United States Patent

Lussier

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[54] DOUBLE CHAMBERED CONTAINER

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[52] **U.S. Cl.** ..... **206/635**, 206/47 A

[51] **Int. Cl.** **A61b 19/02**

[58] **Field of Search** ..... 206/47 A, 63.5; 220/20.5; 215/6; 32/15

[56] **References Cited**

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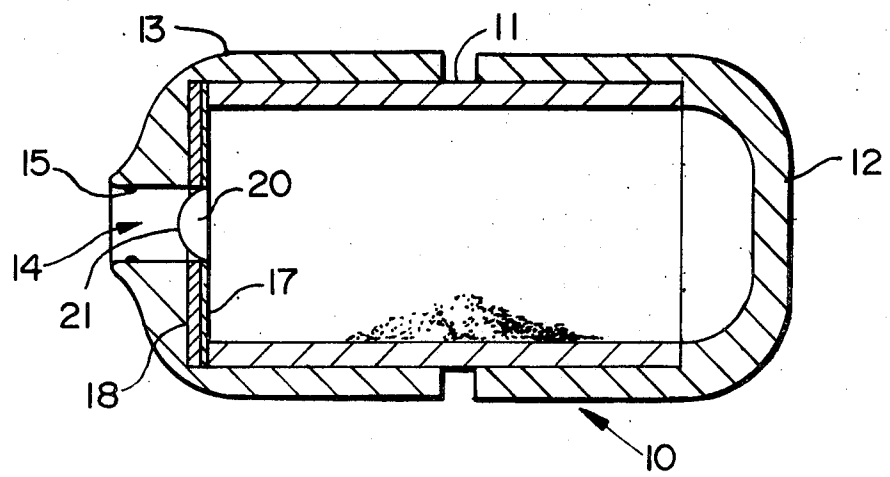
[57] **ABSTRACT**

A double-chambered cylindrical vial for separately containing co-reactive materials is composed of a closed capsule having a fitst storage chamber for one of the co-reactants and a rupturable chamber located adjacent one of the ends of said capsule. The capsule end is characterized by a corridor therein closed to the first chamber by a rupturable wall or membrane. The capsule is activated by inserting into said corridor a pin or piston of sufficient diameter to close the corridor and which ruptures the second chamber thereby expelling all of the contents of said second chamber into the first chamber thus permitting the co-reaction of the materials.

