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3,434,473

HYPODERMIC NEEDLE UNIT WITH INTEGRAL NEEDLE GUARD

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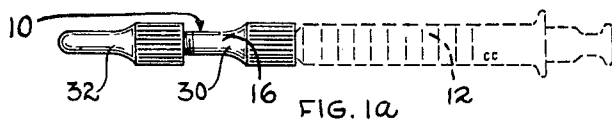


FIG. 1a

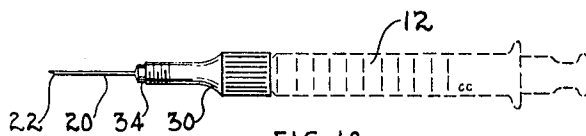


FIG. 1b

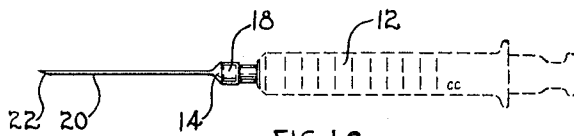


FIG. 1c

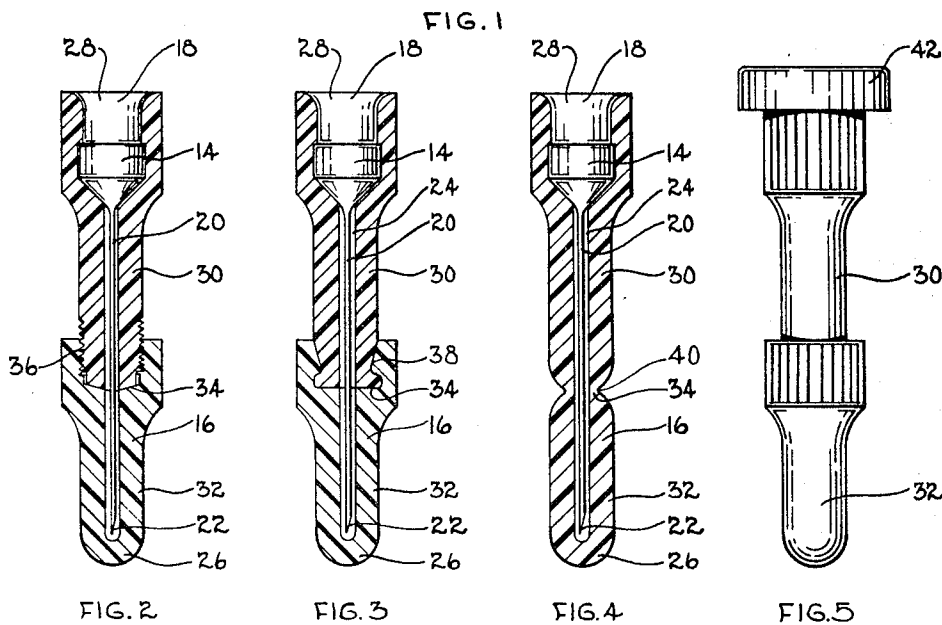


FIG. 2

FIG. 3

FIG. 4

FIG. 5

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HYPODERMIC NEEDLE UNIT WITH INTEGRAL NEEDLE GUARD

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5 Claims

This invention concerns a novel hypodermic needle unit and more particularly it is concerned with a hypodermic needle unit having an integral needle guard.

It is well known in the medical art that parenterally administered drugs should be injected at precise depths. The preferred depth of penetration will vary according to many factors, including the type of drug utilized, the rate of reaction desired, and age and physical size of the patient. The most common types of injections are intradermal, subcutaneous, intramuscular, and intravenous. For each type of injection there is a preferred length of needle.

In actual practice in medical facilities, it is difficult to inventory the relatively large number of needles required to maintain an adequate supply of each length needle. The required inventory is very large in that needles also vary in gauge as well as length. The problem of maintaining an adequate assortment of needles has been even further complicated with the advent of disposable injection equipment. Reuseable needles could be resterilized relatively quickly if a shortage of a particular needle type was encountered. However, disposable needles must be ordered from a vendor a considerable time in advance of the estimated date of use in order to insure an adequate supply. The number of units required is further increased in situations where the syringes are supplied prefilled with needles attached, since a given type of drug must be stocked in syringes having various length needles.

Several suggestions have been made to overcome the above mentioned problems. One method suggested was to use a different injection technique for each type of injection. For example, it was suggested that using the same length needle, intradermal injections be administered by inserting the needle at a 15° angle, subcutaneous at a 45° angle, and intramuscular at a 90° angle, and thereby limit the depth of penetration. This method has several inherent defects including the difficulty of accurately estimating the angle of insertion, especially the 15° and 45° angles. In addition, since a given length needle may be administered in a plurality of methods, the danger of mis-medication is substantially increased.

