

April 20, 1954

A. E. KRUG
SYRINGE

2,675,804

Filed July 9, 1949

Fig. 1

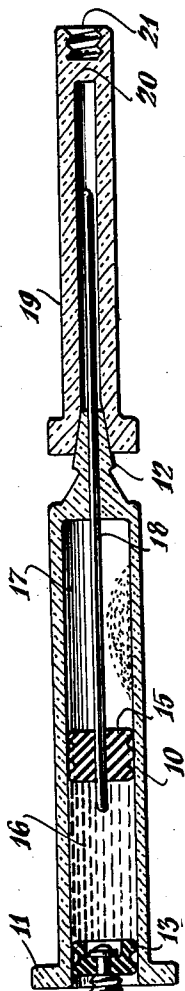


Fig. 4

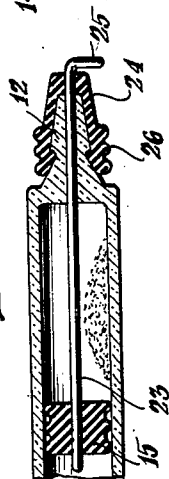


Fig. 2

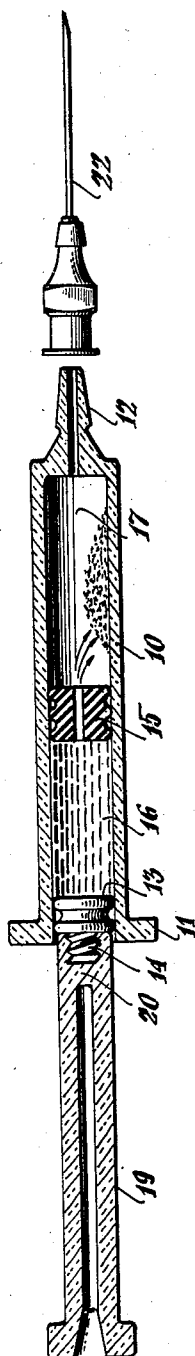


Fig. 3

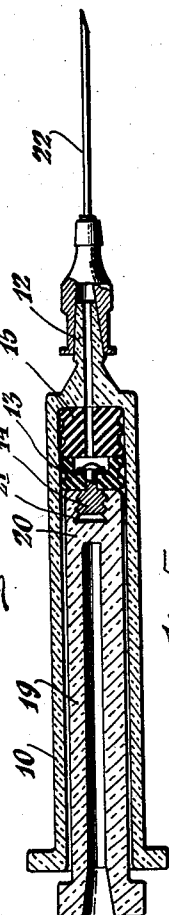


Fig. 5



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2,675,804

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Application July 9, 1949, Serial No. 103,841

6 Claims. (Cl. 128—218)

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This invention relates to a structurally and functionally improved syringe assembly to be used for the hypodermic injection of medicaments.

It is an object of the invention to furnish structures of this type and in which a medicament, for example, in the form of a dry powder and a diluent therefor may be maintained in separate compartments until the injection is to be made. With such segregation of the materials the physician will be assured that, for example, the powder is of precisely the standard desired and even if the unit has been manufactured some time previously. By a simple manipulation of the parts the diluent and powder may be mixed together; a proper solution being conveniently assured by suitable agitation. Thereupon the solution may be injected in the usual manner.

A still further object is that of furnishing a structure of this type which will embody a relatively simple design to furnish units which may be manufactured in large quantities and at nominal cost. Moreover, the parts may be used with assurance that proper operation will occur under all conditions.

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 a syringe assembly with the parts thereof in initial condition;

Fig. 2 is a similar view illustrating a step in the manipulation of these parts;

Fig. 3 shows the final disposition of these parts with respect to each other;

Fig. 4 is a fragmentary end view of an alternative form of the syringe; and

Fig. 5 shows an ampule assembly embodying the present teachings.

Referring primarily to Figs. 1 to 3, the numeral 10 indicates the barrel of a syringe which is preferably formed of glass. Adjacent its rear or open end the barrel may provide a flange 11 and adjacent its forward end a tip or needle mounting portion 12 is preferably furnished. These parts may be modified in numerous different manners and as will be appreciated are more or less of conventional design.

In accordance with the present teachings, the rear end of the syringe barrel is closed by, for example, a stopper 13 of the piston type. This stopper is conveniently formed of rubber and may have a threaded stem 14 extending from its rear face. Intermediate the ends of the barrel a second and similar stopper 15 is disposed.

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In this manner the barrel is divided into compartments 16 and 17. The former may receive a diluent and the latter receives a medicament, for example, in the form of a dry powder.

A stylet or rod 18 of stainless steel, plastic, or any inert material, extends through and beyond the bore of the tip 12 and through the compartment 17 as well as an opening or bore formed through the stopper 15. That opening or bore should have a diameter initially less than the diameter of rod 18. Therefore with the latter in position as shown in Fig. 1, a fluid tight seal is provided, such that diluent may not escape from compartment 16 to compartment 17.

