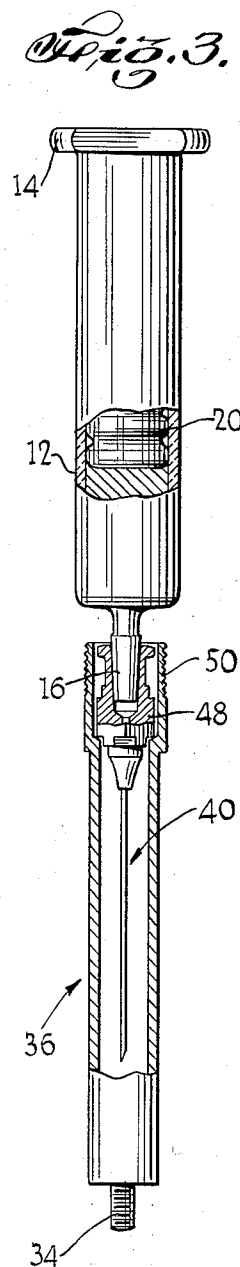
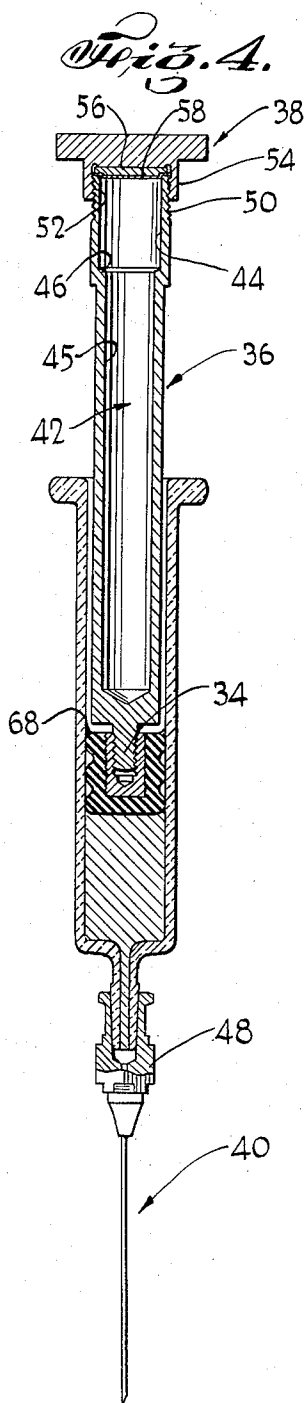
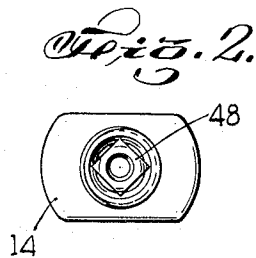
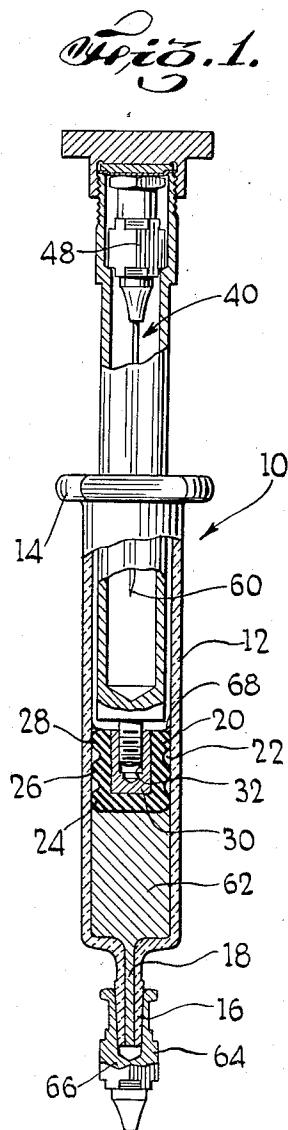


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HYPODERMIC SYRINGE
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HYPODERMIC SYRINGE

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4 Claims. (Cl. 128—218)

1

This invention relates to hypodermic syringes. It is an object of my invention to provide a completely self-contained hypodermic syringe, i. e. a hypodermic syringe including a needle concealed within the syringe so that the syringe can be carried about without exercising any special care to prevent the needle from breaking or pricking someone.

It is another object of my invention to provide a completely self-contained hypodermic syringe in which the needle is arranged to be maintained in sterile condition.

