

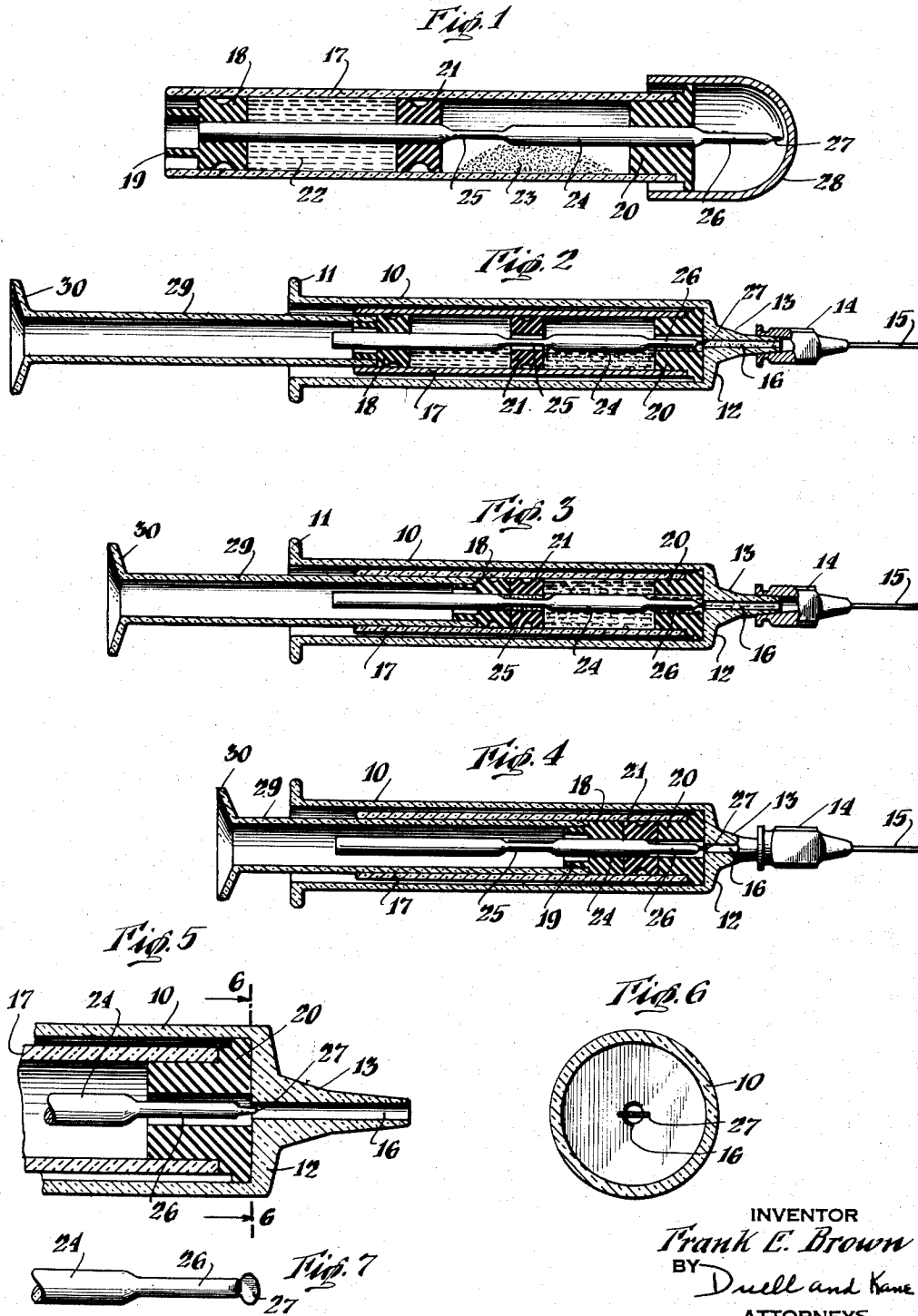
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SYRINGE ASSEMBLY

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SYRINGE ASSEMBLY

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This invention relates to a structurally and functionally improved syringe assembly and especially the units of an assembly for use in connection with hypodermic injections.

It is an object of the invention to provide a desirable structure preferably in the form of an ampule or cartridge involving a plurality of compartments. Within one of these a medicament may be disposed and which medicament may be in the form of a powder. Within the other a diluent is disposed. Immediately prior to the time that an injection is to be given these substances may be mixed to provide a solution; such mixture being achieved without the necessity of any skillful manipulation or in fact conscious effort on the part of the physician or other user. Therefore, a proper and fresh solution may be injected.

