Oct. 7, 1958 P. W. McCONNAUGHEY 2,854,977

MIXING AND DISPENSING DEVICE

Filed June 15, 1956

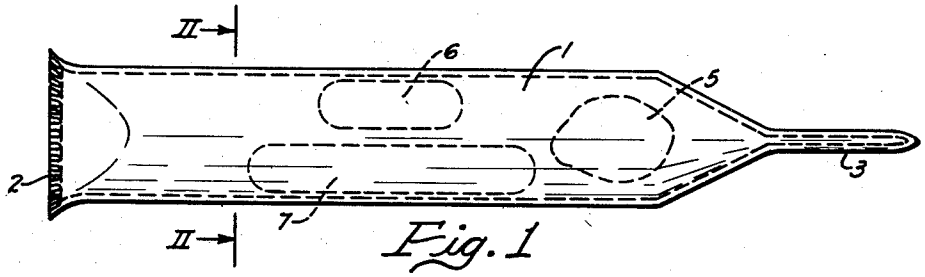


Fig. 1

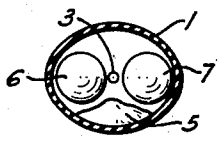


Fig. 2

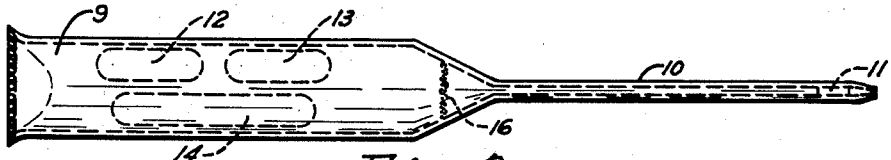


Fig. 3

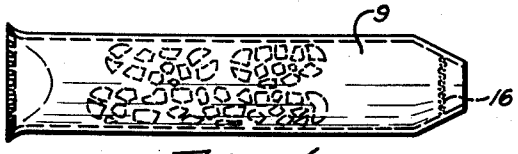


Fig. 4

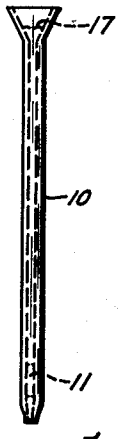


Fig. 5

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MIXING AND DISPENSING DEVICE

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Application June 15, 1956, Serial No. 591,670

1 Claim. (Cl. 128—272)

This invention relates to syringe type devices in which different materials can be mixed before they are ejected.

In many cases it is desirable to use an unstable solution, which is one that deteriorates to such an extent in a relatively short time that it cannot be prepared and sold as a finished product for future use. In other words, such a solution should be used soon after it is prepared. As used herein, the term "solution" refers to a liquid or a freely flowing granular material.

It is among the objects of this invention to provide a simple and inexpensive device in which the ingredients of an unstable solution can be stored separately and in stable condition until needed, in which the separate ingredients can be quickly and easily mixed together to form an unstable solution, and from which such a solution then can be easily ejected.

In accordance with this invention, a resilient storage tube, which is closed at one end, has a delivery tubule at the opposite end. Inside of the storage tube is a frangible ampoule containing a predetermined material. The tube also contains another predetermined material, either in another ampoule or loose. When the ampoule or ampoules are broken by pressure applied to the storage tube, the materials therein are mixed together to form an unstable solution, which then can be ejected from the storage tube by simply compressing the tube. The tubule can be used like a syringe needle, or it can be filled with the solution and then disconnected from the storage tube and used in testing for certain constituents of fluids.

The invention is illustrated in the accompanying drawings, in which

Fig. 1 is a side view of my device.

Fig. 2 is a cross section taken on the line II—II of Fig. 1;

Fig. 3 is a side view of a modification;

Fig. 4 shows the storage tube of Fig. 3 after the ampoules therein have been broken and the tubule removed; and

Fig. 5 shows the tubule filled with solution that it received from the storage tube.

Referring to Figs. 1 and 2, the body of the mixing and dispensing device is a flexible tube **1**, similar to a toothpaste tube, but it also is resilient enough to return to its open form after it has been squeezed. One end **2** of the tube is closed by pinching the opposite sides together and sealing them in any suitable manner. The tube most suitably is formed from a polyethylene plastic, and preferably is oval in cross section. The end of the tube opposite its sealed end is tapered and joined to the inner end of a needle-like tubule **3**, which may be plastic integral with the tube, or a hollow metal needle suitably fastened to the tube.

