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R. E. MOULE

2,290,348

CONTAINER

Filed March 6, 1940

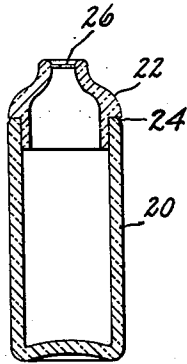


Fig. 1

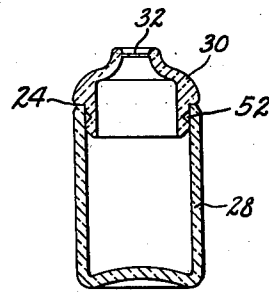


Fig. 2

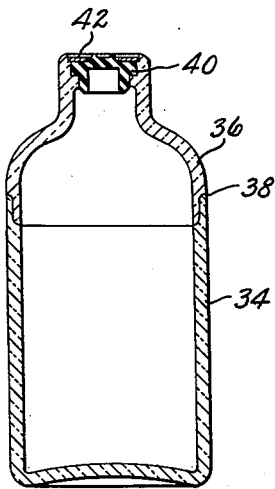


Fig. 3

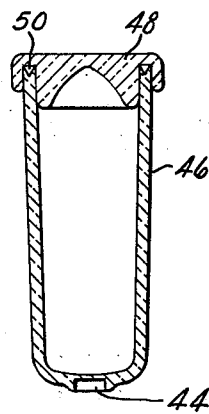


Fig. 4

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CONTAINER

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1 Claim. (Cl. 128—272)

This invention is directed to containers and more specifically to plastic containers which are resistant to the dissolving action of solutions.

An object of the invention is to provide a container which may be formed from a plastic material and which is substantially non-breakable, said container being unaffected by water and water solutions of various chemicals.

In carrying out the above object it is a further object to form the container from a plastic material which is acid-proof, one of said materials being known as polystyrene, which chemically is defined as poly-vinyl-benzene.

A further object of the invention is to provide an ampule for use as a pharmaceutical carrier wherein solutions sealed therein may be preserved over long periods of time due to the fact that the container material is insoluble in solutions contained therein.

In carrying out the above objects it is a further object to provide a diaphragm in the container which may be easily pierced by a hypodermic needle.

A still further object of the invention is to provide an ampule made from plastic material which may be dyed or pigmented whereby the pharmaceutical preparation contained therein may be identified by the color of the ampule or by the combination of colors formed by the dye in one portion of the ampule and pigment in another portion thereof.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of one form of the present invention is clearly shown.

In the drawing:

Figs. 1 through 4 illustrate various types of containers which may be used as ampules.

In medical work there has long been a need for containers for parental solutions, serums, virus containing solutions, etc., which are substantially non-breakable and which due to their resistance toward any dissolving action of the drugs contained therein are substantially insoluble in the drugs thereby making possible long periods of storage in the containers without alteration of the pharmaceutical properties of the preparations contained therein. Such containers are commercially referred to by the profession as ampules and have heretofore been formed from glass wherein the glass bulb or tube after filling has been drawn out in a flame to a long neck which when the contents of the

ampule is to be used is filed and the neck is removed, thereby permitting entrance to the ampule by a hypodermic needle or the like. Glass ampules of this character are difficult to handle and often when the neck is not broken off properly cause waste of the contents thereof and possible injury to the operator. Furthermore, it has been found that pharmaceutical druggists who prepare serums and the like find it impossible to store many of said serums in glass ampules over any extended period of time due to the dissolving effect of the solution of the serum on the glass of the ampule wherein the glass dissolves in the solution, making the same alkaline in character and in many cases ruining the serum for subsequent use. It has therefore been past practice to only prepare relatively small quantities of serum at a time so as to make sure that said quantity is used within a given period whereby dissolution of the ampule is prevented to some extent.

I have found that an ampule formed from plastic material is particularly suitable for work of this character since plastic material, preferably polystyrene, is insoluble as far as tests can determine in solutions of serum and therefore serum may be stored therein without effect thereto over long periods of time. Further polystyrene is relatively non-breakable when compared with glass ampules. That is, an ampule formed from polystyrene may be carried without any danger of breakage and due to the composition thereof these ampules do not require drawn out neck portions which tend to make the glass ampules even more fragile. In the present instance I have found it possible to make an ampule from polystyrene or other plastic material wherein a portion of the ampule is molded to include a thin diaphragm, which diaphragm may easily be pierced, thereby permitting entrance to the container without the necessity of breaking off a neck portion. Further, I have discovered the ampules are easily dyed or pigmented whereby the contents thereof may be accurately designated by the color of the ampule so that in the event that the labels or original cartons including the designation of the contents of the ampule are lost it is possible, by referring to a code chart, to determine exactly what preparation is included in an ampule of a definite color.

