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A. E. SMITH

2,490,553

DISPOSABLE SYRINGE

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Fig. 1.

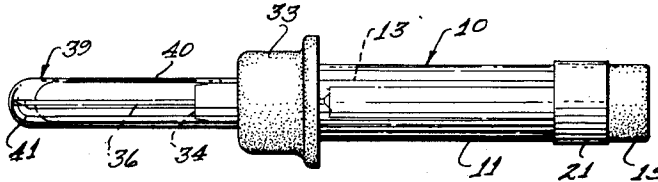


Fig. 2.

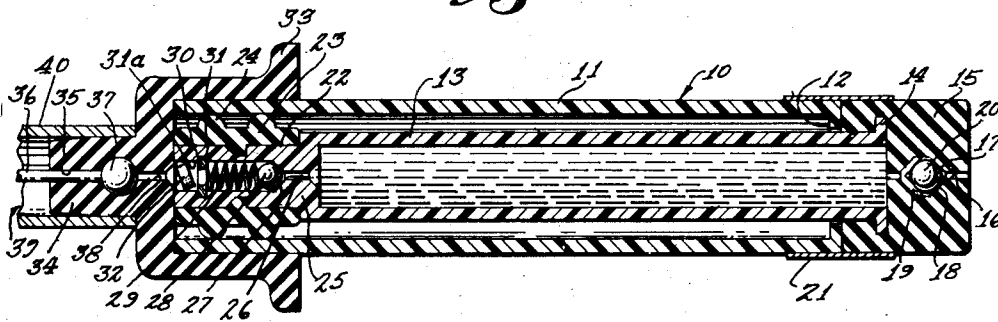


Fig. 3.

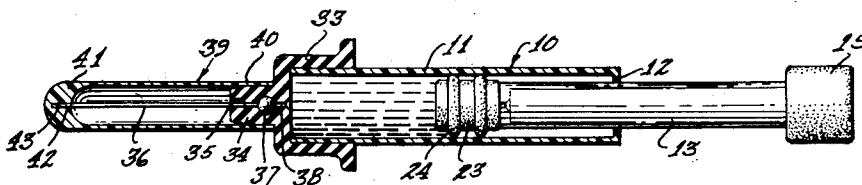


Fig. 4.

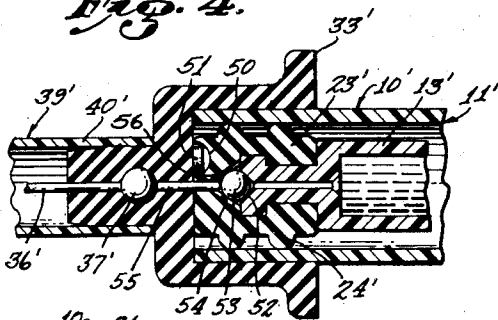


Fig. 5.

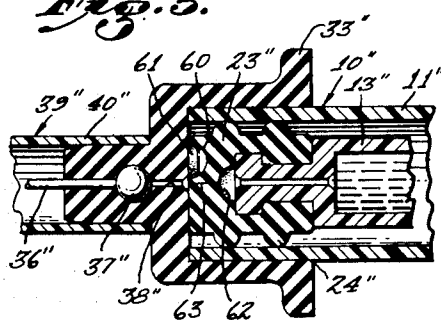
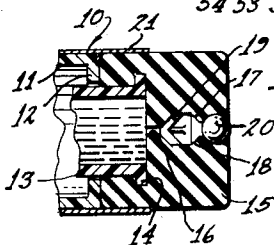


Fig. 6.



BY

ENTOR.
ARTHUR E. SMITH
Arthur E. Smith
ATTORNEY

UNITED STATES PATENT OFFICE

2,490,553

DISPOSABLE SYRINGE

Arthur E. Smith, Los Angeles, Calif.

Application September 20, 1947, Serial No. 775,194

13 Claims. (Cl. 128—218)

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This invention relates to a disposable syringe.

