which must be segregated prior to use. The container has a composite container body consisting of a larger open-topped container having an elastic airchamber extending from the bottom thereof and a smaller open-topped container inserted into an firmly held in said larger container with the mouth thereof approximately in a common plane with the mouth of said larger container. A detachable cap closes the above mouth-plane. A pouring nozzle body having a nozzle head at its top, a reservoir and a hollow mixing space therewithin is detachably connectable to the composite container so as to cover its common mouth-plane in place of the above cap.

6 Claims, 3 Drawing Figures



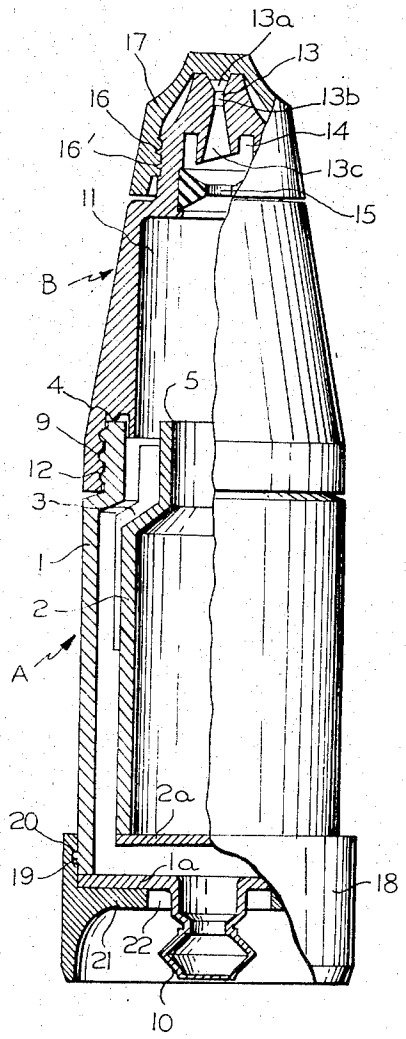


FIG. 1

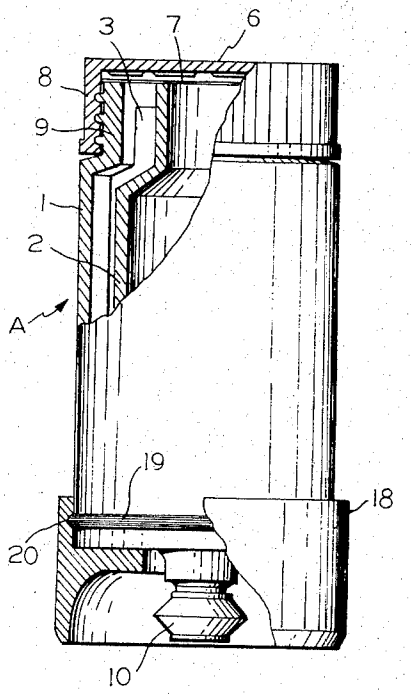


FIG. 2

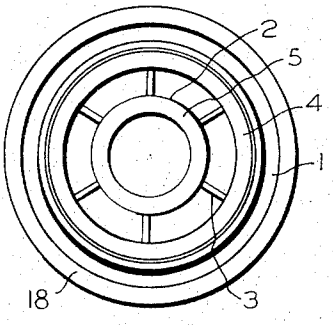


FIG. 3

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COMPARTMENTALIZED CONTAINER

This invention relates to a compartmentalized container, especially which is suitable for safe storage of a plurality of incompatible liquids, for mixing of said liquid immediately before its use and for pouring out said mixed liquids for said use.

Certain medicinal or chemical compositions such as liquid multivitamin preparations or liquid photographic developers are unstable because of the co-existence of incompatible ingredients therein. In many case, effect of a stabilizer added thereto is insufficient to guarantee their quality after storage (ordinarily during several months to 1 year after production).

