Aug. 19, 1952 F. E. BROWN 2,607,341

HYPODERMIC SYRINGE ASSEMBLY

Filed Dec. 24, 1948

Fig. 1.

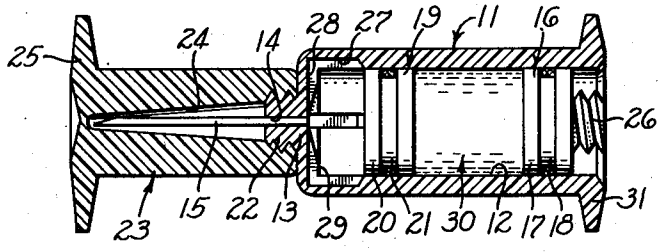


Fig. 2.

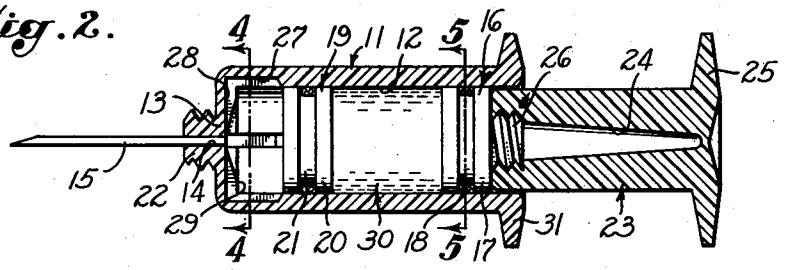


Fig. 3.

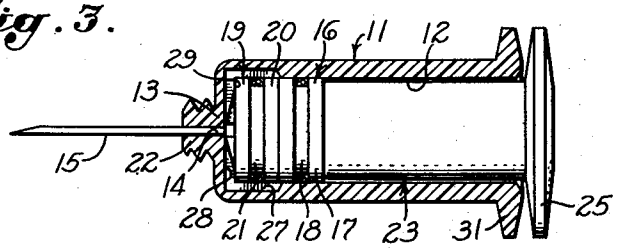


Fig. 4.

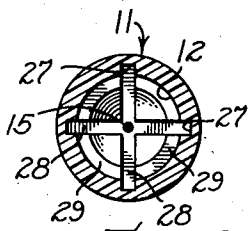


Fig. 5.

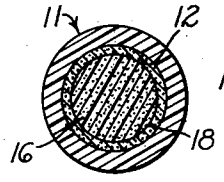


Fig. 6.

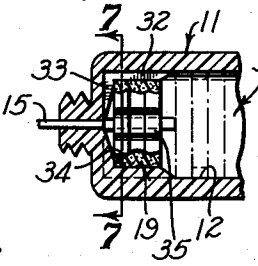


Fig. 7.

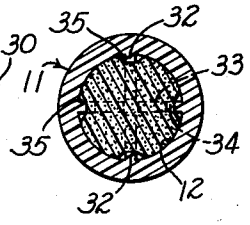


Fig. 8.

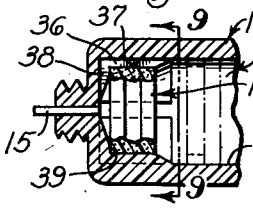
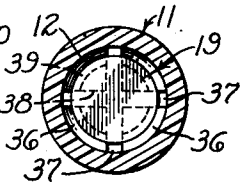


Fig. 9.



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HYPODERMIC SYRINGE ASSEMBLY

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15 Claims. (Cl. 128—218)

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Among the objects of my invention are the provision of an assembly for the hypodermic injection of medicament and which is usable by a doctor or by a patient preferably only once; the provision of a unit which is ready for immediate use with a predetermined amount of a specified medicament and a sterilized needle, so that no sterilization of the unit or the parts of the assembly is necessary prior to its utilization; the provision of a unit with a predetermined quantity of a specified medicament usable only once, so that all possibility of contamination by use upon a former patient is eliminated; and the provision of a syringe which maintains a measured amount of a medicament sealed from and free of any contamination prior to its utilization.

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 vertical sectional side view of one form of the invention;

Fig. 2 is a similar view with the plunger installed upon the primary piston and the syringe ready for use;

Fig. 3 shows the parts in the positions occupied after the expulsion of the medicament from the syringe;

Figs. 4 and 5 are transverse sectional views taken as indicated by the lines 4—4 and 5—5 of Fig. 2;

Fig. 6 is a fragmentary vertical sectional view of an alternative embodiment of my invention;

Fig. 7 is a transverse sectional view taken as indicated by the line 7—7 of Fig. 6;

Fig. 8 is a fragmentary vertical sectional view of a second alternative embodiment of my invention; and

Fig. 9 is a transverse sectional view taken as indicated by the line 9—9 of Fig. 8.