The general object of the invention is to provide a syringe, preferably adapted for single-use, and wherein a medicinal preparation, such as a local anaesthetizing solution, may be injected.

A more specific object of the invention is to provide a novel syringe of the disposable type whereby a fresh solution may be prepared within the syringe and then expelled therefrom.

A more specific object of the invention is to provide a syringe including a drug holding compartment and a vehicle holding compartment and wherein the two may be brought together in a novel manner to provide a fresh solution.

Another object of the invention is to provide a syringe including a barrel with a drug therein and a piston and wherein the vehicle for the drug is carried within the piston and wherein the vehicle is removed from the piston and caused to flow into the barrel to place the drug in solution when the piston is moved in one direction in the barrel.

A more specific object of the invention is to provide a syringe plunger having a chamber for the reception of a liquid and wherein novel means is provided for first causing the liquid to pass from the plunger to the barrel upon movement of the plunger in one direction relative to the barrel and thereafter for causing the liquid to be discharged from the barrel upon movement of the plunger in a reverse direction.

Other objects and advantages of my invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a side elevation of a syringe embodying the features of my invention;

Fig. 2 is a fragmentary, central, sectional view, showing the syringe;

Fig. 3 is a central, sectional view, showing the syringe after the solution is prepared;

Fig. 4 is a fragmentary, central, sectional view, showing a modification of my invention;

Fig. 5 is a view similar to Fig. 4, showing a further modification, and

Fig. 6 is a fragmentary, central, sectional view, showing the manner in which the ball valve is moved to its seat.

Referring to the drawing by reference characters, I have shown my invention as embodied in a syringe which is indicated generally at 10.

As shown, the syringe includes a cylindrical barrel 11 which has an inwardly directed flange 12 at one end thereof. Within the barrel I arrange a plunger 13. This plunger is preferably

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spaced from the barrel and is provided with an outwardly directed flange 14, which is adjacent to the flange 12. The barrel and plunger may be made of plastic or other suitable material.

Arranged upon the end of the plunger, is a rear end member 15, which is preferably made of rubber and which includes an axial bore 16 which includes an enlarged intermediate portion 17. The portion 17 includes a valve seat 18 and spaced ribs 19. A valve ball 20 is passed through the bore 16 by stretching the rubber as shown in Fig. 6 and when in place serves to permit communication through the bore 16 to the interior of the plunger and to prevent passage from the interior of the plunger outwardly.

The rear end member and the barrel are preferably of the same exterior diameter and during shipment are preferably held in place by a label or seal 21.

The plunger has a reduced portion 22 at its forward end and on this portion I arrange a piston 23 which includes beads 24 which engage the inner wall of the barrel 11.

The plunger is closed as at 25 and is provided with an axial bore 26 which is enlarged intermediate its length to provide a valve seat 27, engaged by a valve ball 28, which is normally urged to its seat by a spring 29. A split ring 30, fitting in a groove 31, serves to hold the spring in place. In advance of the ring 30 I provide a space or cavity 31a in which a medicinal preparation or tablet 32 is placed.

Upon the barrel, adjacent to the piston end, I arrange a front member 33, which, like the piston, may be made of rubber and which includes a forwardly projecting tip 34. The front member includes an axial bore 35 in which a needle 36, having a protuberance 37, is arranged. The needle communicates through a bore 38 with the interior of the barrel 11.

Mounted upon the tip 34 is a closure 39, which includes a skirt 40 engaging the tip, and a front end portion 41, which has a hole 42 to receive and seal the pointed front end 43 of the needle 36.

The syringe is prepared, loaded and shipped in the condition shown in Fig. 2.

