July 2, 1946. B. J. GOLDSMITH 2,403,074

HYPODERMIC INJECTION DEVICE

Filed May 18, 1943

Fig. 1.

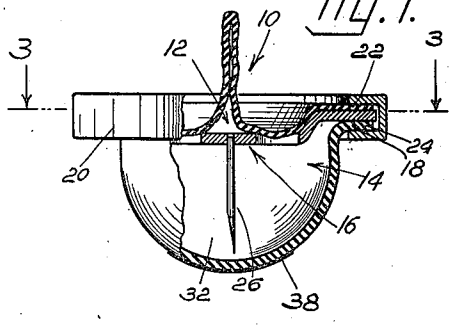


Fig. 2.

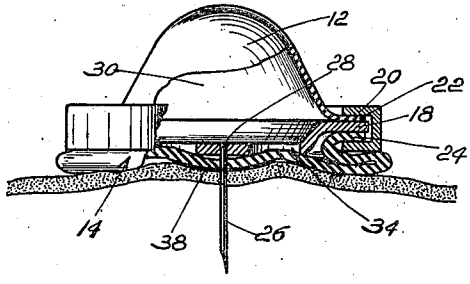
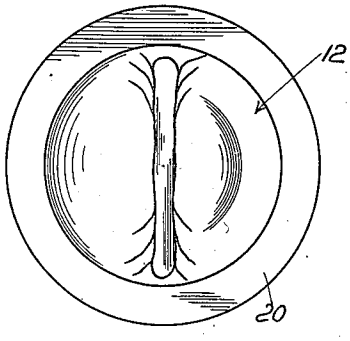


Fig. 4



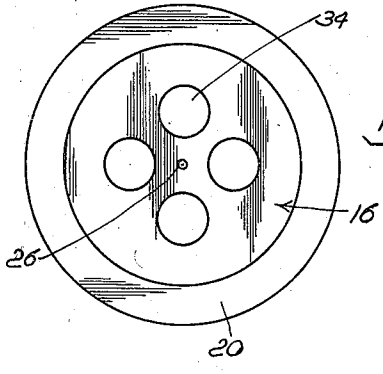


Fig. 3.

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HYPODERMIC INJECTION DEVICE

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4 Claims. (Cl. 128—216)

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This invention relates to hypodermic injection devices.

One object of the present invention is to provide a hypodermic injection device which is especially well adapted to facilitate self-injection.

Another object is the provision of a hypodermic injection device in which the hypodermic needle is maintained in sterilized condition.

Another object of the present invention is the provision of a hypodermic injection device comprising a container for the liquid to be injected and a hypodermic needle which communicates with the interior of said container and which is completely enclosed in a part of the device, said part being flexible and having at least a portion thereof formed of material through which the needle can penetrate to a projected position externally of said part to permit the needle to be inserted in the patient.

A further object of the invention is to provide a hypodermic injection device having in unitary relation liqiud containing means, a hypodermic needle which communicates with said liquid containing means and which is enclosed by said liquid containing means or a part thereof, the construction and arrangement of the elements of the device being such that the needle can be projected from the inside to the outside of the device and simultaneously inserted into the part of the patient in which the liquid is to be injected.

A yet further object of the invention is generally to provide a hypodermic injection device of improved construction and operation, especially in respect to the qualities of simplicity of construction, low cost, preservation of the sterilized condition of the needle, and facility of use for administering an injection.

The above and other objects, features and advantages of the invention will be fully understood from the following description of a preferred embodiment of the invention, reference being had to the accompanying illustrative drawing.

In the drawing:

Fig. 1 is a view partly in elevation and partly in section of a hypodermic injection device embodying the present invention.

Fig. 2 is a view similar to Fig. 1 showing the position of the parts when the needle is projected from the device and inserted in the patient.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1.

Fig. 4 is a top plan view of Fig. 1.

