

[54] **REPLACEABLE CARTRIDGE
HYPODERMIC SYRINGE HAVING STERILE
MAINTENANCE OF NEEDLE**

[76] Inventor: **Benjamin Friedman**, 1064 Victory
Blvd., Staten Island, N.Y. 10301

[22] Filed: **Aug. 16, 1973**

[21] Appl. No.: **388,944**

Related U.S. Application Data

[63] Continuation of Ser. No. 162,497, July 14, 1971,
abandoned.

[52] U.S. Cl. **128/218 N, 128/218 DA, 128/221**
[51] Int. Cl. **A61m 5/24, A61m 5/32**
[58] Field of Search **128/218 D, 218 DA, 216,**
128/218 M, 218 R, 218 N, 218 NV, 220,
221, 215

[56] **References Cited**

UNITED STATES PATENTS

1,240,033	9/1917	Dickinson	128/221
1,839,695	1/1932	Nevin	128/218 D
1,840,788	1/1932	Nevin	128/218 D
2,157,503	5/1939	Smith	128/218 D
2,677,373	5/1954	Barradas	128/216
2,778,359	1/1957	Friedman	128/218 D

2,869,542	1/1959	Orsten et al.	128/218 D
3,021,942	2/1962	Hamilton	128/221 X
3,043,304	7/1962	Higgins	128/218 N
3,052,241	9/1962	Myerson et al.	128/221
3,224,445	12/1965	Melott	128/218 D