To prepare for injection the seal 21 is ruptured and the rear end member 15 is pulled away from the barrel 11 while the syringe is preferably held in a vertical position. This action causes a partial vacuum to be produced in the forward end of the barrel, the pointed end 43 of the needle fits in the hole 42. Liquid in the plunger is thus drawn through the bore 26 past the valve 27 and into the barrel through the space or cavity 31a

so that any medicinal preparation in the cavity is subjected to the vehicle and is placed in solution, with the solution filling the forward end of the barrel. During this operation the ball 17 leaves its seat so that air enters the bore 16 to bleed the interior of the plunger.

The movement is continued until the vehicle has been moved into the barrel, whereupon the syringe is ready for use as soon as the cap 39 is removed. The injection is then made in the usual manner and the syringe is discarded.

In Fig. 4 I show a modification of my invention wherein similar parts are designated by single primed reference characters.

In the modification the piston 23' is extended so that it substantially covers the adjacent end of the plunger and is provided with a cavity 50 in which a medicinal preparation 51, similar to the preparation 32, may be placed. The end of the plunger is provided with a valve seat 52 which is engaged by a valve ball 53, arranged in a cavity 54 in the piston. The needle 36' includes an inwardly extending tube 55 which normally engages the valve ball 53 and holds the latter on its seat so that leakage is prevented during shipment. In the modification the remaining parts are similar to those previously described and the operation of the syringe is similar to that previously described.

In Fig. 5 I show a further modification wherein similar parts are designated by double primed reference characters and wherein the piston 23'' is provided with a cavity 60 which may hold a medicinal preparation 61. The front of the piston 23'' is provided with a cavity 62 and with a self-closing hole 63. The piston being made of soft rubber, the partial vacuum produced in the barrel 11'' causes the wall about the hole 63 to be distended as the liquid in the plunger seeks to fill the partial vacuum and thus the material is drawn from the plunger and passes into the barrel where it dissolves the preparation 61. In Fig. 5 the needle terminates at the protuberance 37'' and the needle communicates with the interior of the barrel through a bore 35'', similar to the bore 38. The operation of the device shown in Fig. 5 is similar to that described above.

If desired, the tablet or drug may be omitted and a stock solution of drug and vehicle may be placed in the plunger. For some uses the bleed valve at the rear end of the plunger may be omitted.

When the drug is present in the cavities 50 and 60, the piston, being made of soft material and being held in forward position by the seal 21, the material of the piston about the cavities is sealed so that the drug is secure in its cavity.

In the construction shown in Fig. 4, the cavity 54 in the piston has spaced ribs 56 therein, between which fluid in the tubular part 13' passes when the valve is opened.

The subject matter disclosed in this application is similar to the subject matter disclosed in my copending application Serial No. 775,193, filed September 20, 1947 and is also similar to the subject matter disclosed in my other copending application Serial No. 775,192, filed September 20, 1947.

The present application discloses a construction similar to the construction in the applicant's copending application Serial Nos. 775,192 and 775,193, both applications filed September 20, 1947. In the present application, however, the claims are directed broadly and specifically to a syringe wherein the piston plunger is provided

with a valve permitting the fluid to flow from a position in the rear of the piston plunger to a position in front of the piston plunger. In application Serial No. 775,193 the claims are drawn more or less specifically to the valved piston plunger and to the recess in the ampule front member, which recess is sealed by the piston plunger. In application Serial No. 775,192 the claims are drawn to the front closure member and the needle carrying cap thereon.

From the foregoing description it will be apparent that I have invented a novel disposable hypodermic syringe which can be economically manufactured and which is highly efficient for its intended use.

Having thus described my invention, I claim:

1. A syringe including a barrel, a plunger shiftable in said barrel, said plunger having a chamber therein, valve means arranged to permit flow of fluid from the chamber into the front end of the barrel while preventing flow from the barrel into the chamber, there being a cavity opening into the forward portion of the barrel, means closing said cavity when the piston is in its forward position, a medicinal preparation in said cavity and a vehicle for the preparation in the chamber, a needle, means to fixedly support the needle on the front end of the barrel, means to afford communication between the needle and the interior of the barrel and removable sealing means normally closing passage through the needle.

