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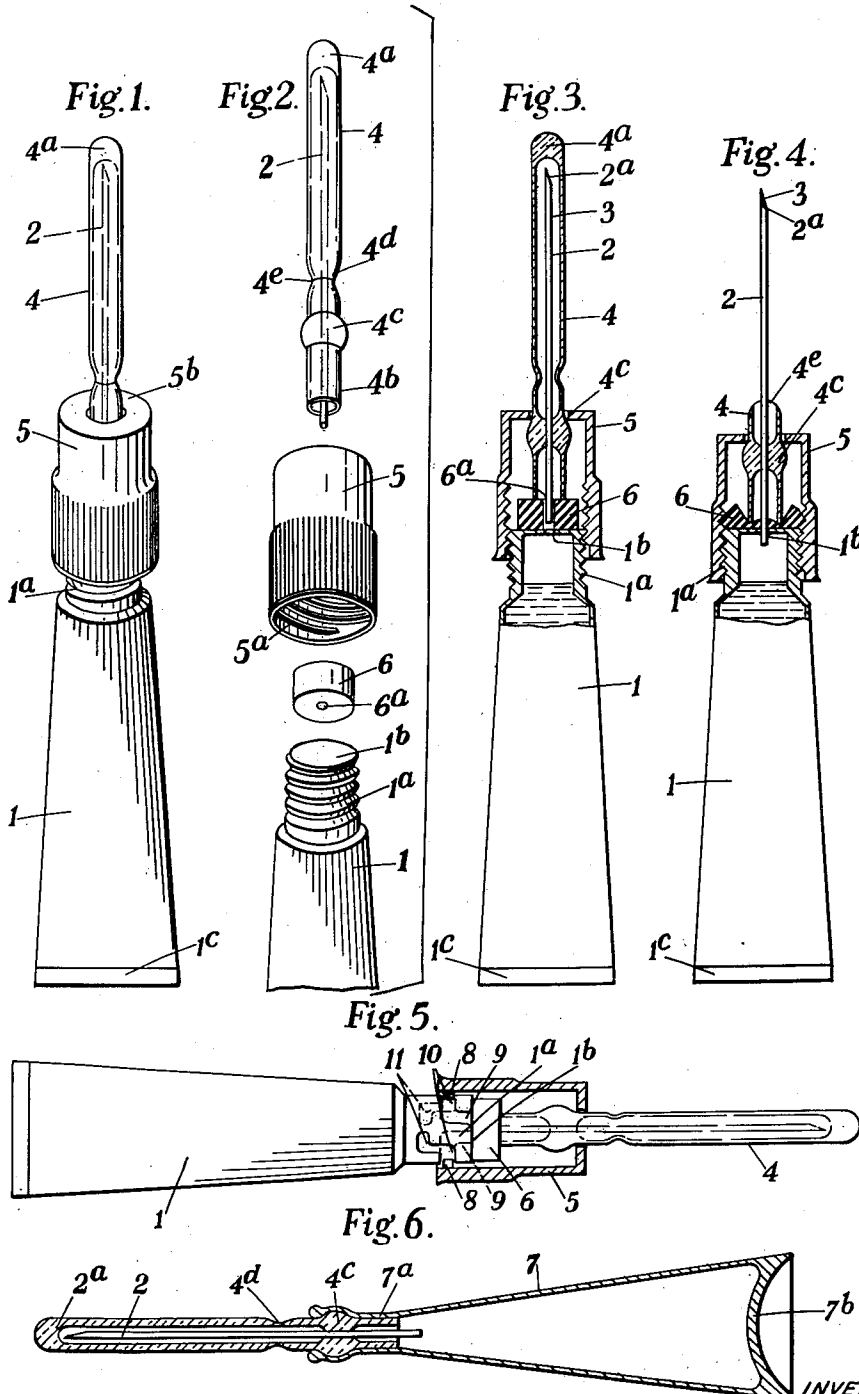
E. D. WATSON ET AL