FOREIGN PATENTS OR APPLICATIONS

236,613	4/1960	Australia	128/221
---------	--------	-----------------	---------

Primary Examiner—Richard A. Gaudet

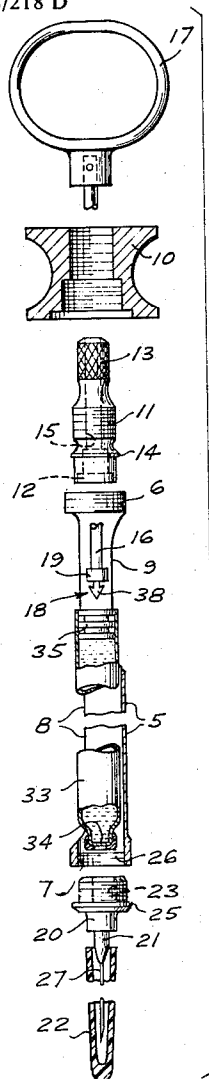
Assistant Examiner—J. C. McGowan

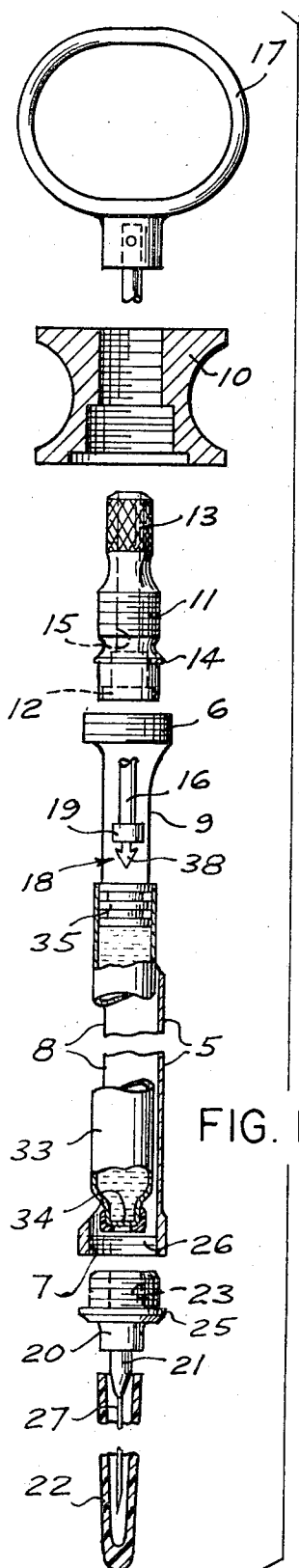
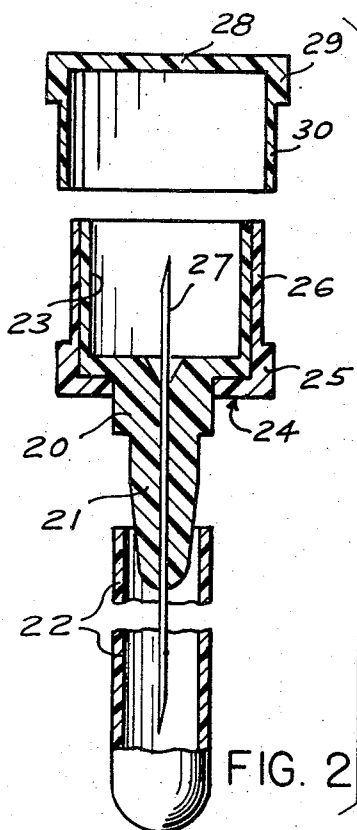
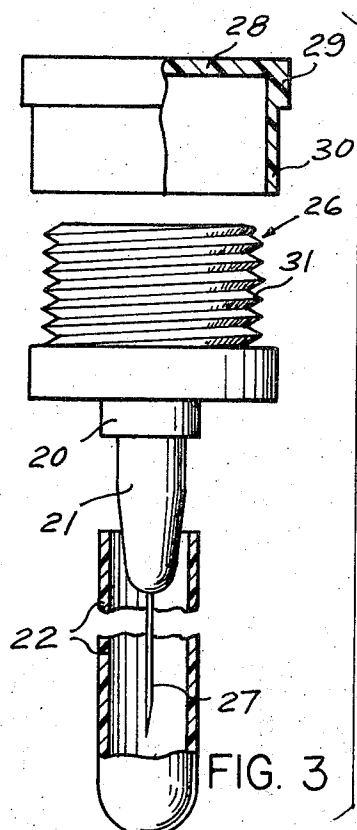
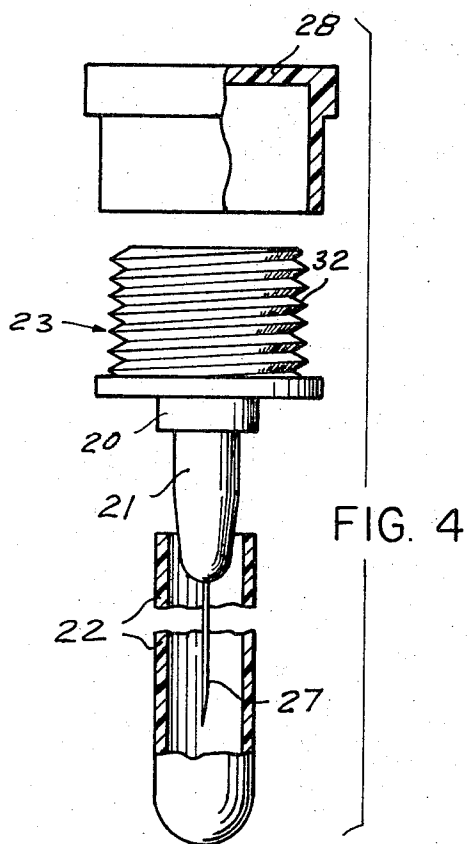
Attorney, Agent, or Firm—Felshin and Feldman

ABSTRACT

[57] This invention is directed to a replaceable cartridge hypodermic syringe in which, initially, a combined needle assembly and cartridge unit are bodily inserted into the distal end of the syringe barrel and thereafter replacement cartridges may be inserted or removed without affecting the sterility of the needle. The needle assembly includes a generally cylindrical body having a proximally extending annular skirt associated therewith for threaded retention within the distal end of the barrel. Sterility of the needle is not affected by cartridge changes.