5 Claims, 4 Drawing Figures



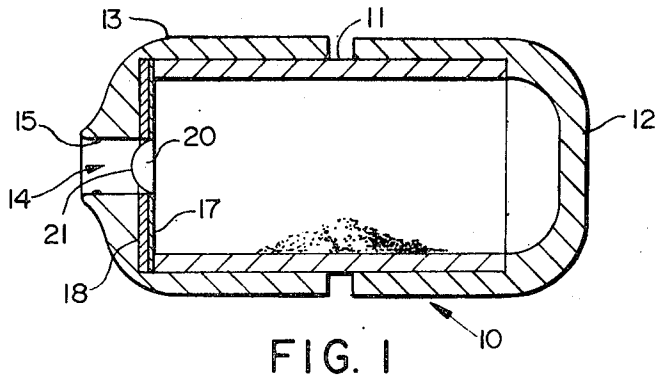


FIG. 1

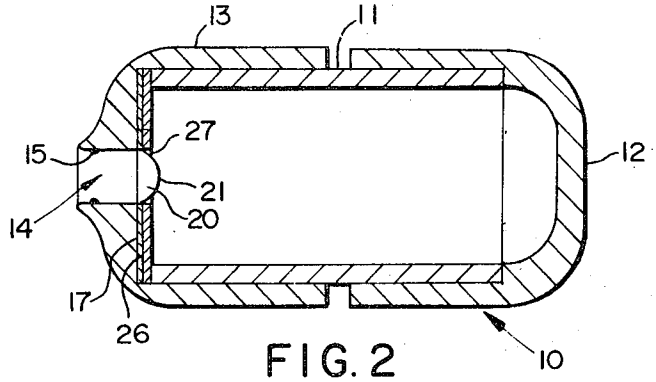


FIG. 2

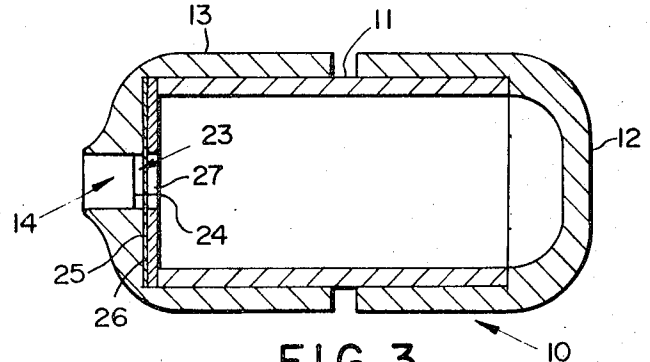


FIG. 3

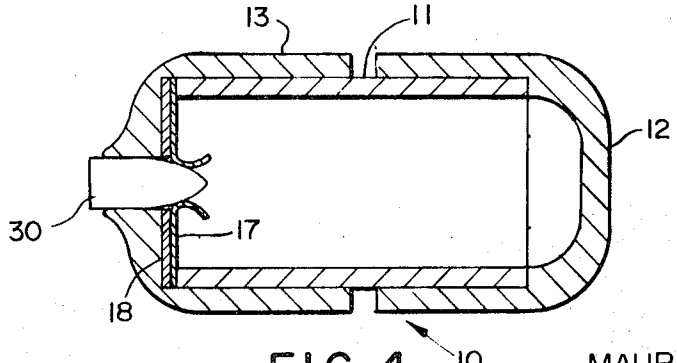


FIG. 4

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DOUBLE CHAMBERED CONTAINER

BACKGROUND OF THE INVENTION

In merchandising various materials, it has become desirable to dispense, in the same container, materials which must be separated from each other until they are to be utilized. Such materials generally have an extended shelf life when not mixed, but which have a relatively short period of utilization after the mixing or reaction has occurred. Such materials include cosmetics, medications, hair dyes, pigments, epoxy adhesives, cleansing solutions, and the like. Also included are dental filling material such as phosphoric acid and zinc oxide and mercury and a silver alloy. In order to premeasure and package such reactants, a number of packages, particularly capsules or vials, have been employed, which include a plurality of chambers to hold the materials separately until it is desired to utilize the materials, at which time the barriers between the chambers are opened by various means and the reactants are allowed to mix. In most of the above-mentioned substances, however, particularly in the case of medicaments and dental filling material, extremely accurate measures of the components must be employed. For example, in the case of dental filling materials, the powder generally comprises about 0.3 gram while the phosphoric acid to be reacted with the powder is less than 0.1 of a ml. A variation in either of these measures of plus or minus 3 percent would render the resulting mixture unsuitable for use.

It is in this respect that the prior art containers are deficient. The construction necessary to provide for the separate storage of the reactants while providing for the ultimate ease of combination and mixture generally fails to insure the dispensing of substantially 100 percent of the one component into the other component. Generally, the configuration and dimensions of the prior art containers trap some of the material, thus preventing adequate mixing. Chambers with sharp corners usually entrap material or a relatively small orifice prevents the ready passage of all of the material from the chamber. From the illustrative figures cited with reference to the dental filling material, it can be seen that the smallest amount retained in one of the chambers would result in an unsatisfactory mixture which would have to be discarded.

A novel container has now been found which is not susceptible to the deficiencies of the prior art.

BRIEF SUMMARY OF THE INVENTION

The present invention is a double-chambered container, preferably in capsule or vial form, closed at both ends, generally cylindrical in shape which defines a relatively large first chamber wherein one of the reactants is contained and which also serves as the mixing chamber. At least one of the cap portions contains a corridor therein to the first chamber of the capsule. The corridor is closed to the second chamber by a rupturable wall of, e.g., plastic film or metal foil such as aluminum foil. The second chamber which generally contains a liquid is located adjacent to the inner opening of said corridor or in the corridor at the end nearer the first chamber. The second chamber is composed of a pillow or tube-shaped structure of, for example, a plastic material.