When filling ampules with certain serums it is necessary to sterilize the interior thereof by means of a phenol solution, which solution does not attack plastics, such as polystyrene, after which the preparation is filled into the ampule

and a closure is effected as will be described hereinafter. With certain serums, however, sterilization thereof by means of heating must be utilized and this method of sterilization is carried out after the filling of the ampule and sealing thereof.

The drawing illustrates four of the many forms of ampules which may be used to contain pharmaceutical preparations such as serum and the like.

Fig. 1 shows a cylindrical cartridge type of ampule having a body portion 20 and a breast-shaped cap portion 22. The body portion 20 is filled with serum or other drug and then the cap is forced into place and a solvent for the plastic is preferably painted around the undercut portion 24 of the body. This solvent tends to cement the cap 22 to the body 20 and in fluid tight relation therewith. Suitable solvents may be chosen from the class of cyclic compounds such as benzene, toluene, xylene, dioxane, etc. A puncturable diaphragm 26 is provided in the cap portion and is molded as an integral part thereof.

Fig. 2 shows another type of ampule including a body portion 28 and a breast-shaped cap portion 30 which includes therein a diaphragm 32.

Fig. 3 shows still another type of ampule wherein a body portion 34 and a cap portion 36 are utilized and are cemented together at 38. After filling, a diaphragm member 40 is pressed into the entrance of the portion 36, said diaphragm member 40 being made of rubber. On top of the rubber portion a washer 42 is pressed into place and preferably cemented to the portion 36, the washer 42 being made from the same plastic material as the remainder of the container or may be a press fit metal ring, in which case it is possible to dispense with the cementing step. In this instance a needle may be pressed through the rubber such as is common practice today in certain types of serum containers wherein a rubber stopper is used. In this embodiment, however, the container itself is substantially non-breakable and includes the many other advantages of a plastic ampule.

Fig. 4 is another type of ampule wherein a diaphragm 44 is provided in the breast-shaped body portion thereof. A cap 48 is used merely as a closure and is joined to the body 46 by means of a solvent which is placed in an undercut groove 50 on the body portion 46.

The use of solvents to seal the container is often unnecessary and other expedients may be resorted to. Referring to Fig. 2, it will be noted that the cap portion 30 includes an undercut portion 52 which acts as a fluid tight seal when the serum within the container is sealed therein. The serum acts as a capillary seal in the portion 52 to effect the fluid tight joint.

In many instances the pressing of the cap portion into the body portion is sufficient to effect the fluid seal and in some cases the seal may be effected by means of heat.

I prefer to use polystyrene as the plastic ma-

terial from which these ampules are fabricated. Polystyrene is known technically as poly-vinyl-benzene, and is particularly desirable due to its consistency and its effective resistance toward dissolution in water, saline and/or acid solutions, etc. Obviously other materials may be used, such as cellulose acetate, methyl methacrylate and other well known plastics. These plastics may be molded into the containers of the desired shape and should be carefully selected for the particular uses in accordance with their insolubility in the solutions which are to be contained therein.

While the disclosure herein given is directed in the main to ampules, containers formed from plastic materials, such as polystyrene have a wide variety of uses. For example, it has been found that hydrofluoric acid does not attack polystyrene. Therefore, this material forms an ideal container for such acid. Heretofore it has been necessary to store the acid in paraffin bottles which under summer heat conditions soften and deform thereby causing a laboratory hazard. Polystyrene containers, on the other hand, do not deform or soften under any normal conditions and being transparent make it possible to see the volume of acid within the container. Likewise mineral acids, such as sulphuric acid, hydrochloric acid, nitric acid, phosphoric acid may be stored in plastic containers formed from polystyrene or other suitable plastic materials.

Another use for which these plastic containers may be used is in conveying pipes and tubes for materials of the type of hydrofluoric acid which can not be contained in conventional materials. Polystyrene can be easily fabricated into tubular material which can be used as conduits for acids around plants and laboratories. In other words, the invention is not limited in scope but may be used in any type of container where a substantially non-breakable material is required and where material is required which does not dissolve in the chemical constituents being contained therein.

While the form of embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claim which follows.

What is claimed is as follows:

A heat, collapse and solvent, resistant ampule for pharmaceuticals and similar preparations intended to be dispensed by hypodermic syringe, comprising: a rigid hollow body member composed of polystyrene, a rigid cap member formed of polystyrene and integrally hermetically bonded to said body member and a small thin polystyrene diaphragm formed as an integral wall portion of one of said members and having a thickness such as to be susceptible of facile puncture by the needle of a conventional hypodermic syringe to enable withdrawal of the contents of the ampule through said wall portion without severance of said cap and body members.

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