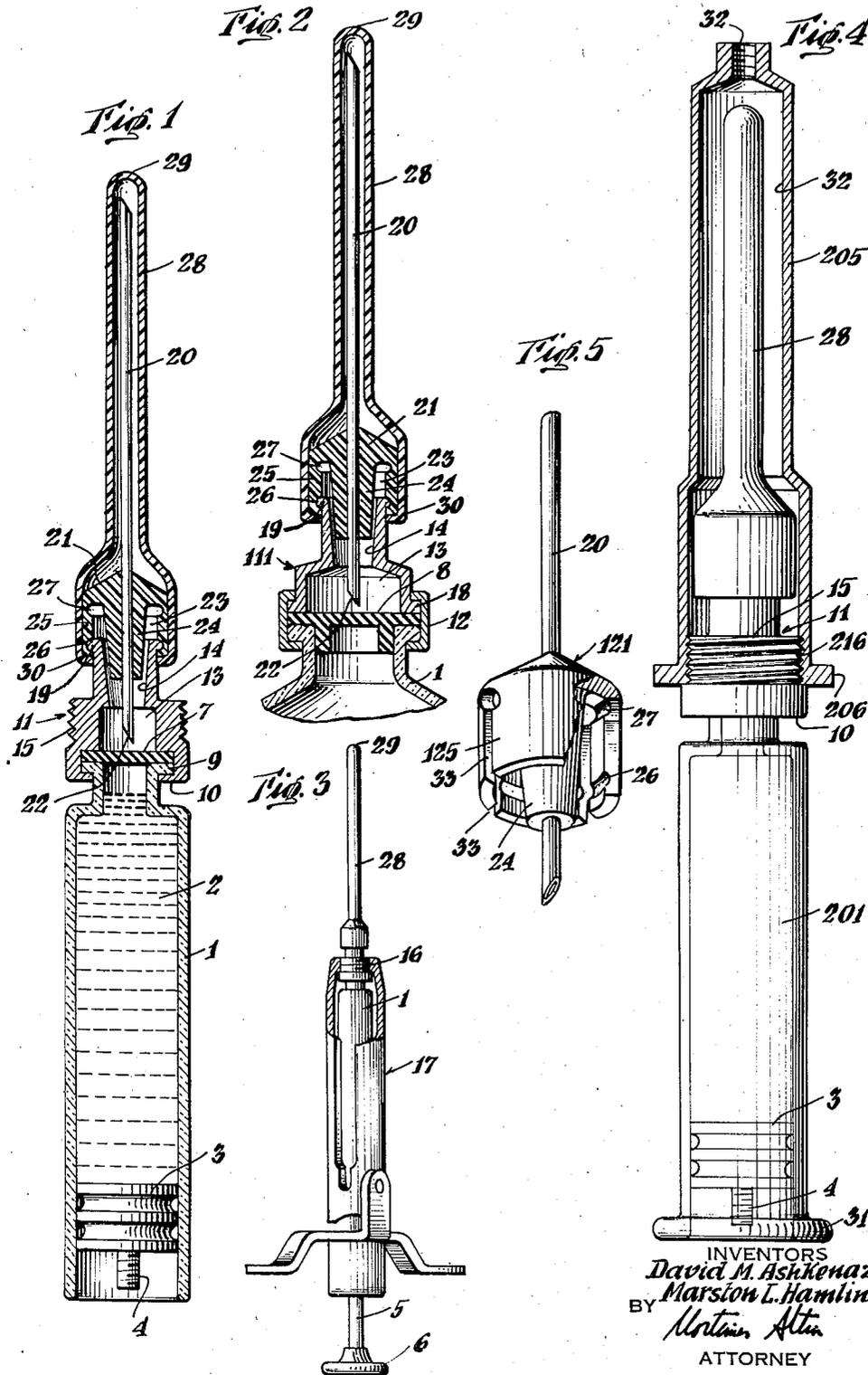


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SNAP-ON CARTRIDGE-NEEDLE UNIT

