This invention is directed to a hypodermic syringe including a longitudinally windowed barrel having a pair of apertured ends, one of which is adapted to retain a normally fixed, but removable, needle assembly having its inner end projecting toward the other end, and the other of which is adapted to retain a reciprocable actuating rod having one end operatively connectable to the plunger of a dispensing or collecting cartridge removably retained within the barrel. Cartridges may be inserted or replaced at will through a window of the barrel without necessitating the removal of or causing contamination of the needle assembly. Releasable members are provided to secure the cartridge in its needle and actuating rod-engaging position within the barrel. Threaded members are employed for mounting the actuating rod, which members also assist in so securing the cartridge.

5 Claims, 11 Drawing Figures
HYPODERMIC SYRINGE DEVICE WHICH MAINTAINS STERILE CONDITION OF NEEDLE

DESCRIPTION OF THE INVENTION

The present invention relates to a hypodermic syringe device. More particularly, the invention relates to a hypodermic syringe device which maintains the sterile condition of the needle substantially at all times, without the autoclavation of said syringe device.

In known types of hypodermic syringe devices, the needle and cartridge must be manually positioned in the barrel. Once the needle is used, it must be covered again with a protective shield and removed with the cartridge as a unit after each injection, in order to maintain the sterility of said needle. If a second or third injection is required for the same patient with the same needle, the shield must be replaced with each change of cartridge. At the present time, dentists use disposable needles. The puncturing end of the disposable needle must thread onto a nipple of the syringe barrel. The puncturing needle point must pass through a fine bore through said nipple. A syringe of this type must be completely autoclaved before the needle is threaded onto the barrel of the syringe. If it is not autoclaved, the sterile disposable needle becomes contaminated. This is a serious shortcoming of a hypodermic syringe device utilized in dentistry. There can be no such contamination in the syringe of the present invention.

In a normal procedure, a dentist first determines a point of injection somewhere in the patient's mouth. He must then insert the needle of the hypodermic syringe device at the selected point and draw the plunger of a cartridge affixed to the needle outward, away from the patient, in order to aspirate. If the fluid in the cartridge is clear, the dentist may proceed with the injection. If blood appears in the fluid in the cartridge, however, the dentist must select a new point for the injection, until there is no blood visible in the cartridge. The needle may thus be used a few times, until the point of injection is determined.

The principal object of the present invention is to provide a new and improved hypodermic syringe device and needle.

An object of the present invention is to provide a hypodermic syringe device which maintains the needle in sterile condition substantially at all times, without the need for autoclaving the syringe. All that is required is a cold sterilizing solution to maintain the syringe ready for use. The needle of the present invention never touches any part of the syringe of the invention when it is inserted with the cartridge and fixed in the syringe ready for an injection. This is why my syringe does not require autoclaving prior to use. All that is required is the removal of the syringe from a cold sterile solution.

An object of the present invention is to provide a hypodermic syringe device of simple structure which permits the needle to be utilized a number of times, with a number of different cartridges, without contaminating the needle and the contents of the cartridge, as hereinbefore described.

An object of the present invention is to provide a hypodermic syringe device of simple structure without springs, which collect dirt within the head of the syringe, as in known syringe devices.

In accordance with the present invention, a hypodermic syringe device comprises a hollow cylindrical barrel for housing a cartridge having a plunger therein and for supporting a hollow hypodermic needle in operative proximity with the cartridge. The barrel has a pair of opposite end bases each having an aperture formed therethrough and a window formed in the side thereof to permit insertion and removal of a cartridge in the barrel and a needle in the barrel and extending through one of the bases and apertures thereof. The barrel has holding means in the area of the one of the base apertures for holding the needle in a fixed position so that different cartridges may be inserted and removed via the window while the same needl
FIG. 5 is longitudinal section of a typical cartridge that may be used in connection with the syringe of this invention; FIG. 6 is a longitudinal section of an adapter that may be employed whenever shorter cartridges are to be used; FIG. 7 is a longitudinal section of a locking element for the syringe; FIG. 8 is an exploded view, partly in section, of the syringe of FIG. 1; FIG. 9 is a fragmentary elevation of a modification of the lower end of the actuating rod; and FIG. 10 is a longitudinal section showing the ultimate connected relationship between the needle assembly of FIG. 2 and the cartridge of FIG. 5.