To actuate the container, a pin or piston is inserted into the corridor of the end cap, puncturing the membrane or film material of the second chamber, expelling the contents of the second chamber into the first chamber where it is then mixed or reacted with the second material. The mixing of the substances is then generally accomplished by agitating the container. In order to prevent the loss of the contents in the container, the pin or piston is of such dimensions that it closes and seals the corridor. A resilient sealing element such as a ring may be located on either the corridor walls or on the pin itself to provide for the most efficient sealing of the corridor. The dimensions of the pin are also selected so that it will penetrate completely through the second chamber, thus, displacing the entire contents of the chamber. To facilitate rupture and to insure the discharge of all of the contents of the second chamber, it is preferred that the wall of the second chamber adjacent to the first chamber be cross-hatched or scored or otherwise weakened to provide a complete opening of said wall.

Since ease of obtaining the mixed materials is also important, preferably, the outer portion of the container is composed of three parts; a cylindrical center portion, and two end caps, all of which are readily detachable for easy access to the contents after they have been mixed. Alternatively, the center cylindrical portion and one of the end caps can be an integral structure with only the remaining end cap detachable. In the alternative embodiment, it is preferred that the end cap containing the corridor be the detachable cap.

BRIEF DESCRIPTION OF THE DRAWINGS

The various features of the invention are illustrated in the accompanying drawings wherein:

FIG. 1 is a vertical sectional view through a capsule constructed in accordance with the present invention.

FIG. 2 is a vertical sectional view showing an alternative embodiment of the present invention;

FIG. 3 is still another embodiment of the present invention in a view similar to FIG. 2; and,

FIG. 4 is a vertical sectional view of a capsule of the present invention showing the means employed to expel the contents of the first chamber.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings, FIG. 1 shows capsule **10** composed of cylinder **11**, imperforate end cap **12** and end cap **13** having corridor **14** therein. Rupturable wall **17** carries thereon a rupturable container in the form of pillow **21** containing liquid **20** and defines one wall of said pillow. Pillow **21** is located adjacent to and opposite said corridor **14**. In the embodiment illustrated, wall **17** is secured to end cap **13** by adhesive layer **18**. Sealing ring **15** is optionally employed to securely position the puncturing means in corridor **14**.

FIG. 2 is an alternative embodiment of the present invention wherein wall **17** carrying pillow **21** thereon is secured within end cap **13** by a tight fitting disc **26** within said end cap and against wall **17**. Disc **26** contains channel **27** through which pillow **21** projects and through which the perforating means would project upon use, destroying the rupturable pillow and expelling the contents thereof. As shown in FIG. 2., pillow **21** faces the second chamber. Alternatively, the pillow could be reversed facing channel **14** as in FIG. 1.

FIG. 3 is still another embodiment of the present invention wherein the second chamber **23** is located in channel **14** and is defined by perforable membrane **24** and perforable wall **25**. Wall **25** which defines the inner wall of well **23** may be optionally secured to end cap **13** by an adhesive, however, in the embodiment shown, it is held in place by a pressfit of disc **26**, preferably of aluminum foil. Disc **26** carries channel **27** of approximately the same dimensions as the well through which the perforating means and the contents of the wall pass upon use of the capsule.

FIG. 4 shows the capsule of FIG. 1 with piercing means **30** inserted into channel **14**, thus rupturing pillow **21** expelling the entire contents thereof into the first chamber, and at the same time, sealing channel **14** completely to insure that none of the contents of the tube is lost during any subsequent mixing operation. The dimensions of the piercing means are also selected to displace the entire contents of the pillow. Thus, as a result of the configuration and location of the second chamber containing the liquid and the dimensions of the puncturing means or piercing means which ruptures the walls of the container and continues its path to displace the entire volume of the container, the contents of the second chamber cannot be trapped within the original container since the volume of the original container is completely replaced by the piercing means. Thus, the present invention provides for more complete and accurate dispensing of the contents of the second chamber into the mixing chamber.