It is a further object of my invention to provide a completely self-contained hypodermic syringe in which both the needle and the syringe tip are arranged to be maintained sterile so that the syringe always will be in proper condition for use regardless of how it is carried around.

It is an additional object of my invention to provide a completely self-contained hypodermic syringe having a simple and highly compact construction and which can easily and quickly be readied for use.

It is yet another object of my invention to provide a completely self-contained preloaded hypodermic syringe by means of which a pharmaceutical preparation can be administered without breaking an ampule, opening a container, inserting a cartridge or performing any of the other acts conventionally associated with the filling of a syringe preparatory to injection.

It is a more specific object of my invention to provide a hypodermic syringe which is sold with a pharmaceutical preparation already loaded therein and with a needle contained within the syringe proper, both the needle and preparation being sealed in such manner as to keep them sterile until the time of use.

It is still another object of my invention to provide a hypodermic syringe which is sold with a pharmaceutical preparation and needle contained therein and which is so constructed that the needle can easily be transferred to its proper position for use without any handling of the needle.

It is yet a further object of my invention to provide a completely self-contained preloaded hypodermic syringe in which the needle is carried by the plunger shaft which latter is detachable from the plunger so that the needle can be fitted on the syringe tip without being touched by hand.

Other objects of the invention will in part be obvious and in part be pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements,

2

and arrangements of parts which will be exemplified in the syringe hereinafter described, and of which the scope of application will be indicated in the appended claims.

In the accompanying drawings in which is shown one of the various possible embodiments of my invention:

Fig. 1 is a side view in partial section of a hypodermic syringe embodying my invention as the same appears when sold;

Fig. 2 is a top plan view of the syringe with the closure member for the plunger shaft removed;

Fig. 3 is a view similar to Fig. 1, but illustrating the syringe as it looks when the needle is being connected to the tip of the syringe; and

Fig. 4 is a longitudinal sectional view through the syringe when ready for use.

In general, I attain the several objects of my invention by providing a hypodermic syringe in which the plunger shaft is hollow whereby to form a receptacle for accommodating the needle of a hypodermic syringe, the mouth of said receptacle being covered by a suitable closure member. Desirably, the plunger shaft is detachably secured to the plunger in order that it may be separated from the plunger and placed beneath the tip of the hypodermic syringe when transferring the needle from the receptacle to the tip of the syringe so that this transfer can be accomplished without touching the needle by hand. In the preferred form of my invention illustrated herein, the syringe is sold with a pharmaceutical preparation in the barrel beneath the plunger, said preparation being sealed in place, as shown in my copending application Serial No. 742,151, filed April 17, 1947 for Hypodermic Syringes.

Referring now in detail to the drawings, the reference numeral 10 denotes a hypodermic syringe which embodies my invention. Said syringe comprises a conventional glass-Luer-type syringe barrel 12 having an extending flange 14 at its upper end and a ground conical tip 16 at its lower end. A bore 18 extends from the bottom of the tip into the bottom of the barrel.

A plunger 20 is snugly slidable within the barrel 12. Said plunger can be of any standard construction, but I prefer to employ a plunger which is connected to a plunger shaft by a quickly detachable attaching means, such for example as is shown herein. The plunger can be of any suitable material, as for instance ground glass. But, to facilitate the incorporation of the quickly detachable attaching means, the plunger conveniently can be fabricated from an elastomeric substance like rubber, this being the material which is employed for the plunger in the preferred em-

3

bodiment of my invention. More specifically, the plunger 20 constitutes a rubber plug having a pair of parallel, annular grooves 22 which break up the side of the plug into three parallel ridges 24, 26, 28. The diameters of these ridges are slightly in excess of the interior diameter of the barrel 12 so that the plunger has a snug sliding fit within the barrel of the syringe.

The rubber plug has an insert 30 of relatively rigid material like metal, which preferably is corrosion proof, being made, for example of stainless steel, aluminum or brass. Said insert may be positioned within the plug in any suitable manner, for instance during molding, as is well known in the art of forming rubber articles; and, desirably, the insert is pre-treated in such manner, as by knurling its external surface, that there is no tendency for the insert to slip out of the plug. Said insert is formed with a well 32 whose longitudinal axis extends parallel to and preferably is coincident with the longitudinal axis of the syringe barrel 12. This well is so shaped that it forms one-half of a quickly detachable attaching means. To this end the bore may be tapped.