Accordingly, the best way to assure the quality of such unstable composition is to separate the components from each other in independent containers and to sell them as a combined set to the users. The users buy this and admix these components together at their will whenever it is desired to use the composition.

However, this "set system" is very inconvenient and expensive to both makers and users as regards packing, transporting handling etc.

For example, the maker must prepare a plurality of containers for one preparation and must pack only one set of containers in one case or carton. On the other hand, the user must ready a mixing vessel or the like and also carry out a troublesome mixing procedure before using the composition.

The main object of the present invention is to provide a convenient container and dispenser which serves as well for preservation of the plurality of incompatible liquids which can not co-exist as a mixture for a long time, and also serves as a mixing container and a dispenser for the mixed liquids. More particularly the object of the invention is to provide a novel compartmentalized container in which two or more kinds of liquids can be isolated from each other during storage untill the liquids have reached the customer's hand's, and in which said liquids can be admixed immediately before use. Moreover, the present invention seeks to provide a convenient liquid dispenser. Further objects and benefits of and by the invention will become clear from the following explanation together with the attached drawings.

The objects of the present invention are achieved by a combination of a composite container body consisting of a larger open-topped container having an elastic airchamber extending from the bottom thereof and a smaller open-topped container inserted into and firmly held in said larger container with the mouth thereof approximately in a common plane with the mouth of said larger container, a detachable cap closing the above mouth-plane, a pouring nozzle body having a nozzle head at its top, a reservoir and a hollow mixing space therewithin being detachably connectable to the composite container so as to cover its common mouth-plane in place of the above cap.

In the drawing:

FIG. 1 is a partially sectioned elevation view of an embodiment of the invention showing the container combined with an upper body for mixing and pouring;

FIG. 2 is a partially sectioned elevation view of the container shown in the FIG. 1 in which a cap is threaded on the container instead of the upper body; and

FIG. 3 is a plan view of the container with the cap of FIG. 2 removed.

As shown in the FIGS. 1 – 3, this container consists of three independent parts, namely a lower body or container assembly A, an upper body B, and closure means in the form of a cap **6**, made of suitable materials such as thermoplastic resins respectively.

As is clear from FIGS. **2** and **3**, lower body A is a double-walled container assembly having a larger outer container and within that a smaller inner container. The smaller container **2** is coaxially positioned in the larger container **1** and firmly held in position by a plurality of ribs **3** extending radially from the outer wall thereof to the corresponding inner wall of said larger container **1**. The mouth **5** of the smaller inner container **2** and the mouth **4** of the larger outer container lie in the same plane. Therefore, it is evident that the both mouths **4** and **5** can simultaneously be closed by a cap or lid which can cover such common mouth plane.

For this purpose, the cap **6** is provided with a thread **8** around the inside of the side-wall thereof and the larger container is provided with a corresponding thread **9** around the outside of its upper-wall. The components of the composition are supplied to the two containers **1** and **2** respectively and a gasket **7** as shown in the FIG. **2** can be provided under cap **6**. When cap **6** is threaded onto thread **9** on container **1**, the gasket is seated against the mouths **4** and **5** to seal them air tightly.

The larger container **1** is further provided with an elastic airchamber **10** projecting outwardly from its bottom. Upward compression force on this chamber causes the chamber to collapse and reduces the volume of the container as shown in the FIG. **1** in proportion to its collapse. When this occurs, a portion of the contents of the container is discharged corresponding to this contraction of the chamber at the time of the use when the distributor is inverted from the position shown in FIG. **1**.

The above compartmentalized container can, for example, be prepared by injection molding with suitable thermoplastic materials such as polyvinylchloride, polyethylene or polystylol by the following procedures.

i. At first, a bottomless compartmentalized container including a plurality of spacers **3** is molded.

ii. Secondly, two bottom plates **1a** and **2a** respectively, one larger and the other smaller are molded separately.

The airchamber **10** is simultaneously molded together with the bottom plate **1*a***.

iii. Thirdly, the bottom plate **2*a*** is joined to the lower end of the smaller container by, for example, an ultrasonic welder.

iv. Lastly, the bottom plate **1a** is also joined to the lower end of the larger container similarly.

