May 25, 1954 M. J. COHEN 2,679,246

HYPODERMIC SYRINGE

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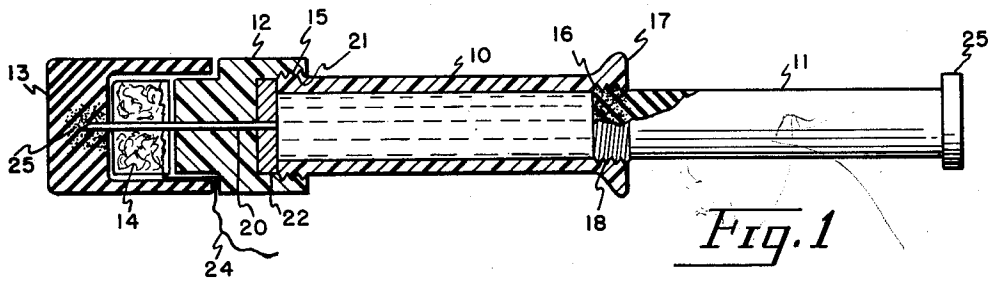

FIG. 1

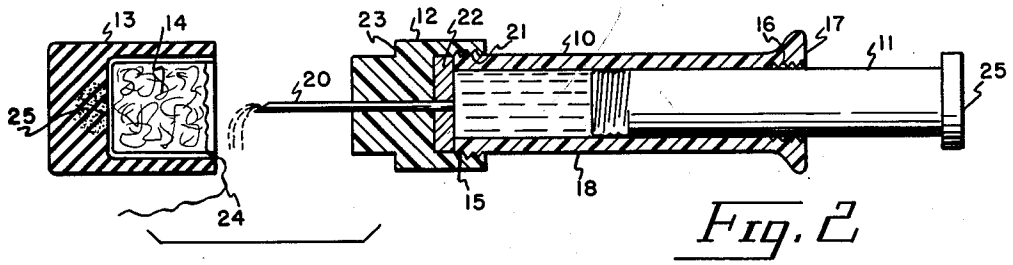

FIG. 2

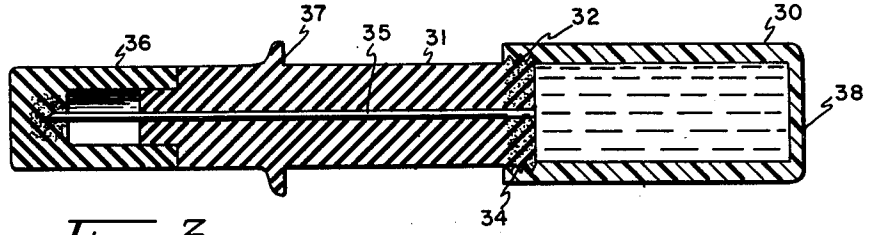

FIG. 3

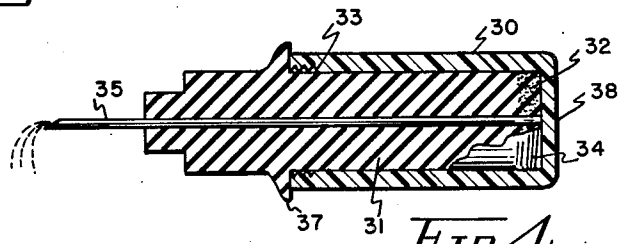

FIG. 4

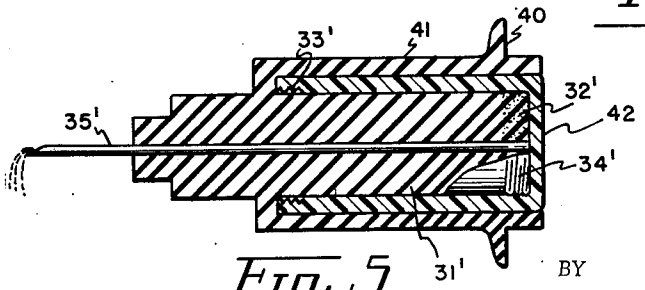

FIG. 5

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HYPODERMIC SYRINGE

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9 Claims. (Cl. 128—218)

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My invention relates to a hypodermic syringe, and some objects of the same are to provide a syringe that shall consist of few and simple parts, that shall be capable of being assembled quickly and easily, that shall provide means for storing a medicament for extended periods in safety, and that shall be capable of being put into condition for use with the greatest of ease when needed, while also being capable of immediate use for making a complete and proper injection quickly and by unskilled persons or by persons acting under conditions of stress, as in times of public calamity or under battle conditions.