The other half of the quickly detachable attaching means comprises a male threaded projection 34 integrally and permanently connected to and depending from the lower end of a plunger shaft 36 which may be formed from metal. This shaft is slightly smaller in diameter than the inside of the syringe barrel and is topped at its upper end by a head 38 to facilitate manual manipulation thereof.

Pursuant to my invention, the plunger shaft is hollow, being sufficiently large to accommodate a conventional hypodermic needle 40. More specifically, the interior of the plunger shaft is in the shape of a deep opening or cavity 42, the upper portion 44 whereof is slightly larger than the lower portion 45 and is connected to the lower portion by a frusto-conical shoulder 46. The diameter of said upper portion is large enough to accommodate the hub 48 of a conventional hypodermic needle whose lower edge is adapted to rest upon the shoulder 46 with the tip of the needle extending into the lower portion of the cavity.

Said cavity opens at the top of the shaft and is capped by the head 38 which functions as a closure member. The plunger shaft is formed with a male thread 50 at its upper end adapted to mesh with a female thread 52 provided in a depending sleeve 54 on the head 38. It is desirable for the joint between the closure member and plunger shaft to be airtight or substantially so, and for this purpose I may introduce a resilient, e. g. cork, disc 56 at the base of the sleeve 54, said disc having its exposed face covered with metal foil 58. The marginal portions of the disc and foil are compressed between the top of the plunger shaft and the undersurface of the closure member, thus effecting the desired type of seal.

The distance from the shoulder 46 to the foil-covered disc 56 is made slightly less than the distance from the lower end of the enlarged portion of the hub 48 of a hypodermic needle to the flat top of the needle, this distance being substantially standard in hypodermic needles. Because of such arrangement, when the closure member 38 is screwed on the plunger shaft with a hypodermic needle located within the hollow interior of said shaft, the foil-covered disc will force the lower edge of the enlarged head of the hypodermic needle down against the frusto-

4

conical shoulder. Inasmuch as this pressure on the top of the needle hub is exerted by a surface perpendicular to the longitudinal axis of the needle, and since the shoulder 46 is symmetrical in respect to the longitudinal axis of said shaft, the needle will be seated centrally within the shaft so that there is no danger of the pointed tip 60 of said needle striking against the interior of the shaft. The needle can be sterilized before insertion into the shaft or after; and in the latter case such sterilization can be carried out in an autoclave.

A hypodermically administratable pharmaceutical preparation 62 is disposed in the barrel under the plunger. Desirably, there is employed a predetermined volume of the preparation which has a predetermined strength; the volume and strength being so selected that injection of the entire amount of the preparation will constitute a proper single dosage. For instance, the preparation may comprise a sterile suspension of calcium penicillin, 300,000 units per cc. in a mixture of a highly refined sesame oil and 4.8% (weight per unit volume) white wax U. S. P., one cc. of this suspension being employed. The preparation is so prepared as to be sterile, non-toxic and non-pyrogenic.

Said preparation is loaded into the syringe under sterile conditions, for example by retracting the plunger with the tip immersed in a body of the preparation and then cleaning the tip. Alternatively, the preparation may be introduced into the open upper end of the barrel before the plunger has been inserted therein.

Before or after loading, depending upon the type of loading practice, the tip of the syringe is covered by a cap 64 which may be made of any suitable material, e. g., metal, rubber or a plastic, and which optionally may be in the shape of the hub of a conventional hypodermic needle. However, said cap differs from a conventional hub in that the bottom wall 66 of the cap is imperforate so that once the cap has been fitted on the tip of the syringe, the bottom of said syringe is sealed tight.

Likewise, the sliding joint between the plunger 20 and the barrel 12 of the syringe may be sealed after a pharmaceutical preparation has been loaded into the barrel. This closure can be effected by a substance like a mastic 68 which can be rendered pasty or liquid with ease (as by the application of heat or the addition of a volatile solvent) but which under normal room conditions will solidify quickly and has a tendency to adhere to the materials constituting the barrel of the plunger and the syringe. The mastic material used for this particular purpose also should be characterized by a low shearing or tensile strength or by a weak bond with the material of the syringe or plunger. A typical substance which has been found satisfactory is a paraffin wax. Said wax is applied by melting the same and pouring the molten wax on top of the plug 20 adjacent the barrel while the syringe is held upright. The fluid wax will run down a short distance into the crack between the barrel and plunger and, upon hardening, will hermetically seal this sliding joint. Wax has an inherently low strength and makes a poor bond with glass so that the wax seal can be broken easily when it is desired to employ the syringe. Preferably, the wax employed has a low melting point so that it will not stay hard enough to be apt to crack. It is within the scope of my invention to omit the use of a sealing mastic altogether and to rely for a seal between

5

the plunger and barrel solely upon the resilient properties of the elastomeric material.

