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W. WOLF

1,643,531

SYRINGE FOR HYPODERMIC NEEDLES OR THE LIKE

Filed Nov. 15, 1926

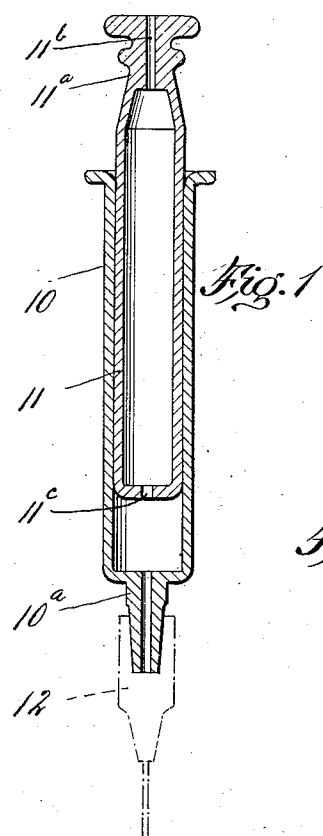


Fig. 1

Fig. 1^a

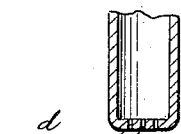


Fig. 2

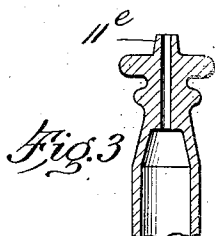
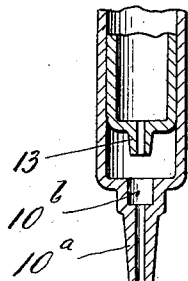


Fig. 3

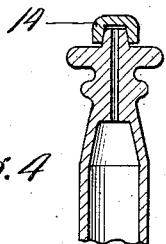


Fig. 4

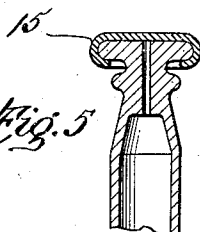


Fig. 5

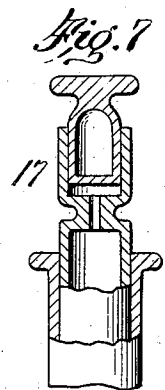


Fig. 7

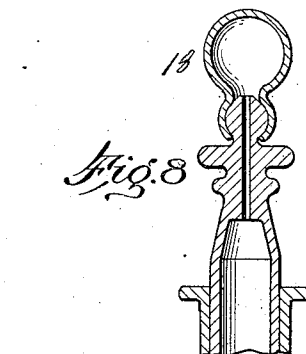


Fig. 8

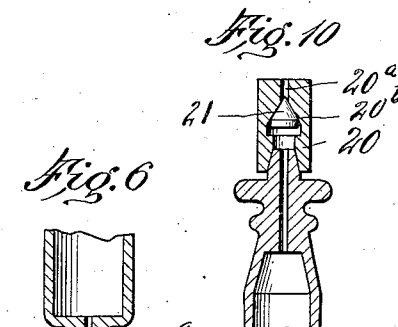


Fig. 6

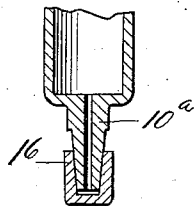


Fig. 7^a

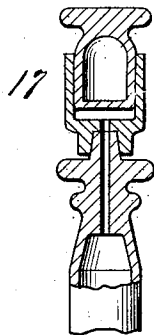


Fig. 9

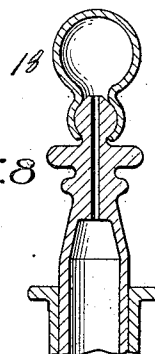


Fig. 10

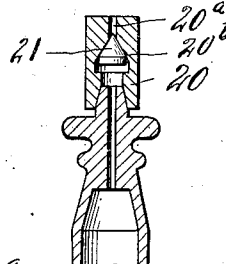
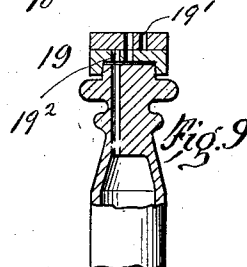
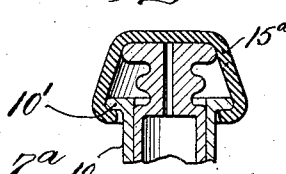


Fig. 11



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SYRINGE FOR HYPODERMIC NEEDLES OR THE LIKE.

Application filed November 15, 1926. Serial No. 148,319.