Another object is to provide a novel plunger for a syringe.

Another object is to provide means for sealing the needle of a hypodermic syringe so as to prevent any loss of medicament, as by leakage or seeping due to change of air pressure or for any other reason.

Another object is to provide rubber articles of different hardness and elasticity in different parts of the same.

Still another object is to provide convenient and readily accessible means for sterilizing an area of skin preliminary to injection, as is approved practice in all surgery and dentistry, wherever such antisepsis is possible.

Referring now to the annexed drawings, which are made a part of this application and in which similar reference characters indicate similar parts:

Fig. 1 is an elevation, partly in section, of the improved syringe in the form at present preferred.

Fig. 2, a similar view, with parts in a different position,

Fig. 3, a like view of a modified form of the invention,

Fig. 4, a view like Fig. 3, but with the parts in a different position, and

Fig. 5 an elevation, partly in section, of another modification.

Referring to the drawings, reference numeral 10 in Figs. 1 and 2 indicates the barrel of a syringe having a plunger 11, a detachable needle-hub housing 12, a pressure-sealing and locking cap 13, and a plug 14 of fibrous material impregnated with antiseptic material.

In that form of the invention embodied in Figs. 1 and 2, the barrel 10 may be made of either glass or of a moldable plastic material, as styrene, nylon, etc. The end to which the needle support is to be applied has a narrow

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external band 15 of screw threads, while the other end has a narrow band 16 of screw threads inside the barrel for engagement by threads on the plunger 11. Externally of the barrel there is a narrow annular flange 17 for engagement by the fingers of the user in making an injection.

The plunger 11 is of special construction in that it is a dual-hardness rubber plunger, it being formed of natural rubber or synthetic rubber such as neoprene, of two different hardnesses. The head of the plunger, or that part of the plunger that has threads matching with those at 16 on the barrel, and which threads are shown at 18, is semi-soft or relatively soft rubber as indicated by the dotted shading, e. g., it may be of a durometer around 50, while the stem portion is of harder rubber, that is inelastic and inflexible. The threads 18 are of an outer diameter slightly greater than the inner diameter of the barrel. The stem portion, i. e., that part extending to the right of the threaded head in Figs. 1 and 2 is hard and inflexible to insure against bending as the head moves through the barrel, but the elastic threads 19 on the head will flatten somewhat, as shown in Fig. 2, as the head moves through the barrel, so as to insure that all material forwardly of the plunger will be forced out through the needle 20 as the head moves along the barrel. The head end moves evenly, without any erratic or jerking action, the complete contact of the elastic head with the inner wall of the barrel preventing any leakage backward about said head. Since the several threads on the head end engage the threads inside the barrel, the contents of the barrel are effectively sealed inside the chamber of the syringe and the device may be stored indefinitely without possibility of injury by leakage of air or liquid into the chamber of the syringe. But the contents may be ejected completely and upon short notice, as hereinafter explained.

The needle hub or housing 12 is made of rubber or of a suitable plastic material, and has a hypodermic needle 20 embedded in the hub and permanently secured thereto. Threads at 21 on the hub engage those on the barrel 10. A washer 22, of rubber or other impervious material, may be inserted between the end of the barrel and the opposed face on the hub to prevent leakage or any contact of the contents of the syringe with the hub 12, as for example when the barrel is made of glass and the hub is made of material such as might react with the liquid in the chamber of the syringe. The needle ex-

tends through the washer to communicate with the chamber of barrel 10 and is permanently secured in said hub 12, its inner end being flush with the inner face of washer 22.

The cap 13 may be slipped on the hub 12, which has a shoulder at 23 for limiting the movement of the annular flange of the cap in applying the same to the reduced end of hub 12. Within this flange there is mounted a plug or mass 14 of fibrous material such as cotton, felt, cellulose or other material that will absorb and hold a fluent antiseptic such as is acceptable for use in sterilizing a part of the body which is to be injected with medicament. This plug has attached thereto in any convenient manner a thread 24, as by embedding the end of the thread in the plug or by tying a part of the thread about the plug, or sewing it through the plug. It will be evident that upon removal of the cap, the plug can be drawn out of the cap sufficiently to expose enough of it so that it can be rubbed over the area to be treated, or the plug can be pulled out of the cap entirely for greater convenience of the user, the thread preferably hanging out of the syringe so as to expose it slightly, as shown in Fig. 1.