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## SNAP-ON CARTRIDGE-NEEDLE UNIT

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This invention relates to a snap-on cartridge-needle unit. More particularly it relates to a cartridge-needle unit for use in a syringe or as a syringe for administering therapeutic injections in which unit, as packaged, an injection needle is maintained in spaced relation to the penetrable closure of a cartridge containing an injectable material but not in communication with the interior of the cartridge, but can be placed in communication with the interior of the cartridge by linear longitudinal movement of the needle with respect to the cartridge which movement simultaneously causes the needle to penetrate the closure and seats the needle firmly in a ferrule secured to the cartridge.

Various forms of cartridge-needle units have been proposed in which an injection needle is brought into communication with the interior of the cartridge by a simple relative linear movement. In these units needle hubs and cartridge ferrules of both metal and plastic have been proposed. All of these, as far as we know and in contrast to those units which comprise a screw-threaded connection, suffer from the disadvantage of an insufficiently secure seat for the needle when in communication with the interior of the cartridge.

It is an object of the present invention to provide a cartridge-needle unit of the kind described in which a simple longitudinal movement of the needle simultaneously causes it to penetrate the cartridge closure and seats it firmly on the cartridge without wobble.

It is a further object to provide such a unit having a needle fixedly mounted in a hub provided with an external skirt surrounding a cartridge ferrule and an internal male cone mating with a tapered female recess in a cartridge ferrule.

It is an additional object to provide such a unit in which the needle hub may be fabricated of synthetic plastic.

Other objects and advantages of our invention will be apparent from the following description which, with the drawing, is intended to be illustrative only and not to limit our invention, the scope of which is defined in the appended claims.

In the drawing:

Fig. 1 is a longitudinal section of a cartridge-needle unit according to one embodiment of our invention;

Fig. 2 is an enlarged section of a portion of a slightly modified form of the invention;

Fig. 3 shows our unit in place in a syringe body;

Fig. 4 illustrates our invention, partly in section, applied to a disposable syringe; and

Fig. 5 is a perspective view, partly in section, of a modified form of needle hub according to our invention.

In the drawing a tube 1 containing an injectable drug 2 is closed at its proximal end by a slideable plunger 3 provided with a threaded stud 4 adapted to engage a push rod 5 having a thumb piece 6. The distal end of tube 1 is closed by a penetrable closure which may be a flat disc 7 or a flanged stopper 8. The closure is seated on and compressed against tube flange 9 by means of a crimped skirt 10 integral with ferrule 11. Alternatively the crimp-

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ing means may be a separate flanged collar 12 as shown in Fig. 2.

Ferrule 11 has a central bore 13 which is cylindrical in its proximal part but has the form of hollow inverted circular cone 14 in its distal part. The exterior of the ferrule is provided in its proximal part with a male thread 15 adapted to mate with the female thread 16 in the distal end of a syringe 17 as shown in Fig. 3.

An alternative form of ferrule 111 is shown in Fig. 2. This differs from ferrule 11 (Fig. 1) in having a flange 18 to furnish a bearing for crimping collar 12, and in lacking an exterior thread such as 15. This type of ferrule is suitable for use in syringes in which the cartridge is secured against longitudinal movement by means other than a threaded connection.

At or near the distal end our ferrule is preferably provided with a fillet 19 serving to aid in securing an injection needle 20 in a desired position as described below.

The double-pointed injection needle 20 is fixedly mounted in the axis of a hub 21 with its proximal point 22 projecting from hub 21 as shown in Figs. 1 and 2. The hub is made of an elastic or springy material; this is preferably a synthetic plastic, but alternatively may be a metal of suitable characteristics. Proximally hub 21 has an internal bore 23 in which is located a solid inverted circular cone 24 adapted to mate with and form a taper joint with hollow cone 14. Bore 23 is defined by a resilient cylindrical exterior skirt 25 and at both its proximal and distal ends is provided with circumferential grooves 26 and 27 adapted to mate with fillet 19.