2. A syringe including a barrel, a plunger shiftable in said barrel, said plunger having a chamber therein, valve means on said plunger constructed to permit passage from the atmosphere into the chamber and preventing passage therefrom, the front portion of said plunger including valve means arranged to permit flow of fluid from the chamber into the front end of the barrel while preventing flow into the chamber, there being a cavity opening into the barrel, a medicinal preparation in said cavity and a vehicle for the preparation in the chamber, a needle, means to support the needle on the front end of the barrel, means to afford communication between the needle and the interior of the barrel and removable sealing means normally closing passage through the needle.

3. A syringe including a barrel, a plunger shiftable in said barrel, said plunger having a chamber therein, valve means constructed to permit passage from the atmosphere into the chamber and preventing passage therefrom, valve means arranged to permit flow of fluid from the chamber into the front end of the barrel while preventing flow from the barrel into the chamber, there being a cavity opening into the forward portion of the barrel, means closing said cavity when the piston is in its forward position, a medicinal preparation in said cavity and a vehicle for the preparation in the chamber, a needle, means to fixedly support the needle on the front end of the barrel, means to afford communication between the needle and the interior of the barrel and removable sealing means normally closing passage through the needle.

4. A syringe including a barrel, a plunger shiftable in said barrel, said plunger having a chamber therein, a rear end member on said plunger, said rear end member having a bore communicating with the chamber, valve means in said bore constructed to permit passage into the chamber and preventing passage therefrom, the front portion of said plunger including valve

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means arranged to permit flow of fluid from the chamber into the front end of the barrel while preventing flow into the chamber, there being a cavity in said plunger in advance of said valve means therein, a medicinal preparation in said cavity and a vehicle for the preparation in the chamber, a front member on said barrel, a needle on said front member, means to afford communication between the needle and the interior of the barrel and removable sealing means normally closing passage through the needle.

5. A syringe including a barrel, a plunger shiftable in said barrel, said plunger having a chamber therein, the front portion of said plunger including valve means arranged to permit flow of fluid from the chamber into the front end of the barrel while preventing flow into the chamber, there being a medicinal receiving, normally closed, pocket opening into the front end portion of the barrel, said pocket being normally closed when the piston is at the inner limit of its movement, means to releasably hold the piston at the inner limit of its movement, a medicinal preparation in said pocket and a vehicle for the preparation in the chamber, a needle, means to rigidly support the needle on the front end of the barrel, and means to afford communication between the needle and the interior of the barrel.

6. A syringe including a cylindrical barrel having an inwardly directed flange at one end, a plunger shiftable in said barrel, said plunger comprising a tubular body having an outwardly directed external flange at one end, a rear end member engaging said external flange and closing the adjacent end of said tubular body, said rear end member having a bore therethrough, a one-way valve in said bore, said valve being constructed to permit passage into the tubular body and preventing passage therefrom, said tubular body having a piston thereon remote from said rear end member, the front portion of said tubular body being closed and having a bore therethrough, a one-way valve in said last mentioned bore, said last mentioned valve being arranged to permit flow of fluid from the tubular body while preventing flow into the tubular body, there being a cavity in said tubular body bore in advance of said valve therein, a medicinal preparation in said cavity and a vehicle for the preparation within the tubular body, a front member on said barrel, said front member having a bore, a needle arranged in said front member bore, means to afford communication between the needle and the interior of the barrel and removable sealing means closing the outer end of the needle.