Inside of the storage tube **1**, there are two or more materials which form the ingredients for an unstable solution that it is desired to dispense from this device. One of the ingredients **5**, either liquid or solid, may be loose in the storage tube, provided the outer end of the tubule is closed. The remaining ingredient or ingredients are stored in one or more frangible ampoules **6** and **7**, inside of the tube. The advantages of storing chemical reagents in glass ampoules for stability are well known. If one of the materials is water, it may be preferable to store it loose in the flexible storage tube so that if it freezes, it will cause no breakage as it might if it were in a glass ampoule.

When it becomes desirable to use the unstable solution, the solution is prepared by squeezing or bending the storage tube to break the ampoules inside. The materials thus released from the ampoules are then mixed with any loose material in the tube by shaking the device or by rapidly squeezing and releasing it between the fingers. After the ingredients of the solution have been thoroughly mixed, the solution can be dispensed or ejected from the device by simply squeezing the storage tube. Of course, if the outer end of tubule **3** is sealed, it will have to be opened first.

As an example of the way in which this device can be used, it can be employed in the preparation of solutions for impregnating paper discs in a fluoride spot detector. By impregnating the discs with the newly prepared solution immediately before sampling, a higher sensitivity is obtained as compared to the method in which a washed and dried filter disc is used. Also, this device can be used in the preparation of chromic acid mist papers in the field, in which the active, unstable reagents (s-diphenyl carbazide and phthalic acid anhydride in alcohol glycerine solution) could be stored separately until test time. Under present production methods, such test papers have a storage life of only six months. Another example of the use of this device is for testing benzene and the like by a solution of sulphuric acid on silica gel and paraformaldehyde sand.

It will be seen that this device is suitable for preparing small amounts of an unstable solution on the spot without going through several meticulous operations. Of course, the device is used only once and then discarded.

In the embodiment of the invention shown in Figs. 3, 4 and 5, the unstable solution that is prepared in the resilient storage tube **9** is not dispensed from the entire device, but is ejected from the tube into the integral tubule **10** to fill the latter. The outer end of the tubule is open, but it contains a porous plug **11** which will hold the solution in the tube long enough for it to be used. The storage tube contains two or more ingredients for an unstable solution, with one or more of the ingredients sealed in a frangible ampoule. Three ampoules **12**, **13** and **14** are shown in Fig. 3. Due to the use that is to be made of this particular device, the solution materials are generally granular. As in the first embodiment of this invention, the materials are released from the ampoules by breaking them and then are mixed together in the storage tube. After an unstable solution has been produced in this manner, it is poured or squeezed through a screen **16** near the outlet end of the mixing tube in order to keep any articles of glass from entering the tubule, which has a larger internal diameter than tubule **3** in Fig. 1. After the tubule has been filled with the solution, the device is held in a vertical position with the tubule at its lower end, and then the tubule is removed from the storage tube by severing the tapered end of the plastic tube. This can be done easily with scissors or a knife. The tubule filled with the unstable solution **17**, as shown in Fig. 5, can then be used for testing fluids which are passed through it in a well-known manner. By a change of color or other indication, the solution will show the presence of the element that is being detected in the fluid.

With this invention, a solution can be prepared at any itme under any conditions. In the meantime, however, the ingredients for the solution are maintained sepa-

rated. The ampoules containing those ingredients are protected from breakage to a large extent by the plastic tube in which they are housed. When two or more ampoules are stored in the same tube, it is desirable to prevent them from possibly striking together hard enough to break, by protecting each ampoule with a surrounding plastic net as disclosed in my copending patent application, Serial Number 591,668, filed June 15, 1956.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claim, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

In combination, a resilient storage tube closed at one end, an open tubule projecting from the other end of the tube, a porous plug in the outer end of the tubule,

a frangible glass ampoule in said tube containing a predetermined material, and another predetermined material in said tube adapted to be mixed therein with the material from the ampoule after the ampoule has been broken by pressure applied to the storage tube, the tubule being separable from the storage tube after being filled therefrom with the mixed materials, whereby a fluid can be passed through the filled tubule in contact with the material therein.

References Cited in the file of this patent

UNITED STATES PATENTS

2,568,915	Friedman	Sept. 25, 1951
2,610,627	Watt et al.	Sept. 16, 1952
2,690,179	Fox	Sept. 28, 1954
2,717,598	Krasno	Sept. 13, 1955
2,769,444	Henderson	Nov. 6, 1956