A further object is that of furnishing a unit of this type which may be employed in connection with a standard type of syringe barrel and without modification of the latter. Accordingly, the physician will not be confronted with unfamiliar apparatus at the time he wishes to make the injection. Rather by proceeding according to a completely simple technique he will be able to efficiently provide the desired solution and inject the same.

An additional object is that of furnishing a device of this character which will include relatively few parts each individually simple in design; such parts being capable of ready production and assemblage and when so assembled maintaining the contained ingredients in a completely sterile condition, in a manner such that they will remain stable for indefinite periods of time.

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

Fig. 1 is a sectional side view of one form of ampule or cartridge constructed in accordance with the present teachings;

Fig. 2 showed the cartridge in its initial operative position within a syringe barrel;

Fig. 3 illustrates the parts in the positions which they assume just prior to the injection operation;

Fig. 4 shows the final position of those parts;

Fig. 5 is a fragmentary enlarged sectional view of the outer end of the syringe assembly with the parts in the position shown in Fig. 4;

Fig. 6 is a traverse sectional view taken along the line 6—6 and in the direction of the arrows as indicated in Fig. 5; and

Fig. 7 is a fragmentary view of the end portion of the metering rod or actuating member.

In these views the numeral 10 indicates the barrel of a syringe formed of glass or other proper material. This barrel in accordance with conventional construction may have its tubular rear end open and defined by a flange portion 11.

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Its front end conveniently presents a transversely extending wall 12 from which a tip or nose piece 13 projects outwardly. The latter serves to mount in one of a number of accepted manners the hub 14 of a hypodermic needle 15. The nose piece 13 is provided with a bore 16 establishing communication between the interior of barrel 10 and the bore of cannula 13.

The ampule or cartridge has been shown in Fig. 1. It embraces a body 17 of conveniently tubular configuration and preferably formed of glass. One end of this member is closed by a piston type stopper 18 which may be provided with an outwardly extending integral collar portion 19. The opposite end of body 17 is closed by a headed stopper 20, the edge of which may project beyond the side face of body 17. Between stoppers 18 and 20 a plug 21 is disposed. Both stoppers and the plug are formed of rubber or other suitable material. Also as shown all three of these elements are provided with transversely extending centrally disposed bores.

With the stoppers and plug properly spaced as shown in Fig. 1, it is apparent that compartments are embraced within the body of the ampule or cartridge. Within the forward compartment medicament 23 may be disposed. That medicament is conveniently in the form of powder although pellets, grains, etc. might be employed and in certain instances this compartment could receive a liquid to be mixed with a diluent or other liquid initially in the rear compartment. However, as shown the latter compartment is filled with diluent 22. Extending through the bores of the stoppers and plug is a closure element preferably in the form of a glass rod 24 common to both stoppers and the plug.

This rod has a body diameter such that it completely fills and seals the apertures of the stoppers and plug. It is formed with a centrally reduced portion 25 and a reduced end portion 26 the latter terminating in a preferably extended tip 27 having an outer rounded edge portion. With the parts disposed in their initial positions, the reduced central portion of the rod 24 lies adjacent the plug 21 and within the compartment containing medicament 23. The reduced end portion 26 extends beyond stopper 20. The latter portion and its tip may be enclosed by a protective cap 28 formed of any suitable material.

When the device is to be used cap 28 is removed and discarded. That end of the ampule or cartridge which carries stopper 20 is introduced into barrel 10. Conveniently at this time hub 14 is mounted on tip 13. The ampule is then telescoped into the barrel. If an aspirating action is desired it may be achieved by retracting the ampule or cartridge to a slight extent from the barrel. Under these circumstances, the edge portion of stopper 20 will function as a piston in engagement with the inner face of the barrel to achieve the desired results. Continued projection of the ampule into the barrel will result in

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the rounded tip portion 27 of rod 24 engaging the surfaces of the end wall 12 of that barrel at points adjacent the bore 16. However, due to the configuration of portion 27, it will not obstruct that bore or passage in a manner such that solution is prevented from flowing through it.

An actuating plunger of plastic or other suitable material is now applied to exert pressure upon the assembly. As shown this plunger may include a tubular body 29 terminating in an outer thumb contacting portion 30. The diameter of tube 29 may be such that it will frictionally engage with and telescope over collar portion 19 of stopper 18. In any event with the parts assembled as described an inward thrust against the thumb portion 30 will cause the cartridge body 17 to move to a position where the head of stopper 20 lies in contact with end wall 12. Under these circumstances rod 24 will have been automatically retracted with respect to body 17.