Referring to the drawing, which is for illustrative purposes only, the numeral 11 indicates a syringe barrel provided with a bore 12 forming a chamber or reservoir for a medicament. The bore 12 extends through one end of the barrel 11, and the other end of the barrel 11 is provided with a reduced portion 13 through which there extends a discharge passage 14. A hollow hypodermic needle 15 may be fixedly mounted in the discharge passage 14.

Indicated by the numeral 16 is a primary piston which is slidable in the bore 12 of the barrel 11. The primary piston 16 includes annular ribs 17 engaging the wall of the bore 12 and separated by an annular channel 18.

Also slidably disposed within the bore 12 of

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the barrel 11 is an auxiliary piston 19, likewise provided with annular ribs 20 engaging the wall of the bore 12 and separated by an annular channel 21. The reduced portion 13 is provided with a threaded boss 22 upon which a plunger 23 may be mounted. The plunger 23 includes a cavity 24 for the reception of the needle 15 and in which the needle 15 is hermetically sealed when the plunger 23 is threaded upon the boss 22. The outer end of the plunger 23 is provided with an annular flange 25 to facilitate its manipulation when the plunger 23 is removed from the boss 22 and threaded upon a threaded projection 26 secured to the outer end of the primary piston 16 as illustrated in Fig. 2.

Formed in the wall of the bore 12 adjacent the reduced portion 13 of the barrel 11 are longitudinal grooves 27 illustrated as four in number. These grooves 27 communicate with the interior of the needle 15 through end grooves 28. Shoulders 29 are provided at the intersection of the grooves 27 and 28 adapted for contact with the auxiliary piston 19 in a manner to permit the passage of medicament around the auxiliary piston 19 through the grooves 27 and 28 and into the needle 15. The pistons 16 and 19 are preferably made of a material different from the barrel 11 to avoid scoring or galling of the wall of the bore 12 by the movement of the pistons. Preferably the barrel is formed of a relatively non-elastic substance, such as methyl methacrylate, and the pistons 16 and 19 are formed of a resilient material, such as polyvinyl chloride. The plunger is preferably formed of a comparatively non-elastic material, such as polystyrene.

In the annular channels 18 and 21 of the pistons 16 and 19 there is contained an inert permanently viscous material, such as polyethylene, which acts as a lubricant and sealing medium for the wall of the bore 12 and as a vapor sealer inhibiting the escape of the plasticizer and the moisture contained in the pistons 16 and 19.

From the foregoing and from an examination of Figs. 1 and 2 it will be apparent that a predetermined amount of a specified liquid medicament may be placed within the bore 12 of the barrel 11 and sealed from the atmosphere in the chamber between the primary and auxiliary pistons 16 and 19; the chamber being indicated by the numeral 30.

The frictional contact of the annular ribs 17 and 20 upon the pistons 16 and 19 with the wall of the bore 12 retains the pistons in the positions illustrated in Fig. 1 against the forces of gravity and any shock incidental to transportation of the syringe, so that the medicament is retained in the

chamber 30 during its transportation and storage preliminary to use. The plunger 23 is threaded upon the boss 22 to hermetically seal the needle 15 in a sterilized condition prior to its use. When ready for use, the plunger 23 is removed from the boss 22 and threaded upon the projection 26 of the primary piston 16 as illustrated in Fig. 2. Thereafter, the plunger 23 and primary piston 16 are moved inwardly of the barrel 11 to exhaust the air forwardly of the auxiliary piston 19.

An annular flange 31 is provided upon the rearward end of the barrel 11 to facilitate this manipulation of the plunger 23. During the exhaustion of the air from the barrel 11, the pistons 16 and 19 and the medicament in the chamber 30 are moved forwardly of the barrel 11, so that the grooves 27 are uncovered by the auxiliary piston 19. The needle 15 is then inserted into the patient, and the further movement of the plunger 23 and primary piston 16 discharges the medicament from the chamber 30 around the auxiliary piston 19 through the grooves 27 and 28 and through the needle 15; the pistons 16 and 19 and the plunger 23 occupying the positions illustrated in Fig. 3 when the medicament has been expelled from the barrel 11.

The embodiment of my invention illustrated in Figs. 6 and 7, in which like numbers indicate the parts corresponding to those previously described, is the same as that previously described, except that, instead of grooves 27 and 28 being formed in the barrel 11, the barrel is provided with longitudinal ribs 32 short of its outer end and radial ribs 33 at its outer end. The ribs 32 and 33 are connected by a shoulder 34 upon which the outer end of the auxiliary piston 19 is seated in a manner to permit the passage of the medicament from the chamber 30 around the ribs 32 in passages 35 existing by the deformation of the resilient auxiliary piston 19 around the ribs 32.