The flanged end of the cap may consist of hard rubber or of other material that can be threaded to engage threads on the needle hub, or it may be elastic so that it can be expanded somewhat to engage resiliently over the reduced end of the hub 12. I prefer, however, to make the flanged open end portion of rigid material while the part at 25 that is engageable by the end of the needle consists of soft resilient material such as soft rubber, that can be flexed by the needle point to such an extent that the passage of the cannula is sealed but will spring back to place when the needle is withdrawn and such that the soft material will not be cut or damaged, while the passage in the needle will remain fully open and free to permit liquid to pass out when the cap is removed.

As stated previously, this syringe comes completely assembled by the manufacturer to the user, for immediate action when ready. When a person is ready to use it, he does so as follows:

The syringe in its entirety is grasped in one hand. With the other hand, the cap is simply pulled off the hub 12. The cap is then inverted so that its open end is over the area to be injected. The thread 24 is then pulled gently which allows the plug 14 to emerge enough to do its purpose. The entire cap 13 with its protruding plug 14 is held downward towards the injecting area and is then rubbed onto that area for a minute or so, thus sterilizing that area, as is properly prescribed for a needle injection. This being accomplished, the cap 13 with its plug 14 is then discarded. The projecting needle 20 is then inserted into the tissue by the usual standard technique. Before injecting, however, to avoid unforeseen results, care must be taken not to inject into a blood vessel directly. To be safe, proper and definite aspiration is necessary. With this syringe, such a move is accomplished with minute exactness, since the human element in moving the plunger at this point is eliminated. With the needle in place in the tissue, while one hand is grasping the syringe barrel 10, the other hand merely gently rotates the plunger 11 to the left a half a turn or so. This will cause a momentary reduction in pressure within the barrel, and should the needle be entering into a vessel, that pressure reduction allows the counter pressure of the blood in that vessel to force a drop of blood back into the barrel where it is seen by the operator. On seeing the presence of blood, the operator then withdraws the syringe and inserts it into a new area. Should the needle be in the proper tissue, the plunger is rotated to the right a couple of turns which brings the elastic part of the plunger past the threads 16 of the barrel, where it is able to move freely. The operator then merely pushes the plunger with the thumb on the thumb rest and the solution enters the tissue. The needle is withdrawn, and the entire syringe discarded. In all other syringes, there is possibility of the plunger being forced out due to formation of gas because of faulty medication or faulty filling. With my syringe, such a possibility is eliminated due to the threaded connection between parts. In all other syringes the operator must pull back on the plunger to aspirate, which sometimes tends to dislodge the needle from the tissue, since the needle was inserted by a push or a motion opposite to that for aspirating. With my syringe, such a dislodgement is not possible, unless done intentionally.

In the form of the invention shown in Figs. 3 and 4 the barrel 30 contains a fluid medicament, and is attached to a plunger 31 by screw threads. The stem is made of hard rubber or the like, but the head 32 (or the threaded portion of the plunger) consists of softer material of such nature that the threads 33 that normally engage threads 34 on the barrel will flatten as the plunger moves along the barrel after the plunger has been rotated to move the threads away from the coacting threads on the barrel and so will eject all contents of the syringe. The stem and head constitute a one-piece dual hardness plunger. Thus the liquid in the barrel is forced through the needle 35 if the cap 36 has been removed from the plunger 31. Until the cap has been so removed, the contents of the chamber cannot leak out or be forced out by anything less than destruction of the syringe nor can the barrel be removed from the plunger save by stripping the threads or unscrewing the barrel from the plunger. Obviously, the user of the syringe will insert two fingers under the collar 37 on the plunger after removing the cap 36 and will then press on the end 38 of the barrel with his thumb to make an injection, the parts assuming a position as in Fig. 4 when the chamber is empty. In this form of the invention the cap may be formed as explained for the cap in Figs. 3 and 4, with a soft resilient portion at the region where the point of the needle contacts it, and with hardness at the flange, et cetera, as above explained, and the cap may contain impregnated fibrous material as in Figs. 1 and 2.

