

[72] Inventor **Michael John Williams**
London, England
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 [73] Assignee **The Amalgamated Dental Company**
Limited
London, England
a British company
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 [31] **35,638/67**

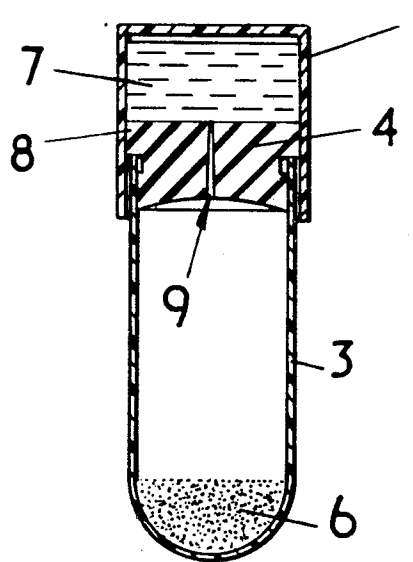
[51] Int. Cl. **B65d 79/00,**
A61b 19/02
 [50] Field of Search..... **206/63.5,**
47(A); 220/20.5(Rubber Plug); 215/6

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Primary Examiner—Joseph R. Leclair
Assistant Examiner—John M. Caskie
Attorney—C. Hercus Just

[54] **CONTAINER**
9 Claims, 3 Drawing Figs.

[52] U.S. Cl. **206/47,**
206/63.5

ABSTRACT: A container for a two-part mixture of the kind having a tubular cap sliding over a tubular body has a plug in the mouth of the tubular body formed with a capillary bore, i.e. fine enough to hold back the liquid housed in the cap until the container is squeezed.



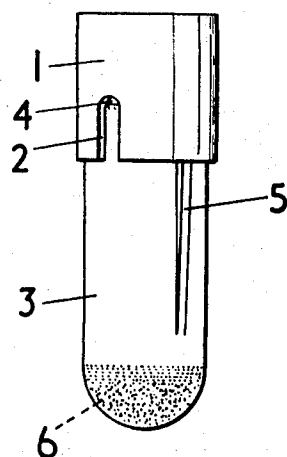


FIG. 1.

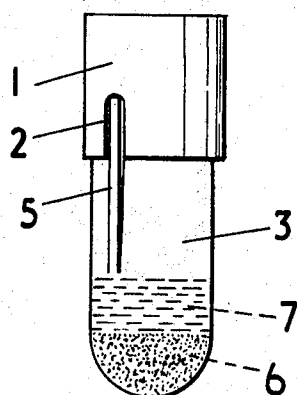


FIG. 2.

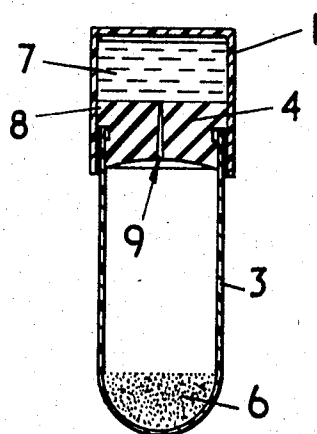


FIG. 3.

INVENTOR
MICHAEL J. WILLIAMS
BY *Herbert Just*
ATTORNEY

CONTAINER

This invention relates to containers for 2-part mixtures, that is to say, mixtures made up of a first and a second portion which are to be kept separate until immediately before use. In particular, the invention relates to containers FOR 2-part mixtures in which one of the aforesaid portions is constituted by a particulate solid and the other by a liquid.

It has already been proposed to provide a container for a 2-part mixture of this kind, comprising a tubular body part and a tubular cap part which is a sliding fit thereon, the body part housing the particulate solid whilst the cap part houses a rupturable capsule containing the liquid. Between the capsule and the inner end of the body part, a member is located which will rupture the capsule when the cap part is pressed down onto the body part and which will permit the liquid contents of the capsule to pass through into the body part. The container can then be shaken to effect an adequate admixture of the two.