4 Claims, 10 Drawing Figures





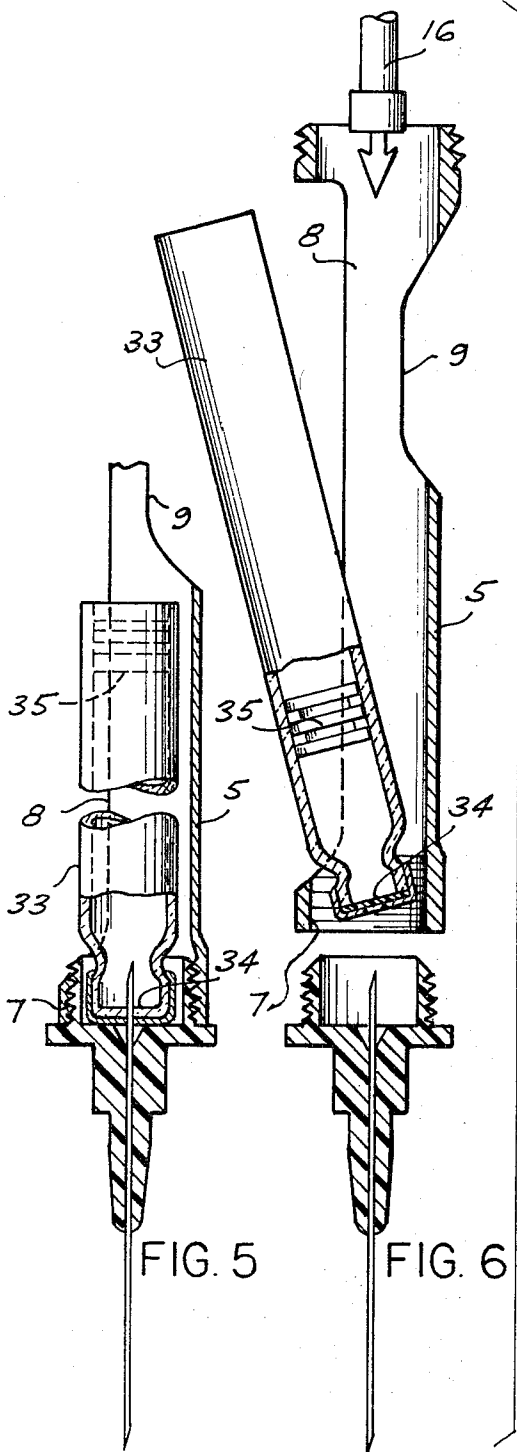
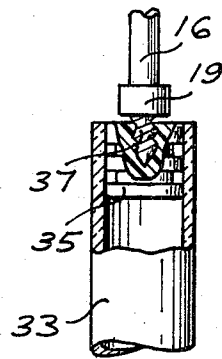