Realizing the difficulties of the above method, it was suggested to include limiting devices on the cannula of the needle, such as those shown by Gaschke, U.S. Patent 1,436,707, and Epstein 2,091,438. These devices, while substantial improvements, are not completely satisfactory. The device shown in both Gaschke and Epstein substantially increased the cost of the needle, making them unsuitable for use with disposable needles. Furthermore, it is difficult to adjust the depth of penetration once the needle is sterilized without contaminating the cannula.

Accordingly, it is one of the objects of this invention to overcome the aforementioned problems and disadvantages.

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Another object of this invention is to provide a hypodermic needle unit which will enable medical facilities to reduce the required inventory of needles while maintaining an adequate supply of various length needles.

It is an additional object of this invention to provide a hypodermic needle unit having means to limit the depth of penetration.

It is a more specific object of this invention to provide a hypodermic needle unit having an integral needle guard which is adapted to limit the depth of penetration of the needle to a predetermined depth.

Other objects and advantages of this invention will become further apparent hereinafter and in the drawings in which:

FIGS. 1a, 1b, and 1c are illustrations of the hypodermic needle unit of this invention shown in various configurations for different depths of penetration.

FIG. 2 is a cross sectional illustration of a first embodiment of the hypodermic needle unit illustrated in FIG. 1a.

FIG. 3 is a cross sectional illustration of an additional embodiment of the hypodermic needle unit shown in FIG. 1a.

FIG. 4 is a cross sectional illustration of a still further alternate embodiment of the hypodermic needle unit illustrated in FIG. 1a.

FIG. 5 is an illustration of an alternate embodiment of the hypodermic needle unit of this invention having end sealing means.

Briefly, the objects of this invention are achieved by providing a hypodermic needle unit having a hypodermic needle positioned with a sheath which is adapted to divide into a plurality of segments which may be removed to expose a given predetermined length of the needle and thereby limit the depth of penetration.

In describing the preferred embodiments of this invention illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, the scope of this invention is not intended to be limited to the specific terms so selected, and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

Turning now to the specific embodiments of this invention selected for illustration in the drawings, the number 10 designates generally the hypodermic needle unit of this invention. The needle unit 10 is shown attached to a conventional Luer-type syringe, 12. The syringe 12 is not an element of the present invention, and it should be understood that the hypodermic needle unit 10 of this invention may be utilized with any suitable syringe.

The needle unit 10 is comprised of two major elements, a hypodermic needle 14 and a needle sheath 16.

The needle 14 is of a relatively conventional design. The needle 14 is preferably made from a corrosion resistant metal, for example stainless steel. The needle 14 has a hub portion 18 and a cannula portion 20. The hub portion 18 is adapted to be attached to the tip of a syringe 12. The cannula 20 is attached to and in communication with the hub 18 at its first terminal end and has a penetrating point 22 its opposite end. The cannula 20 may be made in various gauges, depending on the viscosity of the medica-

tion to be administered, the desired rate of delivery, and certain other factors. However, it has been found that 20-22 gauge needles are suitable for most applications.

The length of the cannula 20 from the point at which it is attached to the hub 18 to the penetrating point 20 is an important factor. As noted above, the depth of penetration is directly related to the type of injections administered. Since the needle unit of this invention is adapted to be utilized for different depths of injections, the needle should be as long as is required for the deepest penetration. In practice it has been found that the cannula 20 of the needle 14 is preferably approximately 1½ inches in length from the hub 18 to the point 22.

The sheath 16 is a generally tubular member having an axial internal bore 24. The sheath 16 is sealed at one end 26 and open at the opposite end 28 and has an internal configuration approximately mating the external configuration of the needle 14. The wall thickness of the sheath 16 should be sufficient to resist breakage during storage and handling. The cross sectional area of the sheath 16 should be sufficient to effectively limit the penetration of the cannula 20 to a predetermined depth. The walls of the sheath should be at least ¼ of an inch and preferably ⅜ of an inch in thickness. The needle 14 is positioned within the sheath 16 with the hub 18 at the open end 28 and the cannula 20 of the needle 14 within the bore 24 with the point 22 of the needle adjacent to the sealed end 26 of the sheath 16. The sheath 16 is releasably secured to the hub 18.

The sheath 16 is adapted to be divided into a plurality of segments 30, 32. As illustrated in FIG. 1a the hypodermic needle unit 10 is attached to the tip of the syringe 12. With the needle unit in place on the syringe as shown in FIG. 1a, the needle is protected from contamination and may safely be stored in this condition.

When it is determined that an injection should be made, a predetermined number of segments 30, 32 are removed from the needle unit 10 to expose the preferred length of needle for the type of injection to be administered. For example, if a relatively shallow depth of penetration is desired as in a subcutaneous injection, only one of the segments 32 would be removed, as shown in FIG. 1b.