This, of course, will occur because of the continuing engagement of the outer tip 27 of reduced portion 26 with the inner surface of the end wall of the barrel. Therefore, with such relative movement occurring on the part of the rod with respect to the ampule it is apparent that the parts will occupy positions such as has been shown in Fig. 2. In that view the aperture of stopper 18 is still closed by the body of rod 24. However, the aperture of central plug 21 is now unobstructed to an extent such that diluent 22 may flow through the aperture into the compartment containing the medicament. In other words, the reduced portion 25 has a length greater than the width of plug 21 and as it is shifted into line with the latter provides a by-pass for such flow. Under these circumstances it will be appreciated that in accordance with preferred technique the entire assembly will be held substantially upright so that there will be no danger of a flow of diluent occurring through the bore of stopper 20 and so into the bore 16; it being noted that the reduced portion 26 now disposed in the aperture or bore of stopper 20 will provide a by-pass serving as a vent for air from the medicament compartment.

The projection of the piston may be continued until the parts occupy the position shown in Fig. 3. It will be apparent in that figure that stopper 18 has moved to a position in contact with plug 21. Under these circumstances all diluent will have been forced through the by-pass into the medicament compartment. Therefore, the physician will be able to shake the assembly to provide a proper solution. The needle may now be caused to pierce the epidermis and continuing projection on the part of piston 30 will cause stopper 18 and plug 21 to move as a unit along rod 24 and towards stopper 20. Therefore, the solution will be expelled from the medicament containing compartment and projecting in the usual manner through the bore of the barrel tip or nose and the bore of the cannula. Continued projection will cause the parts to assume the final position shown in Fig. 4 in which all medicament has been so expelled.

As will be noted from the foregoing review of operation, rod 24 remains stationary through all phases after the tip has once engaged the surfaces adjacent the inner face of wall 12. The rear end is increasingly received within the hollow portion 29 of the piston. When all medicament has once been expelled the needle will be withdrawn from the patient. Thereupon the piston may be retracted. Under these circumstances the frictional contact between, for ex-

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ample, collar 18 and the adjacent tubular surfaces 29 will assure that the entire ampule or cartridge assembly will withdraw with the piston. With removal of the spent cartridge the entire operation may be repeated. If necessary the parts may, of course, be sterilized prior to introducing a fresh ampule assembly into the barrel.

Thus among others 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 department from the spirit of the invention as defined by the claims.

I claim:

1. In a syringe assembly a tubular member, a pair of stoppers mounted thereby and spaced from each other, said stoppers being formed with openings, a rod extending through said openings to obstruct a flow of fluid through the same, said rod being formed with a pair of spaced portions each providing a by-pass disposable adjacent said stoppers and said rod being shiftable with respect to said stoppers to dispose said portions in the zones of the latter whereby fluid may by-pass said stoppers.

2. In a syringe assembly a tubular member, a pair of stoppers mounted thereby and spaced from each other, said stoppers being formed with openings, a rod extending through said openings to obstruct a flow of fluid through the same, said rod being formed with a pair of spaced portions each providing a by-pass disposable adjacent said stoppers, said rod being shiftable with respect to said stoppers to dispose said portions in the zones of the latter whereby fluid may by-pass said stoppers and an extended and reduced end portion forming a part of said rod and serving to automatically manipulate the latter by engagement with the end wall of a syringe.

3. In a syringe assembly a tubular member, a pair of stoppers mounted thereby and spaced from each other, said stoppers being formed with openings, a rod extending through said openings to obstruct a flow of fluid through the same, said rod being formed with a pair of spaced portions each providing a by-pass disposed adjacent said stoppers, said rod being shiftable with respect to said member and stoppers to dispose said portions in the zones of the latter whereby fluid may pass through said stopper openings and a manipulating end forming a part of said rod and beyond one of the stoppers.

4. In a syringe assembly a tubular member, stoppers disposed adjacent the opposite ends of said member, said stoppers being formed with openings, a rod extending through said openings and formed with by-pass portions disposable adjacent said stoppers and an extended end forming a part of said rod at a point beyond one of said portions.

5. In a syringe assembly a tubular member, stoppers disposed adjacent the opposite ends of said member and each formed with an opening, a further stopper formed with an opening and disposed at a point intermediate said first named stoppers, a shiftable rod extending through the openings of all of said stoppers and formed with a by-pass having its opposite ends extendable beyond the opposite faces of said further stopper an end portion of said rod extending beyond said member.