The tip 12 is preferably encased by a cap or tube 19 which again may be formed with an outer threaded recess 21 capable of receiving and engaging with the threads of stem extension 14. These parts may thus be coupled so that a physician may, before injecting, cause reciprocation of the stopper for aspirating purposes. The stem 14—as shown—may be a separate element formed of stainless steel or any inert material. Otherwise, it may extend as a part of stopper 13. In any event, it should be preferably fixed with respect to the latter. As will be understood, with the tube 19 encasing the tip, the latter may be sterilized and will remain in that condition until the tube is dismounted.

While as shown the tip 12 is furnished with merely tapered surfaces, it will be appreciated that the surfaces might be modified in any desired manner so as to receive and properly mount the hub of a hypodermic needle. Such a needle has been shown at 22 in Figs. 2 and 3. With the parts constructed as illustrated, it will, of course, be understood that in accordance with conventional practice a properly sterilized needle including a suitable hub portion is merely fitted on the tip. The cooperating surfaces will provide a leak proof structure and will assure that the needle will not be accidentally dislodged.

As afore brought out, when it is desired to utilize the apparatus, the tube 19 is dismounted. Thereafter the physician or other person making the injection with withdraw the stylet or rod 18. Under these circumstances the passage through stopper 15 will not be obstructed. The needle 22, as afore described may now be mounted on the tip 12. Tube 19 may be coupled with stopper 13 or otherwise be brought into bearing engagement with the same. Thereupon by exerting axial thrust, stopper 13 is projected towards the stopper 15 as shown in Fig. 2. This will cause

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diluent to flow through the bore of stopper 15 into chamber of compartment 17. Air within that compartment will be vented through the bore of tip 12 during this operation.

This action is continued until the diluent is all transferred to compartment 17. During the projection of stopper 13 the operator should, of course, not use such force and haste that the diluent in transferring will move stopper 15. The physician may now shake the entire assembly to assure creation of a proper solution. At that time it will be understood that stopper 13 will be in bearing contact with stopper 15. Therefore continued projection on the part of tube 19 or its equivalent will cause both stoppers to move in unison. During the initial stage of that movement the syringe may be inclined upwardly in accordance with conventional technique so that all air will be discharged from the cannula. The injection may now follow customary procedure, it being understood that continued projection of the stoppers 13 and 15 will result in the expulsion of all the medicament as in Fig. 3.

Under certain circumstances it may be preferable not to use a tube 19 as afore described to protect the tip. In such a case, and as suggested in Fig. 4, the tip 12 may mount a cap 24 conveniently provided of rubber and formed with a bore of restricted diameter through which the rod or stylet 23 projects. The end of the latter may be angularly extended as at 25 and the cap 24 may be formed with a series of ridges 26. As will be understood, with this type of apparatus the user will simply grasp the cap 24 and pull the same. This will result in removal of the cap and withdrawal of the rod 23 and consequently an opening of the passage through the stopper 15. A hypodermic needle may now be mounted on the tip with complete assurance that the sterility of the parts will be maintained. The procedure for mixing the solution will be as afore described.

The teachings of the present invention are also applicable to ampules. More especially as shown in Fig. 5 a tubular body 27, preferably of glass, is provided of proper length and with suitable internal and external diameters. One end of the ampule is closed by a piston type stopper 28, the opposite end thereof being closed by a suitable stopper 29. Intermediate these stoppers is a stopper 30 of the same general character as stopper 15. A rod 31, corresponding to rod 18, extends through perforations or bores in stoppers 29 and 30. Preferably stopper 29 is merely pierced by rod 31 which sealingly engages therewith. To opposite sides of the stopper 30, compartments 32 and 33 are provided; the former conveniently receiving the diluent and the latter the medicament which may be in the form of dry powder. The bore or perforation through stopper 30, while smaller in diameter than rod 31, remains open after the withdrawal of that rod and in a manner similar to that heretofore described in connection with Figs. 1 to 3. The opening or perforation through stopper 29 should preferably be of such nature that it is capable of self-sealing or substantially completely closing as the rod is withdrawn. As shown, the recess of stopper 28 is faced outwardly so that it will not be pierced by the inner end of the needle when technique such as is hereafter is followed.

An ampule of this type is usable in connection with syringe barrels of various designs. Preferably these barrels should have post or thrust portions beyond which the inner end of

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a double ended needle may extend as taught, for example, in the prior United States patents to Hein No. 1,817,003 of August 4, 1931 or Hall No. 1,848,711 of March 8, 1932. Using such structures the rod 31 is withdrawn to establish communication between compartments 32 and 33. Thereafter the end of ampule 27 which mounts stopper 28 is introduced into the syringe barrel. By bringing pressure to bear on the opposite or outer end of the ampule the thrust or post portion 34 of the barrel will bear against stopper 28 and diluent will be forced through the bore of stopper 30 into compartment 33. The ampule may now be withdrawn from the barrel and agitated to assure of the creation of a proper solution.