The exposed shoulder 34 of the segment 30, remaining on the needle 14, limits the depth of penetration of the cannula 20 into the patient. If it is desired to have a greater length of the needle exposed, an additional segment 30 should be removed.

It can readily be seen that the above-described hypodermic needle unit has many advantages. The completely assembled sheath 16 protects the needle 14 from damage and contamination during storage. The number of needles that must be maintained in inventory is substantially reduced since the needle unit 10 of this invention may readily be adjusted to expose various lengths of the needle. It should also be noted that the shoulder 34 of each segment 30, 32 is maintained in a sterile condition and is not exposed until the segments are removed. The still further advantage of the hypodermic needle unit 10 of this invention is that a needle guard is an integral part of the hypodermic needle unit 10. Further, it should be noted that using the hypodermic needle unit 10 of this invention, a standard injection technique can be used for most types of injections. For example, by adjusting the exposed needle length to the preferred length, most injections can be administered by simply injecting the needle at a 90° angle, rather than varying the angle of injection for each type of injection.

Turning now to the specific embodiments of this invention illustrated in FIGS. 2-5, in the needle unit illustrated in FIG. 2, the segments 30, 32 are releasably secured to each other by means of a threaded joint 36. This embodiment has several unique advantages in that it is relatively easy to take apart and the seal between the segments 30, 32 can be made relatively tight by using locking tapered threads.

In the alternate embodiment illustrated in FIG. 3, the segments 30, 32 are attached to each other by means of a friction joint 38. The segments 30, 32 may be separated by pulling them apart. This embodiment has the advantage of being slightly less expensive than the embodiment illustrated in FIG. 2.

In the alternate embodiment illustrated in FIG. 4, the segments are separated by twisting one with respect to the other about a point of reduced thickness 40. In this way the one segment is severed from the other. This embodiment has several unique advantages, namely that it is a one piece construction and is relatively inexpensive to manufacture.

In certain instances it is preferable to inventory the hypodermic needle unit of this invention separately, for example in situations where medications are supplied in pre-filled syringes it is often preferable to supply the syringes and the needle units separately. In order to protect the sterility of the needle 14 during storage it is important that the open end 28 be sealed. Accordingly, in the hypodermic needle unit illustrated in FIG. 5, a cap 42 is provided which is secured to the exposed end 28 of the segment 30 and seals and protects the needle from contamination. The cap 42 is adapted to be readily removed immediately before use.

The sheath portion 16 of the unit 10 noted above may be manufactured from a plurality of well known materials. It is preferable to manufacture the sheath from a material which may be subjected to sterilization without having adverse effects on either the sheath or on the needle enclosed in the sheath. Materials which have been found to be well suited for this purpose are polyethylene and polypropylene.

It is to be understood that the forms of the invention herein shown and described are to be taken as preferred embodiments. Various changes may be made in the size, shape, and arrangement of the parts, for example equivalent elements may be substituted for those illustrated and described herein, without departing from the scope of the subjoined claims. For example, the method of separation of the segments may be by means other than those illustrated in the drawings. However, these are also included within the scope of the invention. Furthermore, as noted above, the hypodermic needle unit 10 of this invention may have more than two segments comprising the sheath 16 and still be within the scope of this invention. The hypodermic needle unit 10 of this invention may also be utilized with medical apparatus other than syringes providing that the purpose of removing the various segments as noted above is for the purpose of limiting the depth of penetration.

What is claimed is:

1. A disposable hypodermic needle unit comprising in combination a hypodermic needle and a tubular needle sheath, said needle having an enlarged diameter hub portion and a cannula portion, a first terminal end of said cannula being attached to and in communication with said hub portion, a second terminal end of said cannula forming a penetrating point at the end thereof, said cannula having a first length from said first terminal end to said second terminal end, said sheath being sealed at one end and open at the opposite end and having an internal configuration approximately mating the external configuration of said hypodermic needle, said sheath being adapted to be manually separated along its major axis into a plurality of detachable segments each said segment having a predetermined length less than said first length, said needle being positioned within said sheath, with the hub at the open end of said sheath and the penetrating point adjacent to the closed end of said sheath, said sheath being secured to said hub portion, whereby a hypodermic needle unit having an integral needle guard is obtained by removing one or more segments of said sheath.

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2. The hypodermic needle unit according to claim 1 wherein the segments are threadably attached to each other.

3. The hypodermic needle unit according to claim 1 wherein the segments are frictionally attached to each other.

4. The hypodermic needle unit according to claim 1 wherein the segments are adapted to be separated by rotating one segment with respect to the other about a point of reduced wall thickness of said sheath.

5. The hypodermic needle unit according to claim 1 including a detachable cap sealing said open end of said sheath.

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U.S. Cl. X.R.

206—43

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