Jan. 17, 1950 A. E. SMITH 2,495,027

SYRINGE

Filed July 25, 1947

Fig. 1.

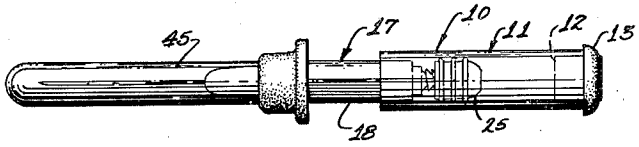



Fig. 2.

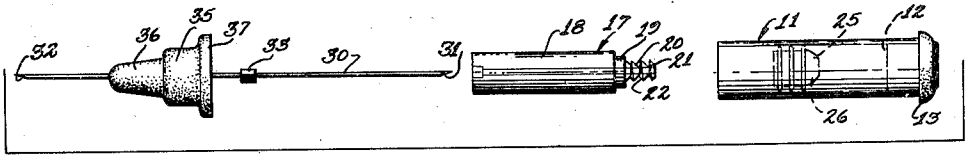



Fig. 3.

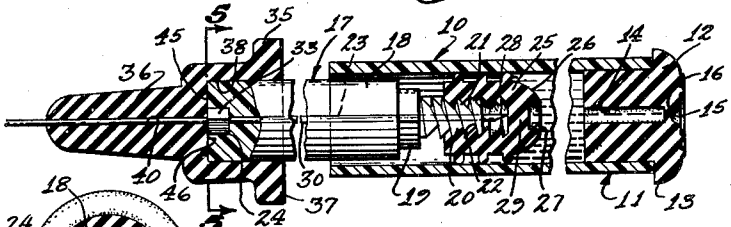



Fig. 4.

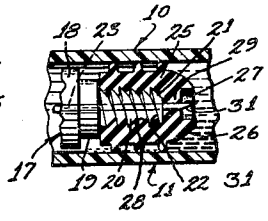



Fig. 5.

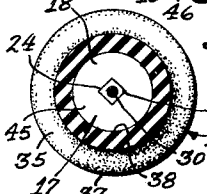



Fig. 6.




Fig. 7.

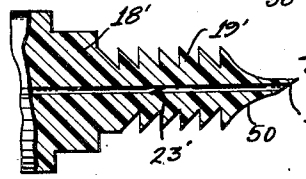



Fig. 8.

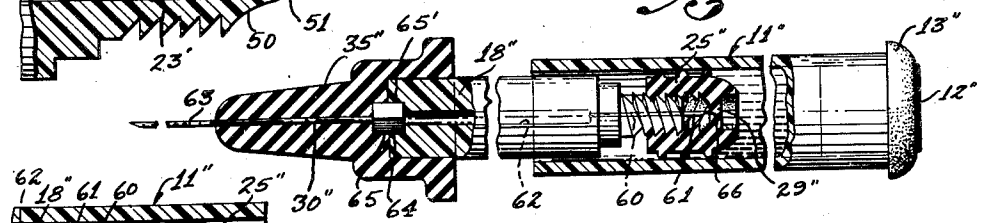
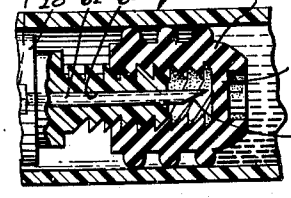



Fig. 9.




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## SYRINGE

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Application July 25, 1947, Serial No. 763,571

11 Claims. (Cl. 128—220)

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This invention relates to syringes.

The general object of the invention is to provide an improved syringe of the disposable type which is useful for the injection of medicinal preparations.

A more specific object of my invention is to provide a novel plunger for use in a disposable syringe.

Another object of the invention is to provide a syringe including a plunger and wherein the plunger has novel means thereon for supporting a hypodermic needle.

Further 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 showing my invention;

Fig. 2 is an extended side elevation showing the parts constituting my syringe;

Fig. 3 is an enlarged, fragmentary, central sectional view showing my syringe;

Fig. 4 is a fragmentary view showing the end of the plunger when the syringe is ready for use;

Fig. 5 is a section taken on line 5—5, Fig. 3;

Fig. 6 is a view similar to Fig. 2, showing a modification;

Fig. 7 is an enlarged fragmentary, sectional view, showing the inner end of the plunger with the piston stopper removed;

Fig. 8 is a view similar to Fig. 2, showing a further modification, and

Fig. 9 is an enlarged, fragmentary, sectional view of the device shown in Fig. 8 and showing the forward end of the plunger and the piston stopper.