The opposite end of the ampule is thereupon introduced into the barrel. With such introduction the inner pointed end of the needle which extends beyond the thrust portion will pierce stopper 29. Thereupon, by further pressing against the opposite or outer end of the ampule the medicament will be forced into and through the bore of the needle in the usual manner. Should it be desirable to manually maintain stoppers 28 and 30 in physical contact during this expulsion of the medicament, then of course, a thrust member similar to tube 19 might be employed to press against the outer face of stopper 28. In lieu of this tube a plug 34 of a diameter such that it may enter the bore of the ampule could be employed. According to either of the latter procedures it might also be possible to dispense with a syringe of the thrust or post type as afore described and simply employ any suitable structure such as a tube, rod or plug to initially project the stopper 28 and thereafter to project stoppers 28 and 30 as a unit to expel the medicament. Such unit projection of stoppers 28 and 30 will, of course, not be necessary if the solution is withdrawn by an aspirating action on the part of a conventional syringe assembly.

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

I claim:

1. In a syringe assembly a tube, a stopper adjacent one end of said tube, a second stopper within said tube and spaced from said first named stopper, said second stopper being formed with an opening, a removable rod extending through said opening and having an outer end beyond said tube, the diameter of said rod being greater than the normal diameter of said opening, and a cap secured to said tube and encircling the outer end of said rod.

2. In a syringe assembly a syringe barrel having an open rear end, a needle-mounting tip at the opposite end of said barrel, said tip being formed with a bore, a stopper mounted within said barrel adjacent the open end of the same, a second stopper also mounted within said barrel at a point spaced from said first named stopper and said tip to provide compartments adjacent each end of said barrel, a rod extending beyond and through the bore of said tip and through said second stopper to prevent communication between said compartments, the diameter of said rod being greater than the initial diameter of the opening formed in said second stopper and a cap mounted by said tip and encircling the portion of the rod extending beyond the latter.

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3. In a syringe assembly a syringe barrel having an open rear end, a needle-mounting tip at the opposite end of said barrel, said tip being formed with a bore, a stopper mounted within said barrel adjacent the open end of the same, a second stopper also mounted within said barrel at a point spaced from said first named stopper and said tip to provide compartments adjacent each end of said barrel, a rod extending beyond and through the bore of said tip and through said second stopper to prevent communication between said compartments, the diameter of said rod being greater than the initial diameter of the opening formed in said second stopper and a resilient cap yieldingly mounted upon said tip and encircling that part of the rod which extends beyond the latter.

4. In a syringe assembly in combination a tube having at least one open end, a perforated part at the opposite end of said tube, a piston-type stopper disposed within said tube adjacent the open end thereof, a bored stopper of resilient material also disposed within said tube at a point between and spaced from said piston-type stopper and perforated part to provide on opposite sides of said bored stopper compartments to receive medicament and diluent respectively, a rod extending through the perforation of said part and through one of said compartments and the diameter of said rod being greater than the bore of said resilient stopper whereby it is extendable into such bore to intimately engage the surfaces thereof to establish direct sealing contact therewith and to simultaneously expand the outer edge of said bored stopper into similar contact with the tube surface.

5. For use in a syringe assembly a tube having open ends, a bored stopper disposed adjacent one of said ends, a piston-type stopper adjacent the opposite end thereof, a further bored stopper of resilient material also disposed within said tube at a point between and spaced from said first-named stoppers to provide on opposite sides of said further stopper compartments to receive medicament and diluent respectively, a rod extendable through the bore of said first-named stopper and through one of said compartments

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and the diameter of said rod being greater than the bore of said further stopper whereby said rod is extendable into such stopper bore to intimately engage the surfaces thereof to establish direct sealing contact therewith and to simultaneously expand the outer edge of said further stopper into similar contact with the tube surface.

6. A syringe assembly including in combination a barrel having one open end, a bored needle-mounting tip adjacent its opposite end, a piston-type stopper disposed within said barrel adjacent the open end thereof, a bored stopper of resilient material also disposed within said barrel at a point between and spaced from said piston-type stopper and tip to provide on opposite sides of said bored stopper compartments to receive medicament and diluent respectively, a rod extending through the bore of said tip and through one of said compartments and the diameter of said rod being greater than the bore of said resilient stopper whereby said rod is extendable into such bore to intimately engage the surfaces thereof to establish direct sealing contact therewith and to simultaneously expand the outer edge of said bored stopper into similar contact with the barrel surface.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,275,315	Smith	Aug. 13, 1918
1,431,860	Zurbrigg	Oct. 10, 1922
1,767,304	Morton	June 24, 1930
1,817,003	Hein	Aug. 4, 1931
1,848,711	Hall	Mar. 8, 1932
2,153,594	Saffir	Apr. 11, 1939
2,168,437	Buercklin	Aug. 8, 1939
2,408,323	Lockhart	Sept. 24, 1946
2,453,591	Poux	Nov. 9, 1948
2,475,060	Smith	July 5, 1949
2,551,414	Burnside	May 1, 1951

FOREIGN PATENTS

Number	Country	Date
282,622	Germany	Mar. 11, 1915