Constructions of this kind have certain disadvantages. In particular, it is inconvenient that the liquid portion has to be packaged separately in individual capsules, especially where the liquid is one such as phosphoric acid which tends to attack most of the materials of which the capsule could conveniently be made. Another object is that the container has to be made of a rather large number of parts especially if an adequate seal is to be achieved between the body part and the cap part which slides over it. It is an object of this invention to avoid these various disadvantages.

The invention consists broadly in a container of the kind referred to, comprising a tubular body part, a tubular cap part sliding thereover, and a plug, effectively sealing the inner end of the body part and constructed with a capillary bore so that liquid in the cap part can be expelled into the body part through the bore in the plug by squeezing the body part and the cap part together, the bore being fine enough to prevent, by capillary action, movement of the liquid therethrough until substantial pressure is applied to the liquid, the latter being freely housed in the cap part. Preferably, to achieve an adequate seal between the body part and the cap part, the plug overhangs the inner end of the body part to form a sliding seal against the inner face of the tubular cap part. Unlike prior constructions using a liquid-tight diaphragm to retain the liquid in the cap part, it is the aforesaid seal in the container of the present invention in conjunction with said capillary bore which stops the liquid from leaking during storage.

It is preferred that the cap part and the plug should be shaped so that, upon the cap part being moved fully down, substantially all the cap part contents must be expelled into the body part. That is to say, the head of the plug should conform with the interior end wall of the cap part. Thus, the plug may have a flat top and the cap part may also have a flat top surmounting a cylindrical side wall. However, this is not invariably necessary, as the cap contents will normally include a pocket of air.

The plug will normally be of a rubbery material which will of course be chosen for its resistance to attack by the capsule contents. Polyvinyl chloride is particularly suitable in the case of those liquids, including phosphoric acid, which will not attack it or leach out plasticiser. Other suitable rubbery materials include the various synthetic rubbers such as butyl rubber, nitrile rubber, silicone rubber or any resilient material not attacked by the liquid to be sealed. The bore in the plug may advantageously be tapered, expanding in the direction of the body part. The optimum dimensions will vary with the viscosity and wetting characteristics of the liquid to be sealed but generally the bore diameter will not exceed 1 mm. in the case of a uniform bore, or 0.75 mm. at the narrow end in the case of a tapered bore. Preferably in the latter case the narrow end has a diameter not exceeding 0.5 mm., suitably 0.1—0.4 mm. being particularly suitable, a taper angle (the angle included in an axial section of the bore) of 2—10°, especially 4—8°. In length the bore (and correspondingly the plug) will generally be at least 3 mm. but less than 10 mm. Where the container is relatively large, say 2 cm. or more in diameter, it will generally be found more satisfactory to make the plug of stiffer material

or to counterbore it, rather than to allow a proportionate increase in length of the capillary bore.

The invention has particular reference to the preparation of dental cements for fillings. In this case, the liquid part may be phosphoric acid, when the solid part will normally be a siliceous material forming a cement with the phosphoric acid. Other possible combinations include phosphoric acid and zinc oxide based cement components, mercury and silver/tin dental amalgam components, and synthetic resin mixtures. In the latter case the powder may be the resin or a hardener therefor, and the liquid may respectively comprise a solvent or a liquid resin. However, such systems are well known in themselves and do not per se form a part of this invention. The container may be of suitable size to house say up to 1 gr. of the powder and a fraction of a cubic centimetre of the liquid.

To facilitate the operation of expressing the liquid portion from the cap part into the body part, the body part may be formed with a fine air hole, being of course not so large as to permit loss of particulate solid contents. This hole may be in the side wall of the body part. The outer end of the body part will of course be closed, suitably by an end wall which may be integral with the side wall of the body part by being formed integrally therewith or by being cemented thereto. To prevent the premature application of pressure to the container, it is preferred that the containers should be packaged individually or in groups held in their respective locations by a vacuum-formed cover sheet of plastics material. Alternatively or in addition the body part may be formed with a raised stop to engage the adjacent end of the cap part, thus preventing premature pressurizing of the liquid contents, the cap part being formed with a slot or channel which will clear the stop when the cap part is correspondingly orientated.