In the FIGS., the same components are identified by the same reference numerals.

The syringe of this invention includes a hollow cylindrical barrel 11 adapted to receive and retain a cartridge 12 having a reciprocable plunger 13 mounted therein. The lower end of the barrel 11 is adapted to support an assembly including a hollow hypodermic needle 14 having its inner end insertable into the lower end of said cartridge. The needle assembly, as shown in FIG. 2, comprises a solid cylindrical body member 15. The hollow needle 14 is embedded in the body member 15 and extends axially therethrough. The needle 14 is positioned so that a considerably greater length 16a thereof extends from one end of the body member 15 than from the other end of said body member. Thus, a considerably shorter length 16b extends from the other end of the body member 15. The body member 15 preferably comprises rigid plastic material having a substantially smooth cylindrical outer surface.

A hollow cylindrical skirt or cover 17 extends from one end of the body member 15 and surrounds the shorter length 16b of the needle 14 in spaced relation therewith. The cover 17 preferably comprises plastic material. The body member 15 preferably has a radial bore 18 formed therein and is provided with a radial peg member 19 extending outwardly therefrom in diametrically opposed relation to the bore 18 as shown in FIG. 10.

The needle assembly, as shown in FIG. 2, may be stored and/or transported in sterile condition by being covered with a friction cap 21, of the type shown in FIG. 3a, which fits over the cylindrical cover 17 of said needle, thereby covering and protecting the shorter end 16b of said needle, and by being covered by a friction cover or protective sleeve 22, as shown in FIG. 4, which fits over and covers and protects the longer part 16a of the needle 16.

The modified cap 21 of FIG. 3b is solid, rather than hollow, and has an axially bore 21a formed therein to receive the shorter end 16b of the needle. Each of the caps 21 and 21' and the sleeve 22 may comprise plastic material.

When the needle 14, of FIG. 2, and the cartridge 12, of FIG. 5, are in operative relation, the shorter part 16a of the needle 14 penetrates penetrable material 23 at one end of said cartridge and extends into the fluid-consuming portion of said cartridge. The penetrable material 23 may comprise a rubber diaphragm. At such time, the cover 17 fits loosely around the lower portion 24 of the cartridge 12 which houses the penetrable material 23. The needle is thus affixed to the cartridge in the usual manner. The needle cover 22 may remain on the needle part 16a for as long as desired, after the needle and cartridge are inserted into the barrel 11 of the hypodermic syringe device.

The barrel 11, as shown in FIGS. 1 and 8, is axially movably mounted on the barrel 11 and passes through the aperture of the upper end base 11a of said barrel for operative connection with the cartridge 12 in said barrel. The actuating rod 31 is coupled or affixed to the plunger 13 of the cartridge 12 (FIG. 8) in a manner whereby said plunger moves with said actuating rod. Thus, when the actuating rod 31 is moved in the direction of an arrow 32, the plunger 13 of the cartridge 12 moves in the same direction and draws fluid into said cartridge via the affixed needle 14. When the actuating rod 31 is moved in the direction of the arrow 33 (FIG. 1), the plunger 13 moves in the opposite direction and expels fluid out of the cartridge 12 via the affixed needle 14. The actuating rod 31 has a ring 31a affixed to the upper end thereof to permit facile manual control of said actuating rod. The ring 31a may be affixed to the end of the actuating rod 31 by any suitable means such as, for example, by a screw or pin.
The actuating rod 31 may be fastened to the plunger 13 of the cartridge 12 by any suitable means. Thus, for example, as shown in FIG. 8, an internally threaded fastening member 31b may be provided at the lower extremity of the actuating rod 31. The fastening member 31b may be threadedly engaged with an internally threaded bore 13a formed in the upper surface of the plunger 13 of the cartridge 12, as shown in FIG. 5. The internally threaded bore 13a of the plunger 13 is provided by a metal sleeve inserted into a bore formed in said plunger. An internally threaded sleeve may be provided at the end of the actuating rod 31 for cooperation with an externally threaded projection on the plunger 13.