Reference being had to the drawing in further

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detail, the hypodermic injection device 10 embodying the present invention comprises, in the preferred form illustrated herein, a collapsible envelope constituted by the parts 12 and 14 formed of rubber or other suitable fluid-impervious material. As illustrated, the material of part 14 is thicker and less pliable than the material of part 12. Said parts are secured in fixed relation to a comparatively stiff disk or diaphragm 16 in fluid sealing relation at the peripheral edge 18 thereof, completely therearound by means of a peripherally-continuous holding member 20. More particularly, member 20 is U-shaped in cross section and the peripheral marginal edge portions 22 and 24 of envelope forming parts 12 and 14 are clamped by member 20 against the peripheral marginal edge portions of diaphragm 16.

The above described envelope constitutes means for containing the liquid which is to be injected into the patient through the hypodermic needle 26. Said needle 26 is fixed to diaphragm disk 16 and the bore or fluid passage of said needle communicates at its inlet end 28 with the chamber 30 defined by envelope part 12 and the adjacent side of said disk 16. The hypodermic needle 26 projects from said disk into the chamber 32 defined by the envelope forming part 14 and the adjacent side of said disk and is enclosed in said chamber. Chambers 30 and 32 communicate with each other through a plurality of openings 34 provided in diaphragm disk 16.

The volume of the envelope or liquid-containing means is greater than the quantity of liquid therein. Preferably, the quantity of liquid within the envelope is about equal to the volume of chamber 32 when the device is positioned as illustrated in Fig. 1. Also, the interior of said envelope is substantially devoid of air or other gas, so that, as illustrated in Fig. 1, the envelope forming part 12 is substantially collapsed by atmospheric pressure and is free to be distended to make room for the liquid which passes from chamber 32 into chamber 30 when the envelope forming part 14 is collapsed, as will presently be described. It will be understood, therefore, that the liquid can flow freely from chamber 32 to chamber 30 through openings 34 of diaphragm disk 16. The quantity of liquid in the envelope may vary and, it will be understood that it need not exceed the amount necessary for a single injection. In this connection, it will be understood that, a special feature of this device is that it can be made and sold at such low cost that it can be used once and discarded.

Thus, the hypodermic injection device embody-

ing the present invention consists of a self-contained unit comprising containing means for the liquid to be injected and a completely enclosed hypodermic needle which is connected to said means. In using the device for injecting the liquid into the patient, the device is positioned as illustrated in Fig. 1 with the needle 26 within chamber 32 pointing toward the part of the patient in which the injection is to be made, and a force is exerted on said device, in any suitable way as by pressing on the member 20 for collapsing envelope forming part 14 against the part of the patient in the region where the injection is to be made, without, however, interfering with the distention of part 12 by the fluid which flows into said part. The hypodermic needle 26 is thus projected through the confronting portion of envelope forming part 14 so that the needle penetrates through said portion and is forced into the patient at the point of injection. After the needle is thus projected through envelope forming part 14 and completely forced into the patient, said envelope forming part is collapsed by pressing the same against disk 16 and the adjacent side of member 20, peripherally thereof between said disk and the confronting part of the patient around the point of insertion of the needle into the patient, as illustrated in Fig. 2. When the envelope forming part 14 is thus collapsed for projecting the needle, the liquid to be injected flows from chamber 32 into chamber 30, after which the liquid is forced through the needle into the patient by pressing the envelope forming part 12 for exerting pressure on the liquid for forcing the same into the inlet end 28 of the needle. Preferably, the volume of chamber 30 containing the liquid therein, in the condition of the device illustrated in Fig. 2, is sufficiently large to contain the liquid to be injected through the needle 26 so that no substantial quantity of liquid will be expelled through the needle until envelope forming part 12 is pressed manually for ejecting the liquid through the needle.

It will be readily understood in view of the above description of the hypodermic injection device of the present invention that said device can be conveniently used by the patient himself for administering a self-injection. Also it will be understood that by reason of the present construction in which the hypodermic needle is completely enclosed, the sterilized condition of the needle is preserved and it is, therefore, unnecessary for the patient or the one who administers the injection to sterilize the needle. Preferably, any suitable antiseptic substance is applied as a coating 38 to the external surface of envelope forming part 14 in the region thereof through which the needle is projected and which is near the part of the patient when the injection is made, it being understood that said part 14 is provided with said antiseptic substance when the injection device is manufactured or prior to the issue of said device for use.