This invention relates to syringes, particularly such as are used with hypodermic needles. The air present between the plunger and the fluid to be injected form air bubbles the injection of which into the tissues or veins of the patient must be avoided. With the hitherto used syringes of this kind the operator accomplishes this before passing the needle which is removably attached to the syringe into the tissues of the body by first inverting the syringe to bring the air bubble to the bottom of the barrel i. e. in front of the fluid and then by slowly moving the plunger upwardly thereby expelling the air. This manipulation consumes time and entails waste of often very valuable fluid, for some of said fluid must be expelled to completely discharge the air. This waste may become considerable when the plunger is advanced too rapidly or with a jerky motion. Syringes used with hypodermic needles are comparatively small and delicate, generally made of glass and the problem of discharging the air from these instruments is different from that of syringes of comparatively large dimensions used for other purposes and where valves or cocks can be readily applied.

One of the main objects of this invention is to provide means which will save fluid and time by permitting the discharge of the air during the injection and dispense with the necessity of previously inverting the syringe.

Another object is to use the simplest possible means for that purpose so that the cost of manufacture of the syringe will not be higher than that of ordinary syringes and which will be effective and can be easily controlled by the operator.

Another object of my invention is to provide means whereby the syringe filled with the substance used for treatment may be carried in one's satchel to be ready for use and whereby the operator is enabled to use only part of the fluid leaving the rest in the plunger for later use.

A still further object of this invention is to provide means which will facilitate the expulsion of the fluid which during the expulsion of the air or during the injection may have entered the plunger.

With these and other objects in view, my invention consists in the combination, con-

struction, and arrangement of parts as will be hereinafter more fully described and defined in the appended claims.

In the accompanying drawing, in which similar reference characters denote corresponding parts, Fig. 1 is a longitudinal section of the syringe constructed according to my invention and Figs. 2-11 are sectional views of modifications of details of said syringe.

As with the known construction, my syringe comprises a barrel 10, having a nozzle 10^a, and a hollow plunger 11, slidably fitted therein and which at its outer end is formed with a finger piece or grasp 11^a. 12 denotes the hypodermic needle which is adapted to be removably attached to the nozzle 10^a of the barrel. Before an injection can be performed with the ordinary syringes of this kind the air which may be present in the syringe between the inner end of the plunger and the fluid has to be first expelled. As has been stated this is effected by first inverting the syringe so that the air will rise to the top or in front of the fluid and then slowly moving the plunger upwardly thereby expelling the air. All air will be expelled when some of the fluid in the syringe passes out from the nozzle or the needle. Thus even when moving the plunger carefully and slowly there will be a waste of fluid. If the plunger is moved too rapidly or with a jerky motion a considerably greater quantity of the fluid may be wasted. Such manipulation is therefore objectionable as it entails waste of often very valuable fluid. According to my invention this objection is obviated by providing the plunger with two openings 11^b, 11^c, at its opposite ends. During the injection the outer opening 11^b is held closed by the finger of the operator until the plunger comes close to the bottom of the barrel. The operator then opens the air passage 11^b as a result of which, when the plunger is pushed further inwardly, the air instead of being forced through the nozzle into the needle, will pass into the hollow plunger 11. Of course the air may be forced into the plunger before the operation and before attaching the needle to the nozzle, by closing the latter and advancing the plunger.

In Fig. 1 the openings 11^b, 11^c, are shown in the center of the ends of the plunger. As the syringe during the operation is held

in a more or less inclined position, the air bubble located between the inner end of the plunger and the fluid rising to the top will be displaced relative to the center of the plunger so that the passage of the air into the plunger will be obstructed by the fluid. To remedy this, the bottom or inner end of the plunger may have a number of perforations 11^a as shown in the modification Fig. 1^a, so that no matter what the position of the syringe may be, when in use the air will readily find an opening through which it can pass into the plunger.

As the operator cannot tell with certainty at which instant to open the outer air passage of the plunger to expel the air, it may happen that the air passage is opened before all fluid was injected into the body of the patient. Thus with the expulsion of the air into the plunger some fluid too may pass into the latter. With the construction according to Figs. 1 and 1^a the quantity of fluid allowed to pass into the plunger will be at least such as to form a film of the entire width of the plunger. To reduce this quantity to a minimum the inner air passage leading into the plunger may be provided with a short projection or nozzle 13. Correspondingly the bottom of the barrel 10 or the inner end of the nozzle 10^a thereof must be provided with a depression or groove 10^b of such size as to permit the projection 13 to enter said groove when the plunger is moved to the extreme inner end position (Fig. 2). It will be seen that with this construction the operator can reduce the quantity of fluid that may accidentally pass into the plunger by advancing the latter while holding the outer air passage 11 of the plunger closed, until all air is expelled from the barrel and fluid just enters the projection 13 of the plunger. He then closes the outer air passage and advances the plunger to complete the injection.

To facilitate the closing of the outer air passage by the finger this air passage may be formed in a protuberance 11^e as shown in Fig. 3 which the operator while performing the injection and without looking at the end of the plunger can quickly locate by his finger. This modification is shown in Fig. 3.