Another type of fastening arrangement is shown in FIG. 9, wherein a pointed helically externally threaded fastening member 31c is affixed to, and extends from, the lower extremity of the actuating rod 31. The actuating rod 31 is first moved downward so that the fastening member 31c comes into contact with the upper surface of the plunger 13, which plunger usually comprises rubber or similar material, and is moved further and rotated under pressure or force so that said fastening member is gradually turned into said plunger in the manner of a screw. When there is no further use for the cartridge, the actuating rod 31 is rotated in its own axis in the reverse direction from the direction in which it was rotated in order to insert the fastening member 31c into the plunger 13. This removes the fastening member 31c from the plunger and permits the actuating rod 31 to be moved away from the fastening contact with said plunger and out of the cartridge 12.

A lock for mounting the actuating rod 31 on the barrel 11 comprises a sleeve 34 and a coupling member 35, as shown in FIGS. 1 and 8. The barrel 11 is externally threaded in the area of its upper base 11b, as shown in FIG. 8. The sleeve 34 is externally threaded, as shown by the threads 36 thereon in FIG. 8. The sleeve 34 has an axially extending bore 37 formed therethrough which has a diameter sufficient to permit the actuating rod 31 to pass therethrough. The sleeve 34 is thus slidably mounted on the actuating rod 31 and is freely movable in axial directions along said actuating rod.

The coupling member 35 is of substantially hollow cylindrical configuration having opposite base end plates 35a and 35b of substantially annular configuration. As shown in FIGS. 7 and 8, the coupling member 35 has a pair of internally threaded parts of different diameter forming a shoulder 35c (FIG. 7) in said coupling member. The lower internally threaded part 35d has a larger diameter than the upper internally threaded part 35e.

The sleeve 34 and the coupling member 35 are both freely slidably mounted on the actuating rod 31 such that the sleeve 34 has an axially extending bore 34d of said actuating rod of larger diameter than the rest of said rod. The diameter of the portion 34d of the actuating rod 31 is greater than that of the internal bore 37 of the sleeve 34. A flange 38 on the sleeve 34 under the external threading 36 (FIG. 8) and having a diameter greater than that of the upper bore 35c prevents the coupling member 35 from moving off said sleeve in the direction of the arrow 33 (FIG. 1).

When the hypodermic syringe device is to be assembled, the coupling member 35 and the sleeve 34 are threadedly engaged with each other, by moving them together so that the threaded portion 36 of said sleeve is threadedly engaged with the internally threaded part 35e of said coupling member. This is facilitated by a knurled portion 39 (FIGS. 1 and 8) which enables manual grasping of the sleeve 34 to enable rotation thereof into the coupling member 35. After the member 35 and the sleeve 34 have been coupled, the ring 31a is removed from the associated end of the actuating rod 31 to permit the coupled unit to be slid downwardly through the barrel 11, as shown in FIG. 3, and the lower end of the rod 31 is inserted into the barrel. The threading at the upper end base 11b of the barrel 11 is then engaged with the internally threaded part 35d of the coupling member 35. The coupling member 35d and the sleeve 34 are then removed axially to the upper end of the barrel 11, and the actuating rod 31 remains freely reciprocable in said barrel.

When the syringe is to be used, the actuating rod 31 is first retracted to permit access to the inside of the barrel 11 after which a needle assembly (with the friction cover 22 still in place over the needle 14) is inserted from within the barrel through the base 11b and locked into position by the setscrew 28. A cartridge 12 is then inserted into the barrel with its plunger 13 in opposition to the free end of the retracted actuating rod 31, and said syringe 31 is rotated to advance same, relative to the coupling member 35 and the barrel 11, to cause the extension 34a to engage the adjacent end of the cartridge and advance the cartridge into its fully seated position within the barrel 11 so that the lower end of the cartridge is received within the element 17 of the needle assembly and the upper portion 16b of the needle projects through the rubber plug 23 into communication with the interior of the cartridge.