It will be appreciated that a syringe containing a pharmaceutical preparation held within the barrel in the manner described is able to maintain said preparation sterile when sold and handled in the normal channels of commerce. Likewise, the hypodermic needle within the hollow plunger shaft will be maintained sterile even though the syringe is handled.

To use the syringe, the plunger shaft is unscrewed from the plunger; the cap 64 is twisted off; the closure member 38 is unscrewed to expose the hollow interior of the plunger shaft; and the upper end of the shaft is placed beneath the tip 16 of the syringe, said tip being inserted into the enlarged conical bore in the hub 48 of the hypodermic needle. This position of the parts is illustrated in Fig. 4. The shaft is pressed firmly against the syringe so as to obtain a good friction fit between the needle and syringe tip. The shaft now can be pulled away from the needle, which will remain in its proper position on the syringe and said shaft then is inserted back into the barrel of the syringe and recoupled with the plunger 20. The closure member 38 is put back in position and the syringe then is ready for use.

It may be mentioned that my invention embraces hypodermic syringes in which no pharmaceutical preparation is pre-loaded into the barrel.

It will thus be seen that I have provided a device which achieves the several objects of my invention and is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention and as various possible changes might be made in the embodiment set forth, it is to be understood that all matter herein described or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense. However, any permissible change in construction must fall within the purview of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A hypodermic syringe including a barrel and a plunger slidable therein, said barrel having a ground conical tip, a pharmaceutical preparation in said barrel under the plunger, a shaft for said plunger, said shaft extending above the barrel so that the top of the shaft is always completely clear of the barrel, rapidly detachable attaching means operable by manipulation of the top of the shaft alone for connecting said shaft to said plunger, said shaft having a hollow interior and a closed bottom, a hypodermic needle disposed wholly within the interior of said shaft and supported therein with the open end of the needle hub facing the top of the shaft, said shaft having an opening at the top thereof which communicates with the hollow interior, a closure member for covering said opening and an imperforate closure member frictionally receiving and covering said tip.

2. A hypodermic syringe including a barrel and a plunger slidable therein, said barrel having a ground conical tip, a pharmaceutical preparation in said barrel under the plunger, a shaft for said plunger, said shaft extending above the barrel so

6

that the top of the shaft is always completely clear of the barrel, rapidly detachable attaching means operable by manipulation of the top of the shaft alone for connecting said shaft to said plunger, said shaft having a hollow interior and a closed bottom, a hypodermic needle disposed wholly within the interior of said shaft and supported therein with the open end of the needle hub facing the top of the shaft, said shaft having an opening at the top thereof which communicates with the hollow interior, a closure member for covering said opening, an imperforate closure member frictionally receiving and covering said tip, and frangible means to seal the joint between the plunger and the barrel.

3. For use with a hypodermic syringe including a barrel, a plunger slidable within said barrel, said plunger having a shaft with a hollow interior which is elongated in a direction parallel to the direction in which the plunger slides within the barrel, said shaft having a closed bottom, a hypodermic needle disposed wholly within the interior of said shaft, said needle having an enlarged hub the top of which is perpendicular to the longitudinal axis of the needle, a shoulder in the hollow interior of said shaft and on which said hub is adapted to be seated, said shaft having an opening at the top thereof which communicates with the hollow interior, and a closure member on whose undersurface is disposed a disk which is flat, perpendicular to the longitudinal axis of the hollow interior and yielding, the distance from the undersurface of the disk to the shoulder being slightly less than the length of the hub whereby the hub is yieldingly pressed against said shoulder.

4. A hypodermic syringe including a barrel and a plunger slidable therein, said barrel having a tip, a shaft for said plunger, said shaft extending above the barrel so that the top of the shaft is always completely clear of the barrel, rapidly detachable attaching means operable by manipulation of the top of the shaft alone for connecting said shaft to said plunger, said shaft having a hollow interior and a closed bottom, a hypodermic needle disposed wholly within the interior of said shaft and supported therein with the open end of the needle hub facing the top of the shaft, said shaft having an opening at the top thereof which communicates with the hollow interior, and a closure member for covering said opening.

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