7. A syringe including a cylindrical barrel, a plunger shiftable in said barrel, said plunger comprising a tubular body, a rear end member closing the rear end of said tubular body, said rear end member having a bore therethrough, a one-way valve in said bore, said valve being constructed to permit passage into the tubular body and preventing passage therefrom, said tubular body having a piston thereon remote from said rear end member, a closure for the front portion of said tubular body, said closure having a bore, a valve seat in said bore, a valve on said seat, spring means normally urging the valve to its seat, said valve being arranged to permit flow of fluid from the tubular body while preventing flow into the tubular body, there being a cavity in said tubular body bore in advance of said valve therein, a medicinal preparation in said cavity and a vehicle for the preparation within the tubular body, a front member on said

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barrel, a needle on said front member, means to afford communication between the needle and the interior of the barrel and removable means to prevent outward flow through said needle and means closing passage through the needle.

8. A syringe including a cylindrical barrel, a plunger shiftable in said barrel, said plunger comprising a tubular body, a rear end member closing the rear end of said tubular body, said rear end member having a bore therethrough, a one-way valve in said bore, said valve being constructed to permit passage into the tubular body and preventing passage therefrom, said tubular body having a piston thereon remote from said rear end member, the front portion of said tubular body being closed and having a bore therethrough, said last mentioned bore including a valve seat, a valve engaging said seat, said last mentioned valve being arranged to permit flow of fluid from the tubular body while preventing flow into the tubular body, there being a cavity in said tubular body bore in advance of said valve therein, a medicinal preparation in said cavity and a vehicle for the preparation within the tubular body, a front member on said barrel, a needle on said front member, said needle extending inwardly and engaging said last mentioned valve to hold the valve in its seat, and means to afford communication between the needle and the interior of the barrel.

9. A syringe including a cylindrical barrel, a plunger shiftable in said barrel, said plunger comprising a tubular body, a rear end member closing the rear end of said tubular body, said rear end member having a bore therethrough, a one-way valve in said bore, said valve being constructed to permit passage into the tubular body and preventing passage therefrom, said tubular body having a piston thereon remote from said rear end member, the front portion of said tubular body being closed and having a bore therethrough, said piston being made of flexible material and having an end extending over the end of the tubular body, said piston end having a valve slit therein, said valve slit being arranged to permit flow into the tubular body, there being a cavity within the syringe and opening into the front end of the barrel, a medicinal preparation in said cavity and a vehicle for the preparation within the tubular body, a front member on said barrel, a needle on said front member, means to afford communication between the needle and the interior of the barrel and means closing passage through the needle.

10. A syringe including a barrel member, a hollow plunger shiftable in said barrel member, a medicinal preparation in one end portion of the barrel member, valve means arranged to permit flow of fluid from one end portion of the plunger into said one end portion of the barrel member while preventing return flow into the plunger, a vehicle in the hollow plunger, a needle, means to support the needle, and means to afford communication between the needle and the interior of the barrel member.

11. A syringe including a barrel, a plunger shiftable in said barrel, said plunger comprising a tubular body, valve means arranged to permit flow of fluid from the tubular body into the front end portion of the barrel while preventing return flow into the tubular body, a medicinal preparation in the forward portion of the barrel, a vehicle within the tubular body, and a needle on said barrel and communicating with the interior of the barrel.

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12. A syringe including a barrel member, a hollow plunger member shiftable in said barrel member, a medicinal preparation in one end portion of the barrel member, a valve means arranged to permit flow of fluid from one end portion of the plunger into said one end portion of the barrel member while preventing return flow into the plunger member, means to bleed the other end portion of the plunger to the atmosphere, a vehicle in the hollow plunger, a needle, means to support the needle on the syringe and means to afford communication between the needle and the interior of the barrel member.

13. A syringe including a barrel, a plunger shiftable in said barrel, said plunger comprising a tubular body, means closing the rear end of said tubular body, said rear end closing means having a bore, a one-way valve in said bore, said valve being constructed to permit passage into the tubular body and preventing passage there-

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from, valve means arranged to permit flow of fluid from the tubular body into the front end portion of the barrel while preventing return flow into the tubular body, a medicinal preparation in the forward portion of the barrel, a vehicle within the tubular body, and a needle on said barrel and communicating with the interior of the barrel.

ARTHUR E. SMITH.

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