The piercing means is generally composed of a pin or a piston type structure, preferably tapering at its forward edge in order to more easily rupture the pillow. The configuration and dimensions, as stated above, are selected to provide a close tolerance with the channel in the end cap of the capsule through which it travels. Any suitable device may be employed to provide the motive force for inserting the piercing means into the capsule. Thus, the piercing means may be inserted by hand or may be attached to any suitable device for providing the motive power. If additional mixing is to be provided by agitation after two components have been combined, it is preferred that the device which agitates the container employ the piercing means as an integral portion thereof. Thus, the clamp that contains the capsule during the agitation could carry on one of the holders the necessary piercing means so that the capsule could be pierced, the materials expelled, the capsule sealed, and the capsule clamped fer agitation in a single operation.

The material employed for forming the pillow to contain the second reactant is selected depending upon the requirements of the substance it is to contain. Thus, it should be non-reactive to the substance, it should prevent the evaporation or leakage of the substance, and if required, should be air and moisture impermeable. The material must be strong enough to prevent damage or leakage prior to utilization of the container but should also be readily rupturable by the application of the piercing means thereto. As examples of suitable materials mention may be made of relatively thin films of paper, paper laminations, metal, polymeric materials, such as cellulose, polyethylene, polypropylene, nylon, polyvinyl acetate, polyvinyl alcohol, polyvinyl chloride, acrylics, vinylidine chloride, and copolymers thereof, as well as other suitable packaging materials known to the art.

The entire structure of the rupturable container need not be composed of the same material. For example, in FIG. 3 the rupturable container is cylindrical or tube shaped with end portions composed of frangible material while the side walls are the walls of the corridor which would preferably be composed of a rigid plastic or glass.

The size or shape of the rupturable container is not critical. Any size or configuration may be employed so long as it is positioned so that the piercing means travelling through the corridor will puncture and expel the entire contents of the container.

As it will be noted by the drawing, it is necessary that the film wall **17** which holds the rupturable container in position be secured sufficiently against the end wall of the cap. This will be accomplished by adhesively securing the wall to the end cap or by employing a wall of relatively rigid material and crimping it into the corners of the cap. Still another embodiment is illustrated in FIGS. **2** and **3** wherein a disc is forced into the end cap retaining the liquid container in position in the end cap with sufficient strength to prevent dislodgement by the application of the piercing means.

In a preferred embodiment, it may be desirable to place a detachable covering over the end cap to close channel **14** in order to prevent the accumulation of dirt or foreign matter from collecting in channel **14** during the storage of the materials.

In an alternative embodiment, both end caps of the container may contain channels and frangible containers of materials associated therewith. In this manner, piercing means could be employed simultaneously or sequentially and thus introduce into contact three materials within the same capsule.

What is claimed:

1. A container for carrying mutually reactive materials comprising a first chamber, at least a first end cap having a corridor therein, said corridor adapted to communicate with said first chamber and the exterior of said container; a first and second rupturable membrane defining a second chamber therebetween within said corridor; said second membrane next adjacent said first chamber covering substantially the entire end wall of said end cap, said second membrane being held against the end wall of said end cap by a substantially rigid disc in frictional contact with the side walls of said end cap; piercing means adapted to rupture said membranes displacing the contents of said second chamber and expelling said contents into said first chamber; said piercing means further adapted to close said corridor subsequent to rupture of said membranes.

2. The container as defined in claim **1** wherein said container is composed of a cylindrical center portion and a pair of end caps, one of said end caps being impermeable, said end caps and cylindrical center portion arranged in detachable relationship.

3. The container as defined in claim **1** wherein said rupturable membranes are composed of materials selected from the group consisting of paper, metal, cellulose, polyethylene, polypropylene, nylon, polyvinyl chloride, polyvinyl acetate, polyvinyl alcohol, acrylics, vinylidene chloride, and copolymers thereof.

4. The container as defined in claim **1** wherein said first chamber contains a solid and said second chamber contains a liquid.

5. The container as defined in claim **4** wherein said first chamber contains zinc oxide and said second chamber contains phosphoric acid.

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