

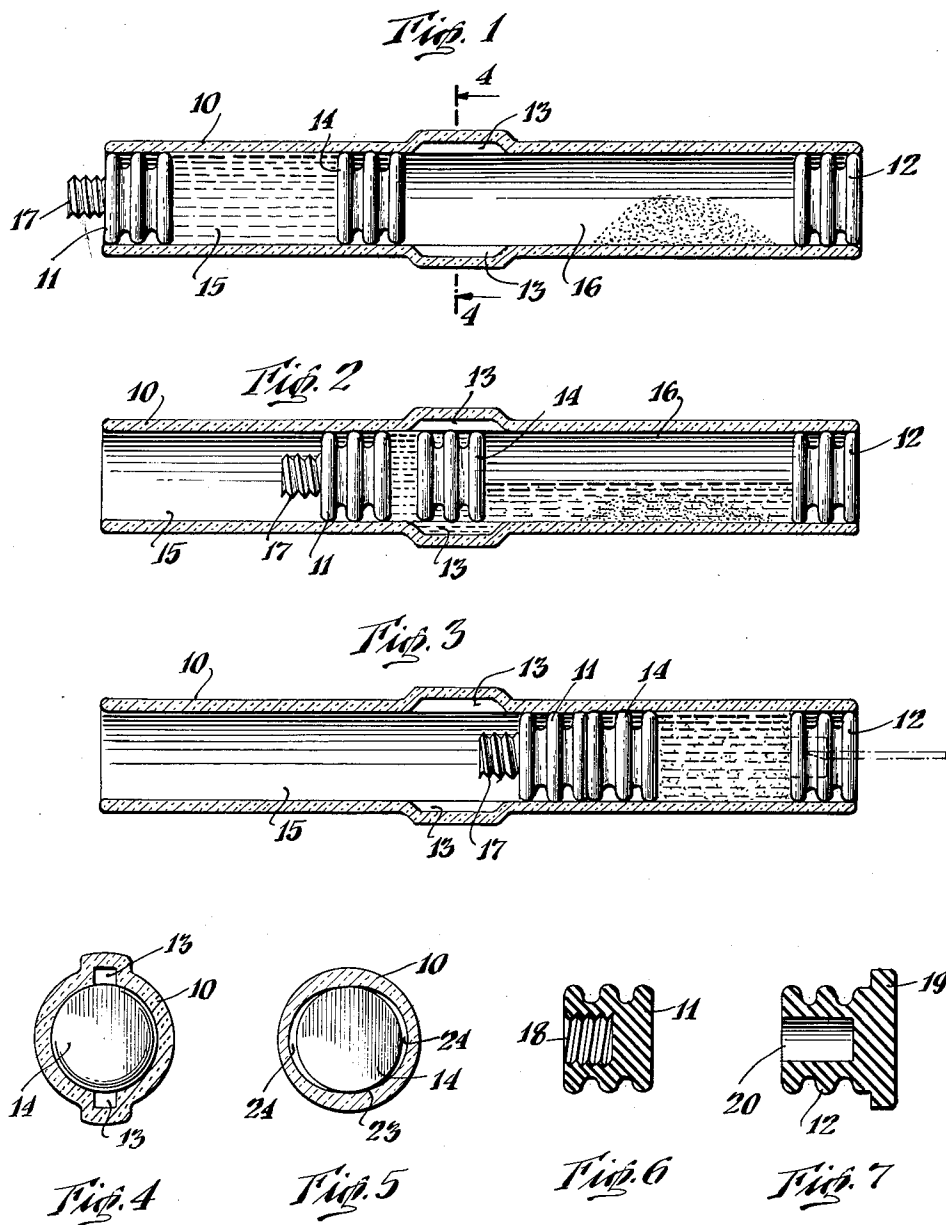
Sept. 13, 1955

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2,717,601

SYRINGE AMPULE

Original Filed Aug. 10, 1949



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1

2,717,601

SYRINGE AMPULE

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Original application August 10, 1949, Serial No. 109,430.
Divided and this application March 16, 1951, Serial
No. 216,058

4 Claims. (Cl. 128—272)

This invention relates to a structurally and functionally improved ampule for use as part of a hypodermic syringe assembly; the present application being a division of the prior application for patent filed in my name under Serial Number 109,430 on August 10, 1949, now Patent No. 2,549,417 dated April 17, 1951.

It is an object of the invention to provide an improved ampule in which diluent and medicament may be maintained in sterile condition until it is desired to perform an injection; the creation of the solution at that time being achieved with minimum effort and expenditure of time.