2,371,086

HYPODERMIC INJECTOR

Filed Nov. 12, 1941

2 Sheets-Sheet 1



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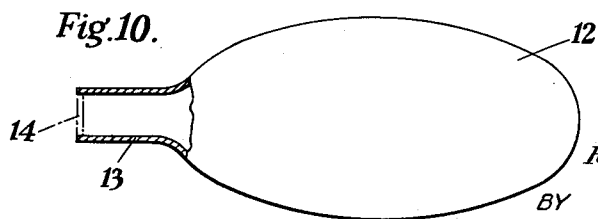
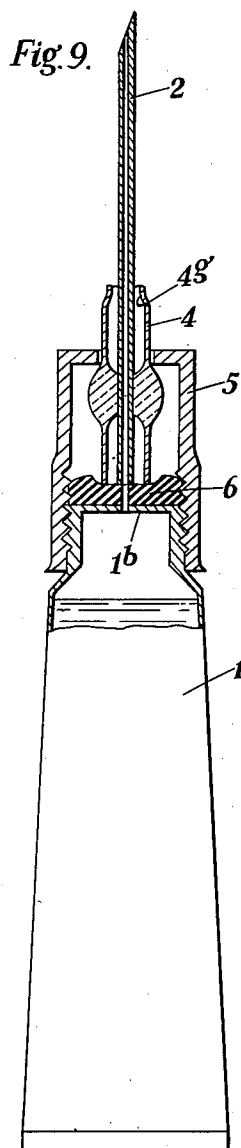
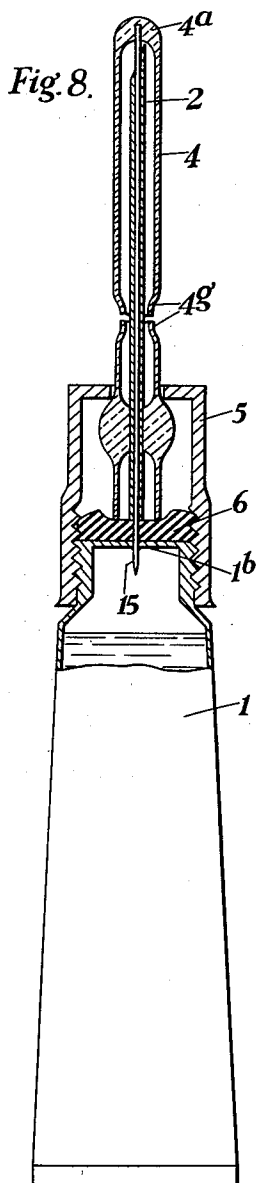
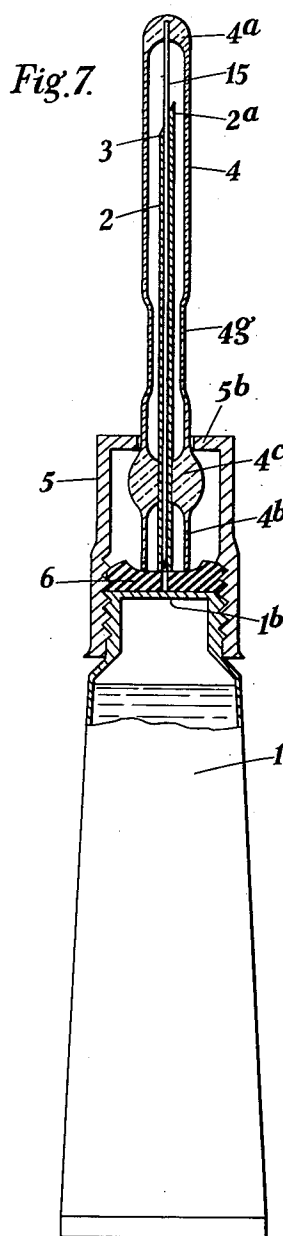
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HYPODERMIC INJECTOR

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,371,086

HYPODERMIC INJECTOR

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In Great Britain November 14, 1940

4 Claims. (Cl. 128—216)

This invention relates to hypodermic injectors and has for its principal object to provide an injector which will be convenient in use, in which the correct dosage can readily be injected into the patient, and in which the essential parts, particularly the upper part of the needle and the dosage, are maintained sterile up to the moment of injection. By the expression "upper part of the needle" as used herein is meant that part of the needle which is intended to be inserted into the patient.

According to the present invention a hypodermic injector is provided comprising a collapsible container for the dosage and a hypodermic needle communicating with or adapted to communicate with said container, and in which the needle or the upper part thereof is contained within a frangible seal.

According to one method of carrying the invention into effect the one end of the needle is permanently located within the container, but in a preferred construction the container is provided with a diaphragm, which diaphragm is adapted to be pierced, conveniently by the needle or a part such as a stylus associated therewith, at the time or immediately prior to the time at which the injection is to be made.

The container may be composed of any suitable material; it may for example be of rubber, metal, synthetic resin or a suitable plastic and the upper part of the needle is preferably sealed by virtue of being located within a tube of glass, synthetic resin or other suitable material, the arrangement being such that such tube hermetically seals the upper part of the needle.