6. In a syringe assembly a tubular member, stoppers disposed adjacent the opposite ends of said member and each formed with openings, a

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further stopper formed with an opening and disposed at a point intermediate said first named stoppers, a rod extending through the openings of all of said stoppers and said rod being formed with by-pass portions arrangeable adjacent certain of said stoppers and being shiftable with respect to the latter to dispose said portions within the zones of their adjacent stoppers.

7. In a syringe assembly a tubular member, stoppers disposed adjacent the ends of said member, a further stopper disposed intermediate said first named stoppers, all said stoppers being formed with openings, a rod disposed to extend through such openings to obstruct a flow of fluid past the same, said rod being formed with by-pass portions arrangeable adjacent certain of said stoppers and a tubular piston member engageable with one of said stoppers and to receive in its bore a portion of said rod.

8. In a syringe assembly a tubular member, stoppers disposed adjacent the ends of said member, a further stopper disposed intermediate said first named stoppers, all said stoppers being formed with openings, a rod disposed to extend through such openings to obstruct a flow of fluid past the same, said rod being formed with by-pass portions arrangeable adjacent certain of said stoppers, a tubular piston member engageable with one of said stoppers and to receive in its bore a portion of said rod and a collar forming a part of a stopper to be engaged by said piston member, said collar frictionally contacting the bore of said latter member.

9. In a syringe assembly in combination a tubular member, a stopper disposed within the bore of said member and intermediate the ends of the same to divide said member into compartments to each side of said stopper, a rod extending through the stopper opening to normally prevent communication between said compartments, said rod being formed with a part to one side of said stopper and which part has a cross-sectional configuration different from that of said opening and said rod being axially shiftable with respect to said stopper to dispose said part to extend through said stopper and beyond the opposite faces of the same to establish communication between said compartments.

10. A syringe assembly including in combination a tubular syringe body open at one of its ends and formed with an apertured wall at its opposite end, an ampule, partition means within said ampule to divide the interior thereof into two compartments, valve means carried by said ampule and shiftable with respect to said partition means to afford access between said compartments and an actuating portion forming a part of said valve means and extending beyond said ampule to be brought into contact with the end wall of said syringe as said ampule is shifted into the latter.

11. A syringe assembly including in combination an ampule, partition means within said ampule to divide the interior thereof into two compartments, valve means carried by said ampule and shiftable with respect to said partition to establish communication between said compartments and means associated with said valve means to operate the latter as said ampule is disposed within a syringe barrel.

12. A syringe assembly including in combination an ampule, partition means within said ampule at points adjacent one end and intermediate the ends of said ampule to divide the interior of the latter into two compartments, 75

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valve means carried by said ampule and shiftable with respect to said partition means to establish communication between said compartments and also between points exteriorly of said ampule and adjacent the partition means disposed at the end of the ampule and means forming a part of said valve means for shifting the latter.

13. In a syringe assembly a substantially rigid rod body formed with a successive number of reduced portions, the body of said rod being disposable through openings formed in stoppers to seal said openings against fluid flow, the length of said portions being greater than that of said openings and said rod being axially shiftable to bring each of said reduced portions into a position at which it extends through a stopper opening and beyond the opposite ends of the latter.

14. In a syringe assembly a substantially rigid rod body formed with a successive number of reduced portions, the body of said rod being disposable through openings formed in stoppers to seal said openings against fluid flow, the length of said portions being greater than that of said openings, said rod being axially shiftable to bring each of said reduced portions into a position at which it extends through a stopper opening and beyond the opposite ends of the latter and a reduced syringe-contacting end portion forming a part of said rod to automatically shift the latter.

15. In combination a tubular member, a pair of stoppers closing the opposite ends of said member, a further stopper disposed between and spaced from said end stoppers to provide a pair of compartments within said member, at least said further stopper and one of said end stoppers being formed with openings, a shiftable rod extending through and closing said openings and said rod being formed with a by-pass portion disposed adjacent said further stopper and of a length greater than the length of the latter, whereby when said rod is shifted to cause the opposite ends of said by-pass to extend beyond the opposite faces of said further stopper communication is established between said compartments.

16. In combination a tubular member, a stopper disposed within the bore of said member and intermediate the ends of the latter to provide compartments within said member beyond opposite faces of said stopper, a further stopper disposed adjacent the end of said member and spaced from said first main stopper, both of said stoppers being formed with axially extending openings, a shiftable rod extending through said openings and said rod being formed with a by-pass disposed adjacent to said first named stopper and having a length greater than the height of the latter, whereby said rod may be shifted to have the ends of said by-pass extend beyond opposite faces of said first named stopper to establish communication between said compartments.

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