A further object is that of furnishing ampule structures capable of economical manufacture by quantity production methods and which ampules may be readily charged with diluent and medicament either manually or by machines.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating practical embodiments of the invention and in which:

Fig. 1 is a sectional side view of one form of ampule and showing the same in an initial and charged condition;

Fig. 2 is a view similar to Fig. 1 but illustrating the initial step in the manipulation of the ampule;

Fig. 3 shows the position which the parts assume during the final stages of their manipulation;

Fig. 4 is a transverse sectional view taken along the lines 4—4 and in the direction of the arrows as indicated in Fig. 1;

Fig. 5 is a section of an alternative design;

Fig. 6 is a sectional side view of a piston stopper which may be embraced in the assembly; and

Fig. 7 is a similar view of a closure stopper which may also be included in that assembly.

In these views the numeral 10 indicates a tubular ampule body preferably formed of glass although other materials might, in certain instances, be employed. As shown in Figs. 1 to 3 one end of the ampule is closed by a piston type stopper 11; the opposite end thereof being closed by a stopper 12. Between its ends the ampule body is formed with a pair of axially extending grooves 13. These are clearly shown in Fig. 4; it being understood that a greater or lesser number of these grooves might be employed if desired. A partition stopper 14 is mounted within the bore of the ampule and in advance of the grooves 13.

In this manner compartments 15 and 16 are provided between stoppers 11 and 14 and 14 and 12. Compartment 15 receives a diluent and compartment 16 the medicament which will ordinarily be in the form of a dry powder, crystals, tablets, etc., etc. Compartment 15 should be of smaller capacity than compartment 16. In fact, the central zones of grooves 13 may be to the left of the center of the device as shown in Figs. 1 to 3.

Stoppers 11, 12 and 14 are conveniently formed of rubber and ridged. Obviously, where permissible, they might be formed of other material. Stopper 14 may be solid. Stopper 11 may be provided with an outwardly extending protuberance 17. This may be screw threaded

2

for engagement with a correspondingly threaded end of an actuating stem (not shown). If desired, the threads might be eliminated to provide for a slip fit between these parts. Otherwise as shown in Fig. 6 the stopper might be formed with a threaded recess 18 to engage the threaded end of an actuating stem. Stopper 12 may, as shown in Fig. 7, be formed with a head 19. In any event, it should be provided with a recess 20 or be otherwise constructed so as to be capable of being readily penetrated by the inner end of a needle.

An ampule of this type may be used with syringes or barrels of various designs. For example, a holder mounting a double pointed needle may be employed as shown in United States patent to Steuer, 1,709,691, of April 16, 1929. Under certain circumstances the ampule may be employed in connection with a barrel having a thrust or post portion as shown in United States patent to Hall, 1,848,711, of March 8, 1932. However, it is contemplated that ordinarily an ampule embodying the present teachings will not be utilized with an assembly of the latter type. For this reason the operation of the unit will be described in conjunction with the structure of a barrel similar to that of Steuer. In any event an actuator which may take one of numerous different forms is preferably employed.

Thus, a physician desiring to use the unit will apply an actuator to stopper 11. Thereupon he will exert a thrust upon that stopper. The ampule at the end containing stopper 12 may engage with the end portion of a needle-mounting syringe, as shown for instance, in the above-cited patents. Compartment 15 being filled with liquid diluent, which is substantially incompressible, it follows that such thrust will be imparted to stopper 14 which will therefore shift to the right as in Fig. 1 in substantial synchronism with the corresponding movements of stopper 11. The length of the by-pass grooves 13 being greater than the width of stopper 14, it follows that that stopper will shift for a distance such that the entrance and exit ends of these grooves extend beyond opposite stopper faces. When this occurs, stopper 11, under continued thrust, will project to displace the liquid through the grooves 13 into compartment 16. Either previously or at this time a hollow needle may have pierced stopper 12. With such piercing, air may vent.

The shifted position of the parts has been shown in Fig. 2. When stoppers 11 and 14 are moved into contact substantially all of the diluent will have been displaced to the medicament compartment. The ampule should now be agitated so that a proper solution is established within compartment 16. With continued thrust against stopper 11, stopper 14 will move into this compartment. Thereupon the needle may be cause to penetrate the epidermis. Continued thrust upon stopper 11 will cause this stopper as well as stopper 14 to move as a unit in the manner shown in Fig. 3 to expel the solution through the cannula which has pierced stopper 12. The first named stoppers will continue to move until the entire solution has been expelled from compartment 16.

If it is desired to employ a structure other than the grooves, the central area of body 10 might be somewhat compressed so that an oval or elliptical shaped passage is presented. This has been indicated by the numeral 23 in Fig. 5. As is apparent when stopper 14 enters this portion of the ampule incident to thrust being exerted upon stopper 11, that stopper 14 may distort somewhat as has been indicated in Fig. 5. However, it will not be deformed to an extent such that it completely fills the bore of the ampule. Therefore, passages 24 will exist between the inner face of that bore and the edge of stopper 14 through which the diluent may flow to the medicament compartment.