The foregoing and other subsidiary features of the invention that are set out in the appended claims are embodied in the examples now to be described with reference to the accompanying drawings, in which

Figure 1 is a perspective view of an assembled injector according to one embodiment of the invention.

Figure 2 is a perspective view of the several parts disassembled.

Figure 3 is an elevational view, part section, of the injector shown in Figure 1, the relative parts being shown in spaced relationship when the injector is not in use.

Figure 4 is an elevational view, part section, showing such injector ready for use.

Figure 5 is a part-sectional elevation of a modified method of mounting the needle and tube.

Figure 6 is a sectional view of a modification.

Figures 7, 8 and 9 are part-sectional elevation-al views of a preferred embodiment.

Figure 10 illustrates a modified type of container.

In the construction shown in Figs. 1 to 4 the collapsible container 1 is preferably of metal, although rubber, synthetic resin or other suitable material may be employed, and at its one end is provided with an external screw-threaded neck 1a which is closed by a diaphragm 1b and such diaphragm is preferably of metal but may be of any other suitable material. At its other end 1c the container is sealed after the dosage of the required liquid has been run in. This latter end of the container may be sealed in any suitable manner and if the container is of metal it may conveniently be sealed substantially in the same way that a tube of toothpaste or the like is sealed; it may be folded, folded and crimped or clipped or it may be welded.

The hypodermic needle 2 is of normal construction provided with a central bore 3 and at its upper end 2a is cut at an angle to the axis of the bore for puncturing the flesh of the patient. This needle is surrounded by a frangible closure member 4 preferably of glass in the form of a tube closed at one end 4a and open at the other 4b, the closed end being positioned a short distance beyond the upper end of the needle and the other end of the needle extending a short distance beyond the other, that is, open end of the tube. At a position 4c intermediate its length the tube is fused, the act of fusing functioning not only to fix the needle within the tube but also to seal hermetically the upper end of the needle. A convenient method of forming the tube 4 is as follows: from a length of glass tubing of the requisite size a short length is cut so that both ends are open. The one end 4a is then closed by the application of heat. Heat is now applied at a position 4d immediately above the point of fusing 4c and during the application of such heat the tube is extended in the direction of its length so that at the position 4e the diameter of the tube is reduced and the thickness of the wall thereof is also reduced. The needle 2 is now inserted so that it occupies the position shown with one end projecting slightly below the end 4b and with the other end 2a extending substantially to the sealed end 4a of the tube. Heat is now applied to the tube at the position 4c until the tube is fused at this point, thereby fixing the needle within the tube and producing a bulging or enlargement on the tube at the position 4c; thereafter the tube at the position 4d is prefer-

ably scored as indicated at 4e by means of a cutting tool. For the purpose of fixing the needle assembled in the tube in the manner just described on to the collapsible container a cover cap 5 is employed, and this cover cap is provided with an internal screw thread 5a adapted to receive the external screw thread formed on the neck of the collapsible container. The lower part of this cover cap may on its exterior surface be knurled, grooved or roughened as indicated. The end wall of the cover cap at that end remote from that at which the screw thread is provided, is formed with a hole and into this hole (from the interior of the cap) is inserted the closed end of the glass tube, and a small plug or washer 6 of rubber or other suitable resilient material is positioned within said cover cap between the extending end of the needle and the aforesaid diaphragm 1b.

When assembling the parts the resilient washer may be first pushed on to the exposed end of the needle, a hole 6a of substantially the same diameter as the needle being preferably provided as shown and the thickness of such washer is preferably substantially the same as or slightly in excess of the length of the needle extending beyond the open end of the glass tube. The said tube and needle with washer affixed is then inserted through the hole in the end wall of the cover cap, and the arrangement is such that whilst the upper part of the glass tube can pass through the hole formed in the end wall of the cover cap, that part of the tube 4c which is fused is of greater diameter and therefore functions as a stop.

The cover cap 5 with tube 4 and associated needle 2 and washer 6 thus assembled is then partially screwed or otherwise assembled on to the neck of the collapsible container and the injector is then complete, with the lower end of the washer resting upon or immediately above the diaphragm, care being taken to see that the diaphragm is not pierced by the lower end of the needle. When it is desired to use the injector the cap 5 is screwed or otherwise forced further down on to the neck with the result that the end wall of such cap bearing upon the fused part of the glass tube forced the needle downwardly and causes the resilient washer 6 of rubber or the like to be compressed and causes the lower exposed end of the needle to pass through such washer and puncture the frangible diaphragm 1b. The glass tube is now broken off at the position 4e as shown in Figure 4 and the needle can then be inserted into the patient and the dosage forced through the needle by squeezing the collapsible tube. It will be appreciated that the washer when compressed functions to prevent leakage after the diaphragm has been pierced by the needle and ensures that the whole of the dosage issues through the needle.