FIG. 7

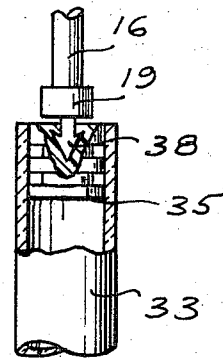


FIG. 8

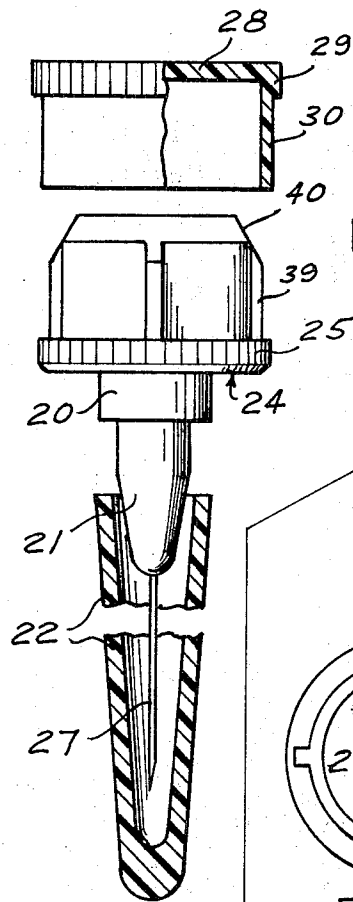


FIG. 9

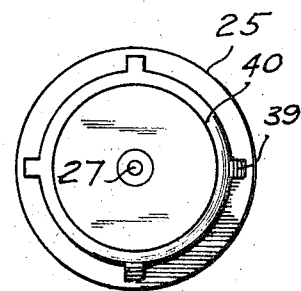


FIG. 10

REPLACEABLE CARTRIDGE HYPODERMIC SYRINGE HAVING STERILE MAINTENANCE OF NEEDLE

This is a continuation of application Ser. No. 162,497, filed July 14, 1971, now abandoned.

THE INVENTION

This invention relates generally to new and useful improvements in hypodermic syringes and particularly seeks to provide a novel hypodermic syringe for dentists in particular that is initially capable of receiving and retaining a combined needle and cartridge assembly for an initial injection or aspiration, after which the cartridge may be removed and replaced by one or more successively installed cartridges without removing the needle and without affecting the sterility of same.

One such general type of syringe is disclosed and claimed in my co-pending patent application Ser. No. 865,818, filed Oct. 13, 1969, now U.S. Pat. No. 3,640,278, granted Feb. 8, 1972. In that type of syringe the needle assembly must first be inserted into the bottom of the barrel from the inside thereof, after which the first and each successive cartridge to be used is inserted and locked into the body of the barrel in needle engaging position. This type of syringe construction, while permitting cartridge replacement without affecting sterility of the needle, precludes the possibility of initially using a pre-assembled cartridge-needle unit because it is impossible to insert such a unit as an entity upwardly into the syringe barrel through the bottom or distal end thereof.

In contrast, a syringe constructed in accordance with this invention is expressly designed to permit the initial use of a preassembled needle-cartridge unit, when desired, while permitting successive cartridges to replace the initial cartridge without affecting the sterility of the needle.

Therefore, an object of this invention is to provide a novel hypodermic syringe constructed to receive and retain a combined needle assembly and cartridge unit when inserted from one end and to permit the independent removal and replacement of the cartridge without necessitating removal of the needle assembly and without affecting sterility of the needle.

Another object of this invention is to provide a syringe of the character stated that includes a longitudinally apertured barrel having cartridge locking or clamping means and a cartridge plunger actuating or piston rod mounted at one end and an internally threaded opposite end for receiving and retaining as assembly including an axially aligned double-ended hypodermic needle.

Another object of this invention is to provide a syringe of the character stated in which the needle assembly includes a generally cylindrical body formed from a plastic material that is sufficiently soft or deformable to be self threading when engaged within the internally threaded end of the barrel.

Another object of this invention is to provide a syringe of the character stated in which the cylindrical body of the needle assembly is prethreaded for engagement within the internally threaded end of the barrel.

A further object of this invention is to provide a syringe of the character stated in which the needle assembly therefor includes a body having a flanged base with

a cylindrical skirt extending axially from one end, a relatively small diameter, circularly cross-sectioned, stud extending from its other end, a double ended hypodermic needle axially retained within the flanged base and the stud with one end projecting beyond the end of the stud and its other end surrounded by the cylindrical skirt and substantially coextensive with the depth thereof, there being removable friction caps covering the skirt of said body and the oppositely extending stud thereof for protecting the exposed ends of the needle.

A further object of this invention is to provide a syringe of the character stated in which means are provided to operatively connect the inner end of the actuating or piston rod with the opposed plunger or piston of a cartridge when such cartridge is installed within the barrel of the syringe.

A further object of this invention is to provide a syringe of the character stated in which the cylindrical body portion of the needle assembly may be enclosed by a cover assembly including a skirted element that surrounds the skirt of the needle assembly for engagement within the internally threaded end of the barrel.