In the form of the invention shown in Fig. 5, the parts shown at 31', 32', 33', 34' and 35' are or may be as in Figs. 3 and 4, but an annular flange 40 is formed on the outside of a mantle 41 that is integral with the plunger 32'. In this way the flange 40 is brought up close to the thumb pressure member 42, so as to be easily engaged by the fingers of a hand whose thumb is on pressure member 42, thereby rendering manipulation of the syringe easier.

In the manufacture of a dual-hardness plunger a mass of untreated rubber or like material may be placed in a mold and heat-treated, a lower degree of heat being applied to produce the semi-soft head portion, whereas a higher degree of heat is applied to produce the relatively hard, inflexible stem portion, and the two different temperatures being applied simultaneously to the rubber

in the same mold. It will be obvious that a similar procedure may be followed in the case of a cap that consists of integral parts differing in such qualities as hardness, flexibility and elasticity or extensibility.

The principal advantages secured by making a rubber member, such as a plunger of a syringe, in two integrally connected parts, one of which is rigid while the other is elastic and semi-soft are, first, cheapness of manufacture and, second, saving in labor costs by elimination of steps in assembling the syringes.

It will be understood that the head of the plunger need not necessarily have threads that engage threads inside the barrel. Thus, the plunger might have circumferential flanges or grooves of suitable diameter to act on the interior of the barrel so as to hold the parts against relative endwise movement and to scrape the inner wall of the barrel and remove all fluent material therefrom in the injecting operation, the interior of the barrel being more or less smooth adjacent its open end.

It will be obvious to those skilled in the art that many changes may be made in the devices herein disclosed, all without departing from the spirit of the invention; and therefore I do not limit myself to what is shown in the drawings and disclosed in the specification, but only as indicated in the appended claims.

This application is a continuation in part of my applications No. 247,522, filed September 20, 1951, now abandoned, and No. 255,983, filed November 13, 1951.

Having thus fully described my invention, what I claim is:

1. A hypodermic syringe comprising a barrel having a chamber to contain a medicament, a needle communicating with the chamber, a plunger movable endwise relatively to said barrel, said barrel and said plunger having short bands of interengaging threads permitting a short relative endwise movement by relative rotation of the barrel and plunger and the remainder of the adjacent center wall on at least one of said members being smooth to permit free relative endwise movement of the barrel and plunger, and the threads on the other of said relatively movable parts being compressible to insure complete evacuation of said chamber upon a full stroke of said relatively movable parts.

2. A device as in claim 1, wherein the adjacent part of that part of the member carrying the compressible threads consists of relatively soft material and the remainder of said member consists of rigid, hard material.

3. A device as in claim 2, wherein the plunger carries a mantle adapted to encircle the barrel in one position of the relatively movable parts, and said mantle has a flange for engagement by a finger of the user when his thumb presses on the head end of the barrel.

4. A hypodermic syringe comprising a barrel, a hub of resilient material screw-threaded to one end of the barrel, a hypodermic needle embedded in the hub, a narrow internal screw thread at the other end of the barrel, the remainder of the barrel having a smooth cylindrical inner surface and a plunger movable lengthwise of the barrel to force the contents of the syringe through said needle, said plunger having a narrow external band of screw threads at its forward end adapted to engage the threads of the barrel, said plunger being freely movable through the remaining length of the barrel after said threads are disengaged by relative rotation of the plunger and barrel.

5. A syringe as in claim 4, wherein the screw threads on the plunger are of greater outer diameter than the inner diameter of the cylindrical portion of the barrel and are of compressible material, so as to be capable of flattening against the inner periphery of the barrel as they move along the smooth cylindrical inner surface of the same.

6. A device as in claim 4, wherein the head of the plunger is of compressible material while the stem is rigid, the threads being formed on the head and being of slightly greater outer diameter than the inner periphery of the smooth part of the barrel so that they can flatten so as to scrape the inner peripheral face of such smooth part of the barrel.

7. A device as in claim 6, wherein the threads consist of rubber.

8. In a hypodermic syringe, a threaded barrel, a threaded hub affixed to said barrel, a hollow needle embedded in the hub in position to communicate with the interior of the barrel when the hub is screwed to the barrel, the hub having a reduced extension providing a shoulder, and the syringe including a cap fitting on the shoulder, a plug of fibrous material fitting in the cap, said plug being impregnated with antiseptic material.

9. A device as in claim 8, including a length of thread secured to the plug and protruding from the cap, for the purpose set forth.

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