Instead of the cover cap being screwed on to the neck of the container it may be a push-on fit or a bayonet joint may be employed. One construction of bayonet joint is illustrated in Figure 5. On the interior of the cap 5 are provided two diametrically opposed projections 8 adapted to be received in two diametrically opposed vertical slots 9, the upper open end of each of which is flush with the upper face of the neck 1a (such neck being devoid of screw thread) whereat the diaphragm 1b is located. The lower end of each slot communicates with an annular slot 10 and diametrically opposed vertical slots 11 (displaced with reference to slots 9) extend downwardly

from slots 10; at their lower ends the slots 11 may extend annularly a short distance. The annular slot 10 may be continuous but preferably extends only between the lower ends of slots 9 and the upper ends of slots 11. The assembled needle and tube are inserted through the hole in the upper wall of the cover cap as described and such cap is then positioned on the neck with the projections 8 resting in the annular slot 10. In this position the lower end of the needle is a short distance above the diaphragm 1a and when it is desired to use the injector the cover cap is rotated and the projections 8 forced down the slots 11 so that the end of the needle punctures the diaphragm 1b. The washer 6 is preferably used in both constructions for in addition to acting as a cushion such washer functions to seal the hole in the diaphragm when the latter is punctured by the needle and thereby avoids wastage and ensures that the whole dosage in the container is administered through the needle.

In the modified embodiment illustrated in Fig. 6 the diaphragm is dispensed with and the needle 2 assembled and sealed within the glass tube 4 as previously described has its lower end forced into the constricted neck 7a of a collapsible container 7. This container may conveniently be of rubber and the neck 7a is designed so that it firmly grips the lower end of the tube 4, but if desired the gripping action may be augmented by the use of a suitable cement and/or by an external binding. The collapsible container 7 may be of narrow conical formation with a dished concave base 7b. The requisite dosage is inserted through the open end of the container and it is then sealed by inserting the assembled needle tube 2 and tube 4.

If preferred, however, with the construction shown in Fig. 6 a collapsible container may be used which is sealed in the same manner as the collapsible container shown in the embodiment in Figs. 1 to 4; in this event the tube and needle will first be inserted into the neck of the container, the container will then be filled from the open end and this end will finally be sealed in manner stated. With the embodiment shown in Fig. 6 it is only necessary to break off the tube at the position 4d and the injector is then ready for use.

In the preferred embodiment illustrated in Figures 7, 8 and 9 a stylus 15 is associated with the needle and the function of such stylus is to pierce the diaphragm 1b. Figure 7 shows the disposition of the parts when the device is not in use; Figure 8 shows the disposition of the parts after the diaphragm 1b has been pierced preparatory to the device being used and Figure 9 shows the device ready for use.

The needle is wholly located within a glass or other tube 4 closed at its upper end and fused at 4c to seal hermetically such upper end and anchor the needle within the tube. The closed upper end of the tube extends beyond the upper end of the needle and fused into such upper end is the stylus 15 which extends through the bore of the needle and the lower end of the stylus and needle are flush with the open lower end of the tube. The tube between the position of fusing at 4c and the closed upper end is attenuated as indicated at 4g. A resilient washer 6 is positioned between the lower open end of the tube and the diaphragm 1b and is provided with a hole 16

extending therethrough which is coaxial with the stylus and of substantially the same diameter. A cover cap 5 (which in the embodiment shown is screwed on to the body but may be a push on fit or a bayonet fit) is provided and through a hole in the end cover 5b thereof the upper end of the tube extends so that the fused part 4c bears on the inner face of such cap. The cap with tube, needle and stylus assembled is now positioned on the body 1 and may be screwed or pushed to the limit of its movement so that the washer 6 is compressed but the diaphragm is not pierced. The container is filled with the requisite charge of fluid in any convenient manner (such container may conveniently be of the type previously described with reference to Figures 1 to 4) and is shown at this stage in Figure 7. When it is desired to use the device, the attenuated part 4g of the tub is broken and the upper part of the tube is then pushed towards the diaphragm 1b; the part 4g of the tube being very thin readily crumbles under pressure. Consequent upon pushing the upper part of the tube towards the diaphragm the same is pierced by the stylus passing through the washer 6 as shown in Figure 8. The stylus together with the broken upper part of the tube are now removed exposing the upper part of the needle and the device is now ready for use as shown in Figure 9. It will again be appreciated that the washer functions to prevent leakage of the dosage after the diaphragm has been pierced by the stylus.