Instead of closing the outer air passage of the plunger by the finger, a cap 14 or 15 of glass, rubber or other suitable material may be used to fit over the protuberance 11^e as in Fig. 4 or over the finger piece 11^a as in Fig. 5. A cap 16 may be used also for the nozzle 10^a to close the barrel (Fig. 6) to allow the syringe filled with the fluid of being carried in one's satchel ready for use. In such case the fluid is forced into the plunger of the syringe from the nozzle of the barrel by holding the outer air passage open. Then the latter and the nozzle of the barrel are closed by the stoppers or caps.

To use the syringe the fluid has to be expelled from the plunger into the barrel which can be done by first removing the cap from over the outer air passage of the plunger and then moving the latter outwardly.

After stopping again the outer air passage the cap over the nozzle is replaced by the needle. The syringe now can be used in the hereinbefore described manner.

The expulsion of the fluid that may have entered the plunger or the nozzle thereof may be easily effected by using an auxiliary syringe 17 which may be an integral part of the main plunger as in Fig. 7 or be permanently or removably attached to the same as shown in Fig. 7^a. Instead a rubber ball 18 which may be mounted over the plunger may be used, as shown in Fig. 8.

Instead of a removable cap such as shown in Figs. 4 and 5 I may use a valve. In Fig. 9 the valve 19 consists of two superposed disks pivotally connected together and having perforations 19¹, 19², which on the turning of one of the disks will be brought into alignment with one another and with the outer air passage of the plunger.

In Fig. 10 the valve comprises a casing 20 adapted to be fixed to either permanently or removably or made integral with the outer end of the plunger. This casing is formed with an air passage 20^a, a conical seat 20^b and is provided with a cone valve body 21. This valve acting like a back stroke valve will be thrown against its seat 20^b when the plunger is advanced and then automatically close the air passages of the casing. Suitable means may be provided to unseat the valve during the advance of the plunger.

Instead of cap 15 shown in Fig. 5 a cap 15^a may be used shown in Fig. 11. This cap is adapted to engage around the finger piece of the plunger and the flange 10¹ of the barrel 10 when the plunger is in its innermost position, and thus serve not only to close the air passage of the plunger but also lock the plunger in the barrel against accidental displacement. This cap is particularly useful when the filled syringe is carried in the satchel.

It is of course clear that various other modifications may be made in the construction of the syringe without departing from the principle of my invention. I therefore do not wish to limit myself to any of the details described and shown.

What I claim is:

1. In a syringe for hypodermic needles or the like, a barrel and a plunger therein having air passages at its opposite ends, so that when said passages are open the air contained in the barrel between the fluid and the inner end of the plunger will be forced into the plunger during the inner movement of the latter the outer air passage of said plunger being made in an outwardly projecting

nozzle and of such small diameter as to be capable of being controlled during operation by the finger of the operator's hand.

2. In a syringe for hypodermic needles or the like a barrel and a plunger therein having air passages at the opposite ends, the air passage at the outer end being formed in an outwardly extending projection and of such small diameter as to be capable of being controlled during operation by the finger of the operator's hand, for the purpose specified.

3. In a syringe for hypodermic needles or the like, a barrel and a plunger therein formed with air passages at its opposite ends, the outer air passage being formed in an outwardly extending projection and of such small diameter as to be capable of being controlled during operation by a finger of the operator's hand, and means for closing said outer passage when the syringe is not in use.

4. In a syringe for hypodermic needles or the like a barrel, a plunger therein formed with air passages at its opposite ends, the outer air passage of said plunger being formed in an outwardly extending projection and of such small diameter as to be controllable during operation by a finger of the operator's hand, and a cap removably mounted on said projection for closing said outer air passage when the syringe is not in use.

5. In a syringe for hypodermic needles or the like a barrel having a nozzle to which said hypodermic needle is adapted to be attached, a removable closure for said nozzle when the syringe is not in use, a plunger having air passages at its opposite ends, the

outer air passage of said plunger being formed in an outwardly extending projection and of such small diameter as to be controllable during operation by a finger of the operator's hand, and a removable means for closing the outer air passage of said plunger when said syringe is not in use.

6. A syringe of the character described having a plunger formed with air passages extending therethrough, the outer air passage being made in an outwardly projecting nozzle and of such small diameter as to be controllable during operation by a finger of the operator's hand.

7. In a syringe of the character described a plunger having an air passage in its outer end of such small diameter as to be controllable during operation by a finger of the operator's hand, and a plurality of air passages at its inner end, for the purpose described.

8. In a syringe of the character described the combination with the barrel and plunger, of a cap removably fitted over the outer end of said plunger and engaging said barrel to lock said plunger against its accidental displacement in said barrel.

9. In a syringe of the character described, the combination with a barrel, a plunger therein having air passages in its ends, and a cap adapted to removably fit over said outer air passage and to engage said barrel, so as to close said outer air passage and lock said plunger against lateral displacement in said barrel.

In testimony whereof I affix my signature.

WILLIAM WOLF.