A further object of this invention is to provide a syringe of the character stated that is simple in design, rugged in construction and economical to manufacture.

With these and other objects, the nature of which will be apparent, the invention will be more fully understood by reference to the drawings, the accompanying detailed description and the appended claims. In the drawings:

FIG. 1 is an exploded longitudinal section of a hypodermic syringe constructed in accordance with this invention;

FIG. 2 is an enlarged longitudinal detail section of the needle assembly shown in FIG. 1 and illustrates one form in which the needle assembly may be made and pre-packaged for self-threading insertion into the barrel of the syringe;

FIG. 3 is a view similar to FIG. 2 but shows how the skirt of the needle body cover may be pre-threaded;

FIG. 4 is a view similar to those of FIGS. 2 and 3 but shows how the skirt of the needle body itself may be pre-threaded in order to eliminate one cover element for pre-packaging purposes;

FIG. 5 is a fragmentary longitudinal section showing the initially installed combined needle assembly and cartridge, with the type of needle assembly being that of either FIGS. 2 or 3;

FIG. 6 is a view similar to FIG. 5 but indicating the removal of the initially installed cartridge for replacement by a subsequently installed cartridge;

FIGS. 7 and 8 are fragmentary detailed longitudinal sections showing various means for operably connecting the actuating or piston rod of the syringe with the plunger or piston of the associated cartridge; and

FIG. 9 is a view similar to those of FIGS. 2-4 but showing a further modification in the construction of the body of the needle assembly for more rapid engagement within the barrel of the syringe.

FIG. 10 is a proximal end view of the needle assembly of FIG. 9 with the cap removed.

Referring to the drawings in detail the invention, as illustrated, is embodied in a hypodermic syringe including a cylindrical barrel 5 having an externally threaded

upper or proximal end 6 and an internally threaded lower or distal end 7.

One wall section of the barrel 5 is provided with a longitudinal aperture or window 8, having a length and width sufficient to permit the ready insertion of cartridges, and the opposite wall section of the barrel is provided with a shorter aperture or window 9 located near the proximal end of the barrel to enable a user's finger to be inserted to displace the upper or proximal end of a cartridge when it is to be replaced by a fresh cartridge.

Cartridge clamping and plunger or piston actuating means are attached to the proximal end of the barrel 5 and include a finger nut 10 that is threadably connected to and seated on the proximal end 6 and is provided a threaded axial bore that is adapted to receive and retain a generally cylindrical axially adjustable clamp element 11 having a cylindrical recess 12 at its distal end for engagement over the proximal end of an installed cartridge and an oppositely extending knurled knob 13 at its proximal end. A flange 14 limits the distal retractive movement of the element 11 while permitting full proximal movement thereof, even to the point of disengagement from the finger nut 10.

The clamp element 11 is provided with an axial bore 15 into which is freely fitted a relatively long actuating or piston rod 16 having a finger ring 17 removably affixed to its proximal end and means generally indicated 28 at its distal end for operative connection with the plunger or piston of an installed cartridge, as will be hereinafter more fully described.

A collar 19 is affixed adjacent the distal end of the rod 16 to prevent the rod from being distally retracted completely from the bore 15, thus necessitating removal and replacement of the finger ring 17 during initial assembly in order to permit the rod to be inserted through the bore from the distal end thereof.

Further in accordance with this invention the lower or distal end 7 of the barrel is adapted to threadably receive and retain a needle assembly for operative communication with the interior of an installed cartridge.

One form of needle assembly for this purpose is shown in FIGS. 1 and 2, with FIG. 2 specifically showing the needle assembly as it appears prior to installation and use. Here, the needle assembly is formed from a suitable plastic material and comprises a cylindrical body 20 terminating at its distal end in a tapering stud 21 over which an elongated cap 22 is frictionally fitted and terminating at its proximal end in a proximally extending annular skirt 23 having an internal diameter such as to freely receive the lower or distal end of a cartridge when installed in the barrel. An inner cap or shell 24, having a flange 25 and an annular skirt 26, fits over the body 20 with the skirt 26 surrounding the skirt 23 of the body.