Again in this form of structure the length of the dis-

torted or oval portion of the bore will be greater than the width of stopper 14. Therefore, liquid will transfer from compartment 15 as stopper 11 is moved to compartment 16. Only thereafter will stoppers 11 and 14 contact and shift as a unit in order to eject the solution from compartment 16. In this form of structure, the end portions of the oval configuration providing the passages 24 in effect furnish grooves or by-passes for the flow of liquid.

As will be apparent, units constructed in accordance with the present teachings might also be employed free from association or combining with a syringe structure. In other words a physician or other user might—upon desiring to make an injection—simply place a needle in a position where it pierces stopper 12 as indicated in Fig. 3. So positioned it would serve as a vent. The ampule or vial might now be disposed in a vertical position with the pierced stopper extending upwardly. By any suitable implement, stopper 11 could be projected to cause stopper 14 to be shifted in the manner aforedescribed and to cause a flow of diluent through the by-pass or passes into compartment 16. During this movement of the parts, air would be vented through the pierced stopper 12. Now by agitating the ampule or vial a proper solution would be prepared. Under these circumstances the parts might, for example, be in the positions shown in Fig. 2. Now by simply aspirating the syringe with which the piercing needle is associated the solution could be drawn into the barrel of that syringe. Thereafter the needle could be withdrawn and the injection proceeded with. If any difficulties were experienced in connection with aspiration or withdrawal of the solution from the body of the device then stopper 11 could conveniently be shifted somewhat to the right of the position shown in Fig. 2 so that too great a condition of vacuum would not arise in compartment 16. Also as is apparent, both stoppers 11 and 14 might be shifted as a unit during the withdrawal action of the solution and as indicated in Fig. 3.

As will be understood in connection with both of the described structures, a by-pass provision is, in each instance, illustrated. This functions—in cooperation with the adjacent stopper—to permit an intermixing of the diluent and medicament in the different compartments as that stopper is shifted. In both instances, the ampule is non-circular in cross section at a point intermediate its ends. In other words, in one form the continuity of the surface is interrupted by a groove or grooves while in the other form an elliptical or oval surface is presented.

Thus, among others, the several objects of the invention as specifically aforementioned are achieved. Obviously numerous changes in construction and rearrangement of the parts might be resorted to without departing from the spirit of the invention as defined by the claims.

I claim:

1. An ampule including a tubular body, the bore of said body at a zone intermediate its ends being oval in cross section to provide relatively recessed portions, said portions furnishing a by-pass for liquid normally confined within the bore and to the rear of a resilient stopper as the latter is shifted axially of the bore in the zone of said portions.

2. An ampule for removable disposal in a needle-mounting syringe, said ampule including a tubular open-

ended body circular in section adjacent at least one end, the bore of said body at a zone intermediate its ends being formed with a longitudinally extending groove in its face, a stopper adjacent said groove, the latter providing a by-pass for liquid normally confined within the bore and to the rear of said stopper as the latter is shifted axially of the bore into the zone of said by-pass, said bore adjacent one end of said body providing a seat, a piston type stopper cooperating therewith to provide a liquid-tight seal, the opposite end of said body furnishing a second seat, a pierceable type stopper cooperating therewith, and edge means on said latter-named end for engagement with the internal end portion of a needle-mounting syringe.

3. An ampule for removable disposal in a needle-mounting syringe, said ampule including a tubular open-ended body circular in section adjacent at least one end, the bore of said body at a zone intermediate its ends having at least a portion of its inner face spaced from the ampule axis a distance greater than at other points to provide a by-pass for liquid, a stopper within said bore adjacent said zone, said stopper confining liquid within the bore and to the rear of said stopper as the latter is shifted axially of the bore into the zone of said by-pass, said bore adjacent one end of said body providing a seat, a piston-type stopper cooperating therewith to provide a liquid-tight seal, the opposite end of said body furnishing a second seat, a pierceable type stopper cooperating therewith, and edge means on said latter-named end for engagement with the internal end portion of a needle-mounting syringe.

4. An ampule for removable disposal in a needle-mounting syringe, said ampule including a tubular open-ended body circular in section adjacent at least one end, the bore of said body at a zone intermediate its ends being formed with a longitudinally extending groove in its face to provide a by-pass for liquid normally confined within the bore, a stopper disposed adjacent said groove and providing a partition intermediate with ends of said body, a piston stopper adjacent one end of said bore and spaced from said first named stopper to furnish a compartment between the same, diluent within said compartment, said diluent flowing through said by-pass as said piston stopper is shifted axially of the bore to cause similar shifting of said first-named stopper in the zone of said groove, a pierceable type stopper adjacent the opposite end of said body and beyond said groove to provide a medicament compartment to receive the diluent flowing through said bypass, said bore furnishing seats for liquid-tight seals for each of said stoppers at the normal positions of same, and edge means at the end of said body containing said pierceable stopper for engagement with the internal end portions of said needle-mounting syringe.

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