A modified type of container is illustrated in Figure 10. It may be of any suitable material and may be produced by casting or by blowing. Conveniently the body 12 is of ellipsoidal or spherical configuration terminating in an open-ended neck 13 through which the container is filled. Thereafter it is sealed by inserting the needle and tube as described with reference to Figure 6 or by a diaphragm fixed in a position in any convenient manner and indicated at 14. If a diaphragm is provided the outside of the neck may be screw-threaded as indicated in Figures 1 to 4 and 7 to 9 or slotted as shown in Figure 5, the method of fixing and using the needle being the same as described with reference to one of the other embodiments disclosed herein.

It will be appreciated that when employing an injector constructed in accordance with the present invention the needle and dosage are maintained sterile until the moment when the injection is to be made. Furthermore, the correct dosage is determined before hand so that injectors in accordance with this invention can with safety be used by inexperienced persons without risk of the incorrect dosage being given to the patient. The name of the drug within the container can be clearly marked on the exterior of the container and/or containers or closure caps therefor having different markings or of different colour may be utilised to differentiate the different drugs.

According to customary practice a hypodermic syringe is employed and when employing such syringe it will be appreciated that there is grave risk of the incorrect dosage being administered. Furthermore, after each injection has been made it is important that the needle should be sterilised and if a number of injections are to be given to different people it is obvious that considerable time is lost in measuring each dose separately and in sterilising the instrument between the making of each injection. These disadvantages

are avoided by the employment of injectors in accordance with the present invention since the operator is supplied with the requisite number of injectors, each containing the requisite dose, and a separate injector is employed for each patient, and after use the injector is thrown away.

We claim:

1. In a hypodermic injector, comprising a dosage container having a rupturable diaphragm at its discharge end, and a hollow needle through which the contents of the container may be discharged: means for protecting and maintaining said needle sterile prior to use, comprising a tubular member enclosing the needle, said member having a readily detachable outer portion for removal at the time of use, and a base portion rigidly supporting the needle adjacent its inner end, said base portion having an enlargement; a compressible washer disposed between said container diaphragm and the inner end of the base portion of said tubular member; and means for attaching the needle and tubular member to the discharge end of said container, said attaching means engaging said enlargement on the tubular member to cause the inner end of the latter to compress said washer against the container diaphragm and provide a leakage-preventing joint.

2. A hypodermic injector according to claim 1, wherein the attaching means comprises a cap adjustably mountable on the discharge end of the container, and having a wall provided with an aperture through which the tubular protecting member projects whereby the engagement between the attaching means and the enlargement on the tubular member is secured.

3. In a hypodermic injector, comprising a dosage container having a discharge opening closed by a rupturable diaphragm, and a hollow needle through which the contents of the container may be discharged: means for hermetically sealing and maintaining said needle sterile prior to use, comprising a tubular member enclosing the needle, said member having a readily detachable outer portion for removal at the time of use, and a base portion rigidly supporting and hermetically sealing the needle adjacent its inner end, the inner end of the wall of said base portion encircling the needle in spaced relation thereto; a compressible washer disposed between said container diaphragm and the inner end of the base portion of said tubular member; and means for securing the needle and protecting tubular member to the discharge end of the container with the inner end of the wall of said base portion compressing said washer against the diaphragm to provide an annular leak-preventing joint radially spaced from the needle.

4. In a hypodermic injector, comprising a dosage container having a discharge opening closed by a rupturable diaphragm, and a hollow needle through which the contents of the container may be discharged: means for hermetically sealing and maintaining said needle sterile prior to use, comprising a tubular member enclosing the needle and having a base portion rigidly supporting and hermetically sealing the needle adjacent its inner end, said member also having a readily destructible intermediate portion adjoining said base portion whereby the outer portion of the tubular member may be moved longitudinally in either direction and removed preparatory to use; means for securing the needle and tubular protecting member in operative position on the discharge end of said

container; means for providing a leak-preventing joint between the inner end of the tubular member and the container diaphragm; and a stylus carried by the outer removable portion of the tubular member for movement inwardly therewith upon destruction of the intermediate portion of said member to puncture the dia-

phragm and provide a passage for the container contents to the needle, said stylus and outer portion of the tubular member being subsequently movable outwardly for removal and discard.

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