It will be understood that the principle underlying the hypodermic injection device hereinbefore described may be embodied in constructions other than that herein shown or described, that the invention may be embodied otherwise than as herein specifically illustrated and described, and that in the illustrated embodiment various changes may be made. Accordingly, I do not wish to be limited to the present embodiment or to the construction herein illustrated or described except to the extent which may be required by the scope of the appended claims.

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

1. A hypodermic injection device comprising a collapsible envelope containing the fluid to be injected and only partly filled with said fluid, a diaphragm secured within said envelope and dividing the same into two chambers, said diaphragm having openings therethrough to allow the free passage of the fluid from one chamber to the other, a hypodermic needle enclosed within said envelope and secured to said diaphragm and projecting therefrom into one of said chambers with the outlet end of the fluid passage of the needle in position to penetrate through the wall of said last mentioned chamber when the portion of said envelope which confronts said end of the needle is pressed thereagainst axially of the needle, the inlet end of the fluid passage of said needle being in communication with the other of said chambers whereby the fluid in said envelope is expelled through said needle by collapsing said envelope to reduce the volume thereof.

2. A hypodermic injection device comprising a collapsible envelope containing the fluid to be injected and only partly filled with the fluid, a diaphragm secured within said envelope and dividing the same into two chambers, said diaphragm having openings therethrough to allow the free passage of the fluid from one chamber to the other, a hypodermic needle enclosed within said envelope and secured to said diaphragm and projecting therefrom into one of said chambers with the outlet end of the fluid passage of the needle in position to penetrate through the wall of said last mentioned chamber when the portion of said envelope which confronts said end of the needle is pressed thereagainst axially of the needle, the inlet end of the fluid passage of said needle being in communication with the other of said chambers whereby the fluid in said envelope is expelled through said needle by collapsing said envelope to reduce the volume thereof, said envelope having a larger capacity than the volume of the fluid therein whereby said envelope can be partially collapsed for projecting the needle therethrough without the fluid being expelled through said needle until the envelope is further collapsed following said projection of the needle.

3. A hypodermic injection device comprising a collapsible envelope containing the fluid to be injected, a diaphragm secured within said envelope and dividing the same into two collapsible chambers, said diaphragm having openings therethrough to allow the free passage of the fluid from one chamber to the other, said envelope comprising two collapsible parts in communication with each other, one of said parts being normally at least partially distended and the other of said parts being normally at least partially collapsed, a hypodermic needle secured to said diaphragm and projecting therefrom into one of said chambers with the outlet end of the needle in position to penetrate through the wall of said last mentioned chamber when the portion of said envelope which confronts said end of the needle is pressed thereagainst axially of the needle, the inlet end of said needle being in communication with the other of said chambers whereby the fluid in said envelope is expelled through said needle by collapsing said envelope to reduce the volume thereof, said envelope having a larger capacity than the volume of the fluid therein whereby said envelope can be partially collapsed for projecting the needle therethrough without the fluid being expelled through said needle until the envelope is

further collapsed following said projection of the needle.

4. A hypodermic injection device comprising a collapsible envelope containing the fluid to be injected, a diaphragm secured within said envelope and dividing the same into two chambers, said diaphragm having openings therethrough to allow the free passage of the fluid from one chamber to the other, a hypodermic needle secured to said diaphragm and projecting therefrom into one of said chambers with the outlet end of the needle in position to penetrate through the wall of said last mentioned chamber when the portion

of said envelope which confronts said end of the needle is pressed thereagainst axially of the needle, the inlet end of said needle being in communication with the other of said chambers whereby the fluid in said envelope is expelled through said needle by collapsing said envelope to reduce the volume thereof, and means accessible externally of said envelope and operatively connected to said diaphragm for transmitting a force to said needle for projecting the same through said envelope and into the part in which the fluid is to be injected.

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