The external diameter of the skirt 26 is complementary to the internal threads of the barrel end 7 and is self-threading when fitted thereto by rotation of the flange 25.

A double ended hypodermic needle 27 is axially embedded in the body 20 with its distal end contained within the removable cap 22 and its proximal end contained within and substantially coextensive with the skirt 23.

For shipment and storage in a sterile condition prior to use, an outer cap or shell 28, having a flange 29 and

an annular skirt 30, is fitted completely over the skirt 26 of the inner cap.

The needle assembly of FIG. 3 is identical to that of FIG. 2 except that the external surface of the skirt 26 is pre-threaded as at 31 for easier engagement with the threaded end 7 of the barrel.

In the modification shown in FIG. 4, the external surface of the body skirt is pre-threaded as at 32 and the internal cap or shell 24 is eliminated but the external cap 28 is still used for shipping and storage purposes.

FIGS. 9 and 10 of the drawings shows a further modification of the needle assembly in which the external surface of the body skirt of FIG. 4, rather than being pre-threaded, is provided with a plurality of symmetrically disposed self-threading longitudinal ribs 39, each having a chisel or feather-edged proximal end 40 for ready insertion into the threaded end 7 of the barrel.

The syringe of this invention is particularly adapted for use with cartridges of the type (see FIGS. 1 and 5) comprising a tubular glass or other transparent body 33 having its distal end sealed by a rubber or other penetrable plug 34 and its proximal end closed by a rubber or other resilient plunger or piston 35 that may be axially reciprocated within the body 33. The body 33 is dimensioned such that its distal end will fit freely within the skirt 23 of the needle assembly and its proximal end will fit freely within the recess 12 of the clamping element 11.

In use for a given patient, and primarily for reasons of sterility, the syringe should be initially prepared by bodily inserting a combined needle assembly and cartridge into the bottom or distal end of the barrel (see FIG. 5) after having first removed the cap 28 from the needle assembly and after having cleaned both ends of the cartridge with a disinfectant. At this point the clamp element 11 is threadably advanced through the nut 10 so that the recess 12 fits over the adjacent or proximal end of the cartridge to securely hold same in position for use. Then the actuating or piston rod 16 is advanced so that its distal end 18 may be operably connected to the plunger or piston 35 of the cartridge.

Such a connection may be made in several ways. Thus, as shown in FIG. 7, the distal end of the rod 16 may be provided with a tapered self-tapping screw tip 37 that may be screwed into the opposed end of the plunger 35; or, as shown in FIG. 8, the distal end of the rod 16 may be provided with a barbed spear-point 38 that can penetrate and be retained by the opposed end portion of the plunger 35.

The needle cap 22 is then removed and the syringe is ready for use.

Should it be necessary to replace the initially installed cartridge while working upon a single patient, it can be done simply by disengaging and retracting the rod 16 from its connection with the plunger 35, retracting the clamp element 11 a distance sufficient to clear the proximal end of the cartridge, and then insert a finger through the window 9 to tilt the cartridge outwardly through the window 8 (see FIG. 6) and remove same in a direction along its tilted axis. A fresh cartridge is then inserted in the reverse manner and the clamp element 11 is advanced to firmly seat the distal end of the cartridge within the skirt 23 of the needle assembly so that the proximal end of the needle 27 is forced through the seal 34 into open communication with the interior of the cartridge.

In this manner cartridges may be installed and replaced without causing contamination of the needle and without requiring the syringe body to be autoclaved between successive uses. In fact it is only necessary to store the syringe body in a disinfectant solution between uses, since no part of the needle ever contacts any part of the syringe body.

It is of course to be understood that variations in arrangements and proportions of parts may be made within the scope of the appended claims.