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 an ampule or barrel 11, which may be made of plastic and which is cylindrical and has a stopper 12, which may be made of rubber and which is mounted in one end of the ampule. The stopper includes a projecting flange 13 and has an inwardly directed recess 14 and an outwardly directed recess 15 with a diaphragm 16 between the recesses.

The syringe includes a plunger, which is indicated generally at 17. The plunger may be made as a solid piece of transparent plastic or similar material and may be die-cast or may be machined to shape as desired. As shown the plunger includes a cylindrical body 18, having a reduced forward portion 19 and having threads 20 on the forward portion. The threads 20 preferably have steeply inclined forward faces 21 and rear faces 22 which are substantially perpendicular to the axis of the plunger. The plunger includes an axial bore 23 which extends therethrough and its outer end is enlarged to form a square recess 24.

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In the ampule I arrange a cylindrical piston stopper 25 which, as shown, has a bulbous front end 26 which is recessed as at 27 at its inner end, and at its outer end has a recess 28 which is threaded with threads of the same shape as the threads 20 previously described. A diaphragm 29 separates the recess 27 from the threaded recess 28.

Arranged within the bore 23 I show a hypodermic needle 30 which has a sharpened rear end 31 and a sharpened front end 32. The needle includes a rectangular protuberance 33, which may be brazed thereon and which is similar in shape to that of the recess 24.

The syringe also includes a front member 35 which includes a tapered tip 36 and a projecting flange 37 which may be grasped by the fingers of the operator while making an injection. The front member 35 includes a recess 38 in which the forward end of the plunger 18 is seated as shown in Fig. 3. The front member tip 36 includes a bore 40 through which the forward end of the needle extends.

The front member 35 may be made of material such as rubber, similar to the stopper 12, while the plunger 18 may be made of plastic such as that of which the barrel 11 is constructed.

In use the piston stopper and the stopper 12 are arranged in the ampule 11 in close relation. A hypodermic needle is then inserted through the diaphragm 16 and material is run into the ampule, forcing the piston stopper away from the stopper 12 until the required amount of material is in the ampule, whereupon the needle is withdrawn from the diaphragm 16 and the hole seals itself, due to the resiliency of the material.

The needle 30 is then inserted in the bore 23 of the plunger with the protuberance 33 in the recess 24 and the plunger is moved to the position shown in Fig. 3, with the forward end 45 of the plunger against a shoulder 46 on the front member. The resiliency of the material of the front member holds the plunger 18 on the front member 35. The plunger is then threaded into the recess 28 until the forward tip 31 on the needle 30 is closely adjacent to, but does not enter or pierce, the diaphragm 29. In this condition the syringe is packaged and shipped.

To prepare the syringe for use the ampule 11 is

grasped and the front member 35 is turned, thus causing the threads on the plunger to move further into the threaded recess on the piston stopper. The piston stopper, due to its frictional engagement with the walls of the ampule, do not rotate within the ampule and thus slowly the pointed tip 31 on the needle pierces the diaphragm 29 until the parts assume the position shown in Fig. 4, where the tip 31 is exposed in the ampule, and thus the needle is placed in communication with the contents of the ampule. A tip 45, which may be made of transparent, flexible material, engages the tapered tip of this front member to maintain the parts in sterile condition.

In use the tip 45 is removed and the plunger is rotated to place the syringe in working condition, as described, and the injection is made. The plunger is slightly advanced and is then withdrawn to determine by the absence or presence of blood in the ampule whether a blood vessel has been pierced. If blood is present, indicating that blood vessel has been pierced, the needle is withdrawn and reinserted properly and the injection is made.

In Figs. 5, 6 and 7 I show modifications of my invention wherein the ampule 11' is similar to the ampule 11, previously described, while the plunger 18' is similar to the previously described plunger 18, as is the front member 35' in the modification. In this modification the forward end of the threaded portion 19' of the plunger tapers forwardly as at 50 and is provided with a sharpened bevelled end 51. The modified plunger 18' includes a bore 23'. The needle 30' has a cubical protuberance 52 which fits in matching recesses 52' in the front member. The needle projects forwardly as at 53 from the protuberance and extends rearwardly therefrom as at 54 and extends into the bore 23'.

