Jan. 17, 1950 A. E. SMITH 2,495,025

HYPODERMIC SYRINGE

Filed July 1, 1946

Fig. 2.

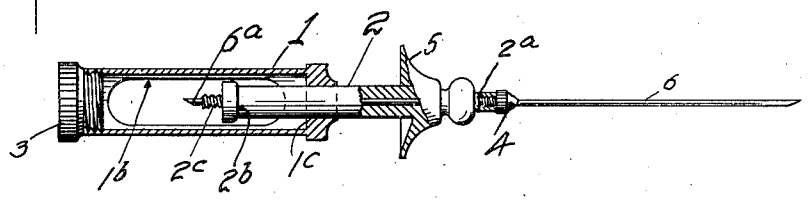
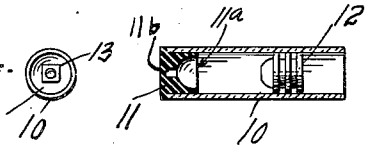


Fig. 4.



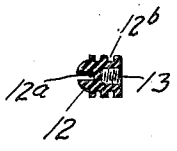


Fig. 5.

Fig. 3.

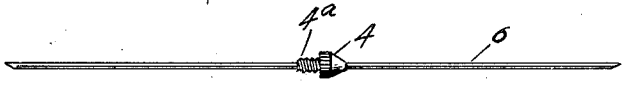


Fig. 6.

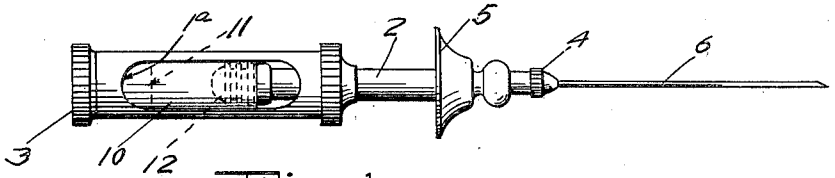


Fig. 1.

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HYPODERMIC SYRINGE

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2 Claims. (Cl. 128—220)

1

The present invention relates to improvements in hypodermic syringes and has particular reference to the type of syringe in which a cartridge, commonly termed an ampule, is insertable, and which includes a detachable tubular needle.

The general object of the invention is to provide an efficient syringe for administering penicillin-oil-wax and other hypodermic medicinal compound or solution. A further object is to provide a simple syringe which is so inexpensive that ampules, containing the sterilized medicinal compound or solution, and the needle thereof may be quickly inserted and discarded after each injection.

Another object of the invention is to provide improved means for centering the ampule within the casing of the device and to guide it properly during the injection operation. A still further object is to provide an improved ampule structure fitted with specially designed closures at the ends thereof for facilitating loading of the ampule and eviction of the medicinal solutions therefrom.

Another object of the invention is to provide means for retracting the plunger cork to determine whether or not the needle point has entered a blood vessel prior to injecting the medicinal compound.

These and other objects of the invention and the many advantages thereof will be apparent from the following detailed description and by referring to the accompanying drawings, of which:

Fig. 1 is a side view of a completely assembled syringe embodying the invention;

Fig. 2 is a substantially corresponding view of the syringe as it appears before the ampule is mounted therein, and with parts in cross-section for the sake of clearness;

Fig. 3 is a sectional side view of the ampule as it appears before insertion into the syringe;

Fig. 4 is a substantially corresponding end view of the ampule;

Fig. 5 is a cross-sectional view of one of the parts thereof; and

Fig. 6 is a side view of the hypodermic needle used in the syringe.

The syringe consists of two main portions namely, a casing 1, within which a plunger 2 is axially fitted to slide. The outer end of the casing is closed by a screw cap 3, and the cylindrical body portion of the casing is transversely perforated to provide openings or windows 1^a, 1^b for convenience in assembling and operating the syringe.

2

The plunger 2 is tubular and is fitted at one end with internal screw threads 2^a of a size to receive the threaded end 4^a of a tubular cap 4 within which a tubular needle 6 is rigidly secured. The plunger is also made with a hand grip 5 which, for convenience, in the drawings takes the shape of a circular, flaring head, but it may be made in any other shape. When the needle is mounted in position within the plunger it is noticed that the inner end 6^a thereof projects a short distance beyond the inner end of the plunger. The latter is in Fig. 1, for the sake of clearness, shown in an intermediate position, but it is to be understood that as a preliminary to seating of the ampule within the casing 1, it is necessary to withdraw the plunger until the shoulder 2^b thereof comes to a stop against the shoulder 1^c of the casing, whereupon the cap 3 is unscrewed.