In that embodiment of my invention illustrated in Figs. 8 and 9, in which like numbers indicate the parts corresponding to those previously described, there is provided at the outer end of the barrel 11 a plurality of ribs illustrated as four in number and indicated by the numeral 36. These are similar to the ribs 32 of Figs. 6 and 7, except that they extend over a greater annular space within the barrel 11. These ribs 36 are separated by longitudinal passages 37 which communicate with the interior of the needle 15 through radial passages 38 formed within the outer end of the barrel 11. The passages 37 and 38 are connected by an annular shoulder 39 which limits the forward movement of the auxiliary piston 19 to a position permitting the medicament to be expelled from the chamber 30 around the auxiliary piston 19, through the passages 37 and 38, and from the needle 15.

The embodiments of my invention illustrated in Figs. 6 and 7 and 8 and 9 are capable of use in the same manner as the embodiment illustrated in Figs. 1 to 5, inclusive, as previously described.

From the foregoing it will be apparent that I have by my invention provided a syringe unit which is an attractive and inexpensive package for a medicament and which is usable by a doctor or by a patient only once; that I have provided a syringe which is ready for immediate use with a predetermined amount of a specified medicament and a sterilized needle, so that no sterilization of the syringe, its barrel, plunger, or needle is necessary prior to its utilization; that I have provided a syringe adapted to contain a predetermined quantity of a specified medicament which can be used only once, so that all possibility of contamination by use upon a former patient is remedied; and that I have provided a unit that maintains a measured amount of a medicament sealed from and free of any contamination during its transportation and storage prior to its utilization.

While the embodiments of my invention hereinbefore illustrated and described are fully capable of performing the objects and accomplishing the advantages primarily stated, it will be understood that my invention is not limited to the specific embodiments illustrated and described but embraces all modifications thereof coming within the scope of the claims which follow.

I claim as my invention:

1. In a hypodermic syringe, the combination of: a barrel having an orifice for the discharge of liquid therefrom; a primary piston movable in and in sealing relationship with said barrel; and an auxiliary piston movable in and in sealing relationship with said barrel between said primary piston and said orifice, and providing with said primary piston and said barrel a chamber for the reception of a medication, said chamber having adjacent its forward end passages whereby the medication may pass around said auxiliary piston for discharge through said orifice when said auxiliary piston is at the forward end of said barrel, said passages being of a length greater than the axial length of said auxiliary piston.

2. In a hypodermic syringe, the combination of: a barrel having an orifice for the discharge of liquid therefrom; a primary piston movable in and in sealing relationship with said barrel; an auxiliary piston movable in and in sealing relationship with said barrel between said primary piston and said orifice, and providing with said primary piston and said barrel a chamber for the reception of a medication, said chamber having adjacent its forward end passages whereby the medication may pass around said auxiliary piston for discharge through said orifice when said auxiliary piston is at the forward end of said barrel, said passages being of a length greater than the axial length of said auxiliary piston, each of said pistons having an annular groove therein; and a viscous non-toxic material filling said grooves and in sealing relationship with said barrel.

3. In a hypodermic syringe, the combination of: a barrel having an orifice for the discharge of liquid therefrom; a primary resilient plastic piston movable in and in sealing relationship with said barrel; an auxiliary resilient plastic piston movable in and in sealing relationship with said barrel between said primary piston and said orifice, and providing with said primary piston and said barrel a chamber for the reception of a medication, said chamber having adjacent its forward end passages whereby the medication may pass around said auxiliary piston for discharge through said orifice when said auxiliary piston is at the forward end of said barrel, said passages being of a length greater than the axial length of said auxiliary piston, each of said pistons having an annular groove therein; and a viscous non-toxic material filling said grooves and in sealing relationship with said barrel and inhibiting the escape of moisture from said pistons.

4. In a hypodermic syringe, the combination of: a barrel having an orifice for the discharge of liquid therefrom; a primary resilient piston movable in and in sealing relationship with said barrel; and an auxiliary resilient piston movable in and in sealing relationship with said barrel between said primary piston and said orifice, and providing with said primary piston and said barrel a chamber for the reception of a medication, said chamber having adjacent its forward end ribs deforming said auxiliary piston whereby the medication may pass around said auxiliary piston for discharge through said orifice when said auxiliary piston is at the forward end of said barrel, said ribs being of a length greater than the axial length of said auxiliary piston.