The ampule is prepared as previously described and for use the front member 35' is rotated, causing the tip 51 to pierce the diaphragm 29' on the piston plunger, thus placing the contents of the ampule in communication with the bore 23', whence the contents of the ampule passes to and through the needle 30'.

In Figs. 8 and 9 I show a further modification of my invention, wherein the ampule 11'', the plunger 18'' and the front member 35'' are similar to those previously described except that the plunger 18'' at the threaded forward portion thereof has a bore 60 in which a tube 61 is arranged. This tube 61 communicates with a large bore 62 in the plunger 18''. The front member has a bore 30'' in which a needle 63 is arranged.

The needle includes a cubical protuberance 64, one-half of which is arranged in a matching recess 65 in the front member and the other half of which is arranged in a similar recess 65' in the plunger 18''. The protuberance serves to lock the plunger and front member together so that they will rotate when the front member turns, thus causing the threads on the plunger to advance along the piston stopper 25'', and will cause the forward portion 66 of the tube 61 to pierce the diaphragm 29'' on the piston stopper to thus place the contents of the ampule in communication with the needle, whence the medicament can pass to the bore 62 and thence to the needle 30''. The use of the modifications is the same as previously described.

From the foregoing description it will be apparent that I have invented a novel hypodermic syringe which may be economically manufactured and may readily be maintained sterile and wherein the syringe may very readily be placed in prepared condition.

This application is a continuation-in-part of my co-pending applications Serial Nos. 680,748, filed July 1, 1946, and 697,075, filed September 14, 1946.

Having thus described my invention, I claim:

1. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body having a closure at one end and a plunger slidable in said ampule, said plunger comprising an elongated body having a threaded inner end portion, said plunger having an axial bore therethrough, a piston stopper in said ampule, said piston stopper having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, said piston stopper having a diaphragm closing the inner end of said threaded recess, the inner end of said plunger having a projecting, hollow, sharpened tip normally disposed in the threaded recess of said piston stopper and spaced from the diaphragm of the piston stopper, said plunger being rotatable relative to the piston stopper to cause the sharpened tip to pierce the piston stopper diaphragm to thereby place the hollow tip in communication with the contents of the ampule.

2. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, a plunger slidable in said ample, said plunger comprising an elongated body having a threaded inner end portion, said plunger having a bore therethrough, a piston stopper having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, means closing the inner end of said threaded recess, and a needle in the plunger bore and having an inner end normally disposed in the threaded recess of said piston stopper and spaced from the closing means of the piston stopper, said plunger being rotatable relative to the piston stopper to cause the inner end of the needle to pierce the piston stopper diaphragm to thereby place the needle in communication with the contents of the ampule.

3. A syringe including a medicament holding ample, said ampule comprising a cylindrical body, a closure at one end of said body, a plunger slidable in said ampule, said plunger comprising a cylindrical tubular body having a threaded inner end portion, said plunger having a bore, a piston stopper in said ampule, said piston stopper having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, said piston stopper slidably engaging the inner wall of the ampule, said piston stopper having means closing the inner end of said threaded recess, said plunger including a front member having a hole therethrough and a needle extending through said front member hole and through said plunger bore and having its inner end normally disposed in the threaded recess of said piston stopper and spaced from the closing means of the piston stopper, said plunger being rotatable relative to the piston stopper to cause the inner end of the needle to pierce the piston stopper closure means to thereby place the needle in communication with the contents of the ampule.

4. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, a plunger slidable in said ampule, said plunger comprising a cylindrical tubular body having a threaded

inner end portion, said plunger having an axial bore therethrough, a piston stopper in said ampule, said stopper having a recess, said stopper recess having threads adapted to engage the plunger threads, said piston stopper slidably engaging the inner wall of the ampule, said piston stopper having a diaphragm closing the inner end of said threaded recess, a front member on said plunger, said front member having an axial hole therethrough, and a needle carried by said front member and extending through the axial hole and through said plunger bore and having a sharpened inner end normally disposed in the threaded recess of said piston stopper and spaced from the diaphragm of the piston stopper, said plunger having a recess in the outer end thereof and said needle having a protuberance thereon disposed in said recess, said plunger being rotatable relative to the piston stopper to cause the inner end of the needle to advance to pierce the piston stopper diaphragm to thereby place the needle in communication with the contents of the ampule.

5. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, said closure having an axial recess therein with a diaphragm closing one end of said recess, a plunger slidable in said ampule, said plunger comprising a cylindrical body having a threaded inner end portion, said plunger having an axial bore therethrough, a piston stopper in said ampule, said piston stopper comprising a resilient body, said body having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, said piston stopper having spaced beads thereon, said spaced beads slidably engaging the inner wall of the ampule, said piston stopper having an inner end recess therein with a diaphragm between said end recess and said threaded recess, a front member on said plunger, said front member having an axial hole therethrough, a needle carried by said front member and extending through said axial hole and said plunger bore and having a sharpened inner end extending beyond the plunger inner end and normally disposed in the threaded recess of said piston stopper and spaced from the diaphragm of the piston stopper, said plunger having a rectangular recess in the outer end thereof and said needle having a rectangular protuberance thereon disposed in said rectangular recess, said plunger being rotatable relative to the piston stopper to advance the plunger and to cause the inner end of the needle to pierce the piston stopper diaphragm to thereby place the needle in communication with the contents of the ampule.

6. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, and a plunger slidable in said ampule, said plunger comprising an elongated body having a threaded inner end portion terminating in a sharpened end, said plunger having an axial bore therethrough, a piston stopper in said ampule, said piston stopper having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, said piston stopper having a diaphragm closing the inner end of said threaded recess, a front member on said plunger, said front member having an axial hole therethrough, a needle carried by said front member and extending into said axial bore, the sharpened end of said plunger being normally disposed in the threaded recess of said piston stopper and spaced from the diaphragm of the piston stopper, said plunger being rotatable relative to the piston stopper to cause the sharpened end of the plunger to pierce the piston diaphragm to thereby place the plunger bore in communication with the contents of the ampule.

7. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, and a plunger slidable in said ampule, said plunger having a threaded inner end portion terminating in a sharpened end, said plunger having an axial bore therethrough, a piston stopper in said ampule, said piston stopper having a threaded recess adapted to engage the plunger threads, means closing the inner end of said threaded recess, a needle on said plunger and communicating with the plunger bore, the sharpened end of said plunger being normally disposed in the threaded recess of said piston stopper and spaced from the closing means of the piston stopper recess, said plunger being rotatable relative to the piston stopper to cause the sharpened end of the plunger to pierce the recess closing means to thereby place the plunger bore in communication with the contents of the ampule.

8. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, and a plunger slidable in said ampule, said plunger comprising a cylindrical tubular body having a threaded inner end portion, said plunger having an axial bore therethrough, a piston stopper having a threaded recess, the plunger threads engaging the piston stopper threads, said piston stopper having a diaphragm closing the inner end of said threaded recess, a front member on said plunger, said front member having an axial hole therethrough, a needle carried by said front member and communicating with the front member hole, the inner end of said plunger including a sharpened hollow needle, means affording communication between the hollow needle tip and the front member needle, the hollow needle tip being normally disposed in the threaded recess of said piston stopper and spaced from the diaphragm of the piston stopper, said plunger being rotatable relative to the piston stopper to cause the sharpened hollow needle to pierce the plunger diaphragm to thereby place the hollow needle tip in communication with the contents of the ampule.

9. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, a plunger movable relative to and slidable in said ampule, said plunger comprising an elongated body having a threaded inner end portion, said plunger having a bore therethrough, a piston stopper having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, means closing the inner end of said threaded recess, and a needle in the plunger bore and having an inner end normally disposed in the threaded recess of said piston stopper and spaced from the closing means of the piston stopper, said plunger being rotatable relative to the piston stopper to cause the inner end of the needle to pierce the piston stopper closing means to thereby place the needle in communication with the contents of the ampule.

10. A syringe including a medicament holding ampule, said ampule comprising a cylindrical body, a closure at one end of said body, a plunger movable relative to and slidable in said ampule,

said plunger comprising an elongated body having a threaded inner end portion and having its outer end portion seated within a needle holding member, said plunger and said needle holding member each having a coaxial bore therethrough, a piston stopper having a threaded recess, the plunger threads being adapted to engage the piston stopper threads, means closing the inner end of said threaded recess, and a needle in the plunger bore, said needle having an inner end normally disposed in the threaded recess of said piston stopper and spaced from the closing means of the piston stopper and having an outer end



disposed in the needle holding member bore and extending beyond the outer end of said needle holding member, said plunger being rotatable relative to the piston stopper to cause the inner end of the needle to pierce the piston stopper closing means to thereby place the needle in communication with the contents of the ampule.

11. The syringe defined in claim 10 wherein the needle is a unitary element sharpened at both ends.

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No references cited.