I claim:

1. A hypodermic syringe comprising a cylindrical barrel provided at its proximal end with a removable cartridge clamping means including a cartridge plunger-actuating rod, a cartridge in said barrel containing a reciprocable plunger actuatable by said rod, said barrel having its distal end internally threaded for removably attaching a needle assembly thereto, said cartridge being substantially cylindrical throughout its length, said barrel having an aperture, said aperture having a length and width sufficient to permit the ready insertion of said cartridge, said barrel being adapted to house said plunger-containing cartridge intermediate its ends in peripherally spaced relation thereto throughout its length and being constructed to permit the ready insertion and removal of said cartridge into and out of said barrel, said cartridge being provided with a penetrable seal at its distal end and with said reciprocable plunger normally positioned adjacent its proximal end, the distal end of said plunger-actuating rod being provided with means for operable connection with the plunger of said cartridge when said cartridge is housed within said barrel, a needle assembly including a central body provided with an external flange seated against the distal end of said syringe barrel, a tapered stud of reduced dimensions projecting from the outer end of said central body and having a longitudinal axis forming an extension of the central axis of said body, an annular wall projecting from the inner end of said central body and having a central longitudinal axis forming an extension of the central axis of said body, said annular wall being located within the distal end of said barrel and closing the distal end of said cartridge in the barrel, said distal end of said barrel seated against the inner end of said central body, said distal end of said cartridge being in non-fluid tight peripherally spaced relation with respect to said annular wall, and the periphery of said annular wall being in threaded engagement with the internal thread at the distal end of said barrel for removably attaching said needle assembly to said barrel, said central body, tapered stud and annular wall being of a one piece plastic construction, a double-ended hypodermic needle having an intermediate portion axially embedded within said body and said tapered stud, the proximal end of said needle projecting axially into the space defined by

said annular wall and the distal end thereof extending beyond the outer end of said tapered stud, and the projecting proximal end of said needle penetrating through the penetrable seal at the distal end of the cartridge seated against said central body and enclosed by said annular wall, the projecting proximal end of said needle being of a length less than that of the projecting distal end thereof and less than longitudinal length of said annular wall.

2. A hypodermic syringe comprising in combination, a cylindrical barrel having a proximal end and a distal end, said barrel being formed with opposed apertures wherein one of said apertures extends substantially throughout the length of the barrel between the distal end and the proximal end, thread means formed on the inner circumferential surface of the barrel at the distal end; a cartridge in said barrel, said cartridge being cylindrical and having substantially the same diameter throughout its length said diameter being less than the inside diameter of said barrel and said cartridge having a penetrable seal at the distal end, said one aperture having a length and width sufficient to permit the ready insertion of said cartridge, and a needle assembly having a central body portion formed with an external flange seated against the distal end of said syringe barrel, and an annular wall projecting upwardly toward the proximal end of the barrel from the inner end of said central body portion and being coaxial with the central body portion, a double-ended hypodermic needle having an intermediate portion axially fixedly disposed in said central body portion, the proximal end of said needle projecting into the space within the annular wall and the distal end thereof extending past the central body portion, thread means on the outer surface of said annular wall to engage said barrel thread means, and the inner surface of said annular wall being spaced from said cartridge, said body and said annular wall being of a one-piece plastic construction, so that said cartridge is in tilted relationship with said annular wall of the needle assembly upon insertion and removal of the cartridge through the aperture extending substantially throughout the length of the barrel, whereby said cartridge is insertable and removable through the aperture extending substantially throughout the length of the barrel, the proximal end of said barrel or the distal end of said barrel.

3. The combination of claim 2, wherein the top end of the annular wall of the needle assembly extends to a point within the space of the aperture extending substantially throughout the length of the barrel.

4. The combination of claim 3, wherein the other of said apertures extends between the distal end and the proximal end of said barrel, and is of lesser length than the first said aperture opposed thereto.

* * * * *