5. In a hypodermic syringe, the combination of: a barrel having an orifice for the discharge of liquid therefrom; a hollow needle mounted on said barrel and communicating with said orifice; a plunger secured to said barrel and having a chamber receiving said needle and maintaining it aseptic; a primary piston movable in and in sealing relationship with said barrel; an auxiliary piston movable in and in sealing relationship with said barrel between said primary piston and said orifice, and providing with said primary piston and said barrel a chamber for the reception of a medication, said chamber having adjacent its forward end passages whereby the medication may pass around said auxiliary piston for discharge through said orifice when said auxiliary piston is at the forward end of said barrel, said passages being of a length greater than the axial length of said auxiliary piston; and means on said primary piston for the attachment of said plunger thereto.

6. In a syringe assembly in combination a body provided with a bore to receive liquid, said body being formed with a by-pass extending axially of said bore and adjacent one end of the latter, a stopper-piston disposed within said bore in advance of said by-pass to confine liquids within said bore and to the rear of its body, the width of said stopper being less than the length of said by-pass whereby as said stopper is shifted within said bore to a position in line with said by-pass the ends of the latter will be exposed to provide a passage for the flow of liquid past said stopper.

7. In a syringe assembly in combination a body provided with a bore to receive liquid, said body being formed with a by-pass extending axially of said bore and adjacent one end of the latter, a stopper-piston disposed within said bore in advance of said by-pass to confine liquids within said bore and to the rear of its body, the width of said stopper being less than the length of said by-pass whereby as said stopper is shifted within said bore to a position in line with said by-pass the ends of the latter will be exposed to provide a passage for the flow of liquid past said stopper and a second piston-stopper disposed within said bore to the rear of said first named stopper to shift—through pressure exerted upon the intervening liquid body—said first named stopper.

8. A hypodermic unit including a body formed with an open end, a by-pass adjacent its opposite end and a bore extending uninterruptedly between said open end and by-pass, said bore embracing a single compartment to receive and retain liquid through a zone extending from a point adjacent the open end of said bore to a point adjacent said by-pass and said bore at a point in advance of said by-pass presenting a mounting surface to sealingly and slidably support a stopper.

9. A hypodermic unit including a body formed with an open end, a by-pass adjacent its opposite end and a bore extending uninterruptedly between said open end and by-pass, said bore embracing a single compartment to receive and retain liquid through a zone extending from a point adjacent the open end of said bore to a point adjacent said by-pass, said bore at a point in advance of said by-pass presenting a mounting surface to sealingly and slidably support a stopper and the length of said by-pass being greater than a stopper so supported.

10. A hypodermic unit including a body formed with an open end, an end wall defining a discharge passage at the opposite end of the body, said body presenting a bore extending between its opposite ends, a by-pass formed in the inner face of the end wall and in the bore area adjacent thereto, said bore embracing a single compartment to receive and retain liquid through a zone extending from a point adjacent its open end to a point adjacent said by-pass and said bore at a point in advance of said by-pass presenting a mounting surface to sealingly and slidably support a stopper.

11. A hypodermic unit including a body formed with an open end, a by-pass adjacent its opposite end and a bore extending uninterruptedly between said open end and by-pass, said by-pass comprising a section of said bore providing relatively raised and recessed portions, said bore embracing a single compartment to receive and retain liquid through a zone extending from a point adjacent the open end of said bore to a point adjacent said by-pass and said bore at a point in advance of said by-pass presenting a mounting surface to sealingly and slidably support a stopper.

12. A hypodermic unit including a body formed with an open end, a by-pass adjacent its opposite end and a bore extending uninterruptedly between said open end and by-pass, said by-pass comprising a section of said bore provided with an axially extending groove in its face, said bore embracing a single compartment to receive and retain liquid through a zone extending from a point adjacent the open end of said bore to a point adjacent said by-pass and said bore at a point in advance of said by-pass presenting a mounting surface to sealingly and slidably support a stopper.

13. A hypodermic unit including a body formed with an open end, a by-pass adjacent its opposite end and a bore extending uninterruptedly between said open end and by-pass, said by-pass comprising a rib forming a part of said body and extending inwardly of the bore face, said bore embracing a single compartment to receive and retain liquid through a zone extending from a point adjacent the open end of said bore to a point adjacent said by-pass and said bore at a point in advance of said by-pass presenting a mounting surface to sealingly and slidably support a stopper.

14. For use in a hypodermic syringe assembly a barrel formed with a bore and having an open rear end, a wall closing the opposite end of said bore and formed with an opening in line with which a needle is to be mounted, a rib adjacent the inner face of said wall and said rib extending in the direction of the open rear end of said barrel inwardly from the bore face.

15. For use in a hypodermic syringe assembly

a barrel formed with a bore and having an open rear end, a wall closing the opposite end of said bore and formed with an opening in line with which a needle is to be mounted, said barrel being formed with groove adjacent the inner face of said wall and said groove extending in the direction of the open rear end of said barrel and in the face of said bore.

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