In order to permit the utilization of cartridges of shorter length than that of the cartridge 12, a cartridge adapter sleeve 41 (see FIG. 6) may be employed. The cartridge adapter has an axial bore 42 for free passage of the actuating rod 31 therethrough. When a cartridge adapter 41 is used, it is interposed between the cartridge sleeve 34 and the bottom of the sleeve 34. The respective ends of the adapter 41 are suitably flanged or recessed to mate with the adjacent end portions of the sleeve 34 and the cartridge.

While the invention has been described by means of specific examples and in a specific embodiment, I do not wish to be limited thereto, for obvious modifications will occur to those skilled in the art without departing from the spirit and scope of the invention.

What I claim is:
1. A hypodermic syringe including; a cylindrical barrel for removably retaining a needle assembly at one end, a reciprocable cartridge plunger-actuating rod at its other end and for removably housing a plunger-containing cartridge intermediate said needle assembly and said actuating rod; the wall of said barrel being provided with a first window that is sufficiently long to permit insertion and removal of said needle assembly at said one end and to permit the insertion and removal of said cartridge into and out of said barrel; said cartridge, when housed within said barrel, being provided with a penetrable closure in opposition to said needle assembly and with a reciprocable plunger in opposition to said actuating rod; said needle assembly including an axially disposed hollow needle having its inner end projectable through the penetrable closure of said cartridge for communication with the interior thereof; means for operably connecting the adjacent end of said actuating rod with the adjacent end of said cartridge when said cartridge is housed within said barrel; holding means for removably retaining said needle assembly in a fixed position at said one end of said barrel; and locking means for mounting said actuating rod at said other end of said barrel, said locking means comprising an externally threaded part of said barrel adjacent said other end thereof, an externally threaded sleeve slidably mounted on said actuating rod for free axial movement with respect thereto, and a coupling member having a pair of internally threaded parts of different diameter defining a shoulder therebetween within said coupling member, one of the internally threaded parts of said coupling member being threadedly coupled with the externally threaded part of said barrel and the other of the internally threaded parts of said coupling member being threadedly coupled with the externally threaded sleeve of said barrel.

2. The hypodermic syringe of claim 1 in which said barrel is provided with a second window disposed in opposition to said first window, and in which the holding means of said barrel includes a radial internally threaded bore formed through the side of said barrel adjacent the said one end thereof and a setscrew threadedly engaged into said bore and projectable into holding contact with said needle assembly; said needle assembly including a protective sleeve removably mounted over that part of said needle extending from said barrel, said needle
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assembly being held in position by the holding means of said barrel in a manner to permit the free mounting and dismounting of said protective sleeve.

3. The hypodermic syringe of claim 2 in which said needle assembly comprises a solid body member adapted to fit within the said one end of said barrel for engagement by said holding means and including an end portion projectable beyond the said one end of said barrel, and a hollow needle extending axially through said body member and embedded therein with its ends projecting beyond the ends thereof, that end of said body member extending inwardly towards the interior of said barrel being provided with a hollow cylindrical cover surrounding the inwardly projecting end of said needle in spaced relation thereto, said protective sleeve being removably attached to the other projecting end of said body member.

4. The hypodermic syringe of claim 3 in which said needle assembly holding means additionally includes a bayonet joint defined by a generally L-shaped slot formed in the wall of said barrel adjacent to said setscrew and having a leg in open communication with the adjacent end of said first window and a peg fixed to and extending radially from said body member for reception into said L-shaped slot.

5. The hypodermic syringe of claim 4 in which said body member is also provided with a radial bore adapted to be aligned with and receive the inner end of said set screw when the said peg of said needle assembly is fully seated within the L-shaped slot of said bayonet joint.

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