Alternatively, the two containers are separately molded without bottoms and then they are closed by one common bottom plate having the airchamber **10** internal therewith. In this case, the lower ends of the two bottomless containers are arranged concentrically on the reverse side of the plate **1*a***. According to this modification, the spacer **3** may be omitted because the first container **1** can be fixedly held to the second container without said spacer by the common bottom plate **1*a***.

On the other hand, the upper body B is also a bottomless, upwardly convergent and shell-like hollow body and it has a nozzle head at its upper end and a hol-

low interior constituting a mixing compartment **11** at its middle and lower portions. The nozzle head has an opening **13** therethrough which opens out of the top of said head. A thread **12** is provided on the inner-wall of the lower edge of said upper body so that it can be threadedly engaged with the thread **9** of the larger container in place of the cap shown in FIG. **2**.

The compartmentalized container shown in FIG. **1** can be formed by mounting the upper body B on the lower container A after removing the cap **6** therefrom and by screwing said body B down on the said lower container. It is preferable that the capacity of the above mixing compartment **11** in the nozzle body be between about one-half to two-thirds of the total volume of the liquids contained in the containers **1** and **2** respectively in order to insure ready mixing at the time of the first use and to avoid making the upper body too large.

The nozzle head has therein the pouring opening **13**, a measuring reservoir **14** and an inner-orifice **15** between the reservoir **14** and the mixing compartment **11**. The opening **13** has an upwardly expanded end **13***a*, an intermediate portion **13***b* of uniform diameter and a downwardly expanded opening **13***c* respectively. An extension having the end of opening **13***c* therein projects into the measuring reservoir **14** which lies under and around said opening. The orifice **15** is directly below the above opening **13***c* and is spaced a short distance from the latter. The nozzle head can be covered by a nozzle cap **17** having a thread around the inner side-wall and which can be screwed onto a thread around the outer side-wall of the said head.

The operation of this container and the action of the nozzle head are as follows:

i. The cap **6** in the FIG. **2** is removed.

ii. The upper body B is mounted on the lower body A to form the assembly as shown in FIG. **1**.

iii. The container is inverted from the position shown in FIG. **1**.

iv. The inverted distributor is shaken for a time sufficient to obtain complete mixture and then is reinverted to the position as shown in FIG. **1**. (The above is only at the first use.)

v. The nozzle cap **17** is removed.

vi. The distributor is then inverted as in item (iii). At this time some liquid flows down through the orifice **15** into the compartment **14** and stays in said compartment, but the contents do not flow out through the opening **13** because there is a small space between the horizontal plant of the contents in that compartment and the lower open surface of the orifice (i.e., the bottom surface of the material in the container.)

vii. Then, the airchamber **10** is compressed by a finger. By this compression the air forced out of the chamber **10** contacts the surface of the contents of the container depending on the volume of said air chamber. The pressure of this air forces the liquid to flow out through the orifice **13**. The amount of the liquid thus forced out is determined quantitatively by the volume of said air-chamber.

viii. After the desired amount of the liquid has been discharged, the container is reinverted and recapped with the nozzle cap **17** as in FIG. **1** until it is desired to discharge more of the liquid.

The shape of the opening **13** will have influence upon "dripping" after the airchamber has been released. In general, funnel-shaped outlet and inlet in the opening as shown in FIG. **1** provide a good "drip-proof" nozzle head. In particuler, the tapered outlet is effective for this purpose. According to our experiments, when the finger is removed from the top of the airchamber the remaining liquid in the outlet and the opening **13***a* adjacent to it is immediately sucked into the rear opening **13***c* or into the accumulation chamber **14** through the intermediate opening **13***b*. Thus, such a construction and an appropriate design of the airchamber corresponding to the amount of material desired to be used at any one time will deliver an accurate dose to the users.