The body and cap parts may be made of any chemically and mechanically suitable material, the nature of such material forming no particular part of the invention. Various kinds of plastics material such as polypropylene, impact resistant polystyrene, gelatine, glass or even (where not liable to attack) metal may be used.

When using a container according to the invention, after the cap part has been pressed farther onto the body part to expel the contained liquid through the capillary bore, the still-closed capsule may be shaken by machine to mix the contents thoroughly. Such machines are generally available e.g. in the dental profession. It is an important advantage of the invention that the mixture in the capsule can be shaken directly, without e.g. having first to pick out pieces of fractured diaphragm.

The invention will be described further with reference to the accompanying drawings, of which:

FIG. 1 is a front view of a filled but unused container;
FIG. 2 shows the squeezed container ready for shaking; and
FIG. 3 is a vertical sectional view of FIG. 1.

The container comprises a flat-topped hollow cap 1 whose side wall at its free end is axially slotted as at 2. The cap fits snugly over a tubular cup-shaped body 3 whose open end, inside the cap 1, is closed by a plug 4. In FIG. 1, a portion of this plug can be seen through the slot 2 and the transparent or translucent wall of body 3. A rib 5 is formed extending axially along the outside wall of body 3 and its upper end serves as a stop engaging the opposed end of the cap 1. A powder or paste 6 is housed in body 3 whilst a liquid 7 is housed in the cap 1. Liquid 7 is sealed in the cap by a flange 8 (FIG. 3) at the top of plug 4, which is an interference fit within the cap.

When it is required to expel liquid 7 into the body 3 to mix with the contents 6, the cap 1 and body 3 are turned relatively to register the rib 5 with the slot 2. It will be appreciated that more than one rib 6 and correspondingly more than one slot 2 may be provided, each rib of course registering with a slot when the cap is properly orientated. This now permits the cap to be pressed down farther over the body 3, as illustrated in FIG. 2. A tapered capillary bore 9 in the plug 4 conveys the liquid 7 into the body 3, this bore being, in one example 5 mm. long, 0.25 mm. diameter at its narrow end and 0.75 mm. diameter at its wide end, in the body 3.

In filling the illustrated container the paste or powder is filled into the body part and the plug fitted. The liquid is filled into the inverted cap part and then the inverted body part is pushed home until the free edge of the cap part engages the stop (rib) 5. It is an advantage of this construction that the slot 2 allows air to escape from the cap 1 as the plugged body part is pushed in, upto the point that the flanged head 8 of the plug reaches the inner end of the slot. Of course the slot 2 must not be so long that the head 8 cannot seal the cap part 1. The slot 2 could if desired be bridged over to form a channel, and/or strengthening ribs may be formed on the cap part 1.

I claim:

1. A container for a two-part mixture comprising a tubular cup-shaped body part housing a first part of said mixture and a tubular cap part having a sliding sealing fit on the end of the body part opposite the closed end thereof and housing a second liquid part of said mixture, said body part being sealed at its inner end by a plug formed with a normally open capillary bore through which said liquid part can be pressed into said body part.

2. A container according to claim 1 wherein the plug overhangs the inner end of the body part to form a sliding seal

against the inner face of the tubular cap part.

3. A container according to claim 1 wherein the bore is of a constant diameter not exceeding 1 mm.

4. A container according to claim 1 in which the inner end surface of said cap part and outer end surface of said plug are of complementary shapes.

5. A container according to claim 1 wherein the body part is formed with a raised stop positioned to engage the adjacent end of the cap part in the as-filled position of the part, and the cap being formed with a slot which will clear the stop when the cap part is correspondingly orientated.

6. A container according to claim 1 wherein the bore is tapered with its narrowest end facing the cap part.

7. A container according to claim 6 wherein said narrowest end of the bore has a diameter not exceeding 0.75 mm., preferably not exceeding 0.5 mm.

8. A container according to claim 6 wherein said taper angle is between 4 and 8°.

9. A container according to claim 6 wherein the taper angle is between 2 and 10°.

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