The ampule, in the preferred form illustrated in the drawings, comprises a transparent tube 10 which is closed at one end by means of a cap 11, and a small piston 12 is seatable for axial sliding movement therein. The ampule is designed to hold any predetermined amount of medicinal compound or solution and, as this may vary with the kind of solution used and with the dosage required, it is merely necessary before the closure 11 is seated to insert the piston into the end of the tube and to advance it within the tube until the space between the piston and the closure 11 is of a volume to correspond to the amount of medicinal solution desired. Closure 11 is next inserted into the end of the ampule and the space between 11 and 12 is filled with the medicinal compound by a needle through diaphragm 11^b.

Ampules, as above described, are specially designed for loading and delivery by the pharmaceutical manufacturer so as to be ready for immediate insertion in the syringe and, as above stated, are discarded upon completion of the injection.

It is now noticed that the piston 12 is internally threaded, as shown in Figure 5, or fitted, as shown in Figure 4, with a metal insert 13 which is internally threaded for engagement with a threaded projection 2^c at the inner end of the plunger. Once the ampule has been seated in position within the syringe and the cap 3 mounted thereon to maintain the ampule confined therein, the syringe is ready for use. It is then merely required to advance the plunger into the casing until the shoulder portion 2^b enters the ampule tube 10 and the threaded end

2c of the plunger reaches the threaded opening 13 of the piston 12, whereupon the plunger is rotated in order to screw this end in position within the piston. The latter is preferably made from suitable soft material such as rubber and, as indicated in Fig. 5, is made with a thin centrally located membrane 12a through which the inner end of the needle penetrates when the plunger is screwed into position therein, thereby to open a passage for the solution within the ampule to the interior of the needle.

It is quite necessary that the piston be tightly fitted within the ampule, and it is also important that it is so designed that it may be axially slidable therein without exerting undue pressure on the plunger, and it is for this reason shown made with a series of annular grooves 12b. The closure 11 is also preferably made from soft rubber or other resilient material, and it is noticed that the inner end thereof is recessed at 11a to form a substantially hemispherical seat for the end of the piston. When so constructed it is seen that the closure may be made long enough to insure against leakage or accidental dislodgement and that because the end of the piston seats therein all of the contents of the ampule may be expelled and no part of the contents thereof need to be wasted.

In inserting the needle into the patient it occasionally happens that the needle enters a blood vessel. This is an occurrence which the practitioner is always guarding against, and it is of considerable importance to him to be able to determine whether or not such puncture has occurred. It is one of the great advantages of the present invention that this may be readily determined after the needle has been inserted in the patient by merely withdrawing the plunger within the casing a very short distance. In doing this, it is noticed that the piston 12 is moved correspondingly within the ampule thereby to create a partial vacuum therein, a vacuum which causes blood, if present, to be drawn through the needle into the ampule and so to enable the practitioner to determine by a mere glance at the syringe whether or not a blood vessel has been penetrated.

Another great advantage of this device is that the plunger is always perfectly guided axially within the casing, particularly because the shoulder portion 2b thereof enters and fits into the end of the ampule before the screw threads reach and engage the threads 13 of the piston, thereby to make sure that the needle and the end of the plunger correctly engage the piston and that during the injection operation the plunger and piston are continuously axially guided within the ampule so as not to impart any side strain thereto.

It is also important to note that the outer end of the plunger is internally threaded, and that for this reason the threads thereof are protected against accidental damage in handling the syringe, and also against dirt and other foreign matter. Still another advantage of this arrangement is that the needle can only be inserted in one direction, and that for this reason the inner, pointed end 6a thereof always assumes the proper position beyond the end of the plunger.

From the foregoing description it will be apparent that I have provided a very simple and efficient syringe combination which is convenient to assemble and use.

I claim:

1. In a hypodermic syringe, the combination with a cylindrical casing and a needle holder axially slidable therein, said needle holder having external screw threads at the inner end thereof and a needle extendable therethrough, of a cylindrical ampule seated within the casing, a piston of resilient material snugly fitted to slide within said ampule, an internally threaded tubular insert axially seated within said piston, the piston having annular grooves in the periphery thereof and being made with a substantially semispherical projection rising from the inner face thereof, a resilient shouldered stopper for closing the other end of the ampule, said stopper having a recess sunk into the inner surface thereof of a size to receive the projection of said piston, there being a thin membrane between the bottom of said recess and the outer surface of the stopper.

2. For use in a hypodermic syringe, a cylindrical transparent ampule open at both ends, a resilient piston seatable for sliding movement within said ampule and having a spherical projection at the inner end thereof, an internally threaded recess portion within said piston at the opposite end thereof, said inner end portion of the piston being recessed to form between the outer surface of said inner end and the bottom of said threaded recess portion a thin membrane, a resilient shouldered stopper for the opposite end of the ampule, said stopper having a recess in the inner surface thereof of a size to receive the spherical projection of the piston and a small recess extending therefrom to form between the bottom of the recess and the outer surface of the stopper a thin membrane.

ARTHUR E. SMITH.

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