After use, the nozzle head is re-capped by the cap **17** and stored erect as shown in FIG. **1** by means of a detachable annular stand **18** which can be engaged with an annular projection **19** around the lower outside-wall of the lower body A, by a corresponding annular groove **20** being provided on the upper inside-wall of said annular body **18** to engage over the projection **19**. The bottom of the lower body A is supported on a horizontal flange **21** which projects inwardly from the middle of the side-wall of the body **18**. The airchamber **10** projects downwardly through an aperture **22** which is formed at the center of said flange. It is clear that this body **18** is also useful as a means to prevent unintentional compression of the airchamber **10**.

As will be clearly understand from the foregoing explanations and drawings, this container is very useful as a preservative container, as a mixer and a dispenser for two or more kinds of liquid incompatible chemicals or medicines. Such incompatible liquids can be safely stored up until they are used by the users, and the user can conveniently admix them immediately before use and can discharge an accurate amount for the desired purpose. One of the most advantageous uses of this container is for liquid multivitamin preparations in which two incompatible vitamins, vitamin B_1 (thiamin) and vitamin C (1-ascorbic acid are necessarily included. With this container these vitamins can be safely stored during the time it takes to get them from the makers to the customers through druggists, and the customers such as housewives can instantly mix both vitamins and also can administer exact doses of said medicine to babies or children.

The invention can include several modifications. One is to construct the container with a common bottom plate as hereinbefore described and the other is to three or four or more containers within the lower body to permit storage of a corresponding number of materials. Another is to extend the periphery of the bottom-plate **1a** so as to form a circular wall instead of providing a separate body **18** shown in FIG. **1**. Therefore, it should be clearly understand that the foregoing explanations and the attached drawings are by way of illustration and not by way of limitation.

We claim :

1. A compartmentalized container for storing, mixing, measuring and dispensing liquids which must be segregated prior to use, which comprises in combination;

a lower body composed of an outer and at least one inner cylindrical container disposed concentrically with respect to each other, said outer cylindrical container having a mouth and a fastening means extending therearound, and an elastic, compressible air chamber projecting outwardly from the bottom wall thereof and communicating with the outer cylindrical container, and a plurality of radially extending ribs extending between the side cylindrical walls of the containers for holding said inner cylindrical container in spaced relationship with said outer container and said inner cylindrical container having a mouth lying in the plane of the mouth of the outer container, a closure means having a fastening means engageable with the fastening means around the mouth of the outer cylindrical container for equally and simultaneously sealing the mouths of both container, and an upper body composed of a vertically stacked combination of a nozzle head, a reservoir for measuring the dispensing liquid and a mixing compartment, said body having fastening means thereon for fastening said body to the mouth of said outer cylindrical container interchangeably with the first closure means to permit inflow of the liquids from the lower body containers into the mixing compartment,

said mixing compartment having a capacity sufficient for effecting admixing of liquids from both containers,

said nozzle head having a liquid conduit therethrough and a top dispensing nozzle at the outer end thereof, a nozzle cap attachable to said upper body for closing said conduit, said nozzle head projecting inwardly into the reservoir with said conduit extending therethrough, and

said upper body having an orifice connecting said reservoir to the mixing compartment.

2. A compartmentalized container as claimed in claim 1, wherein the capacity of the mixing compartment of the upper body is between about half and two thirds that of the lower body containers.

3. A compartmentalized container as claimed in claim 1, in which the bottom portion of the outer cylindrical container has attached thereto an annular cylindrical body for supporting the container and for protecting the outwardly projecting air chamber from being pressed unintentionally.

4. A compartmentalized container as claimed in claim 1, wherein said liquid conduit in the nozzle head has a flared end at least one end thereof.

5. A compartmentalized container as claimed in claim 1, wherein said inwardly projecting portion of the nozzle head is cut obliquely.

6. A compartmentalized container as claimed in claim 1, wherein the capacity of said air chamber is slightly larger than that of said reservoir.

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