When assembled for packaging, hub 21 is slipped over ferrule 11 far enough so that groove 26 is sprung over fillet 19 as permitted by the elasticity of the hub material. This engagement of groove and fillet prevents accidental displacement of the needle prior to preparation of the syringe for injection.

Before use for injection, the hub is moved further proximally with relation to the ferrule so that cone 24 seats in conical bore 14, forming a firm taper joint. The dimensions of hub and ferrule are so chosen that when cone 24 is seated in conical bore 14, needle point 22 penetrates closure 7 or 8 and simultaneously groove 27 snaps over fillet 19. In this position the taper joint 14—24 assures a rigid positioning of the needle and the engagement of groove 27 with fillet 19 prevents accidental withdrawal of the needle.

In packaged form needle 20 is provided with a sheath 28 of rubber or similar flexible elastomer. This sheath is closed at its distal end 29 and at its proximal end 30 fits snugly over hub 21 and a portion of ferrule 11. The main function of sheath 28 is to maintain sterility of needle and hub prior to use.

In assembly, the cartridge-needle unit is sterilized by any suitable conventional method.

To give an injection with the units illustrated in Figs. 1-3, the user inserts and secures the unit in a syringe (as in Fig. 3 for example), grips sheath 28 with his fingers opposite hub 21 and presses the hub towards the syringe. This forces cone 24 to seat itself in tapered bore 14, simultaneously snapping circular groove 27 over fillet 19 and causing point 22 of needle 20 to penetrate closure 7 or 8 as the case may be. A firm seat is thus provided for needle 20 when it is in communication with the contents of tube 1.

Up to this point there is no need for the user to take precautions against contamination of the needle since it is still protected by the sheath. It is thus possible for a number of syringes to be prepared and laid out at one time, e. g. when multiple injections are to be given to one or a series of patients.

When ready, the user slips off the sheath and makes the injection.

Application of our invention to a disposable or "one shot" syringe is illustrated in Fig. 4. In such syringes the drug-containing tube 201 itself serves as the syringe body. It is provided with a finger flange 31, and push rod 205 doubles as a protective needle cover. The push rod has an outside diameter sufficiently small to pass through the bore of tube 201 and has an internal bore 32 sufficiently large to accommodate needle and sheath. It is provided at its proximal end externally with a flange 206, serving as a thumb piece, and internally with a female thread 216 mating with male thread 15, and serving to retain the rod in position until the syringe is used. At its distal end rod 205 is provided with a female thread 32 adapted to mate with the thread on stud 4.

The user of the syringe of Fig. 4 first removes rod 205 from ferrule 11, affixes it by thread 32 and stud 4 to plunger 3 and manipulates hub 24, as described in connection with Figs. 1-3, to cause the proximal end 22 of needle 20 to penetrate the cartridge closure 7. Then, immediately before injection, he slips off sheath 28 to expose the sterile needle.

Hub 24 is advantageously made of a synthetic polymer having a moderate degree of elasticity, such as will permit grooves 26 and 27 to pass over and engage ferrule 19, but having sufficient body to provide a firm mount for the needle when taper joint 14-24 is engaged. Numerous resins meeting these requirements are available commercially, one such being rigid polyethylene produced commercially by several manufacturers.

If more resiliency is required, as for example in a metal hub, the skirt 125 of a modified hub 121 may be provided with a series of longitudinal slots 33, as shown in Fig. 5.

From the above description it will be seen that we have provided a cartridge-needle unit having a hollow needle firmly mounted out of contact with the cartridge contents but adapted by a simple linear movement to be brought into communication with the cartridge contents, in which position it is held rigidly and without wobble. The unit is adapted to be packaged and distributed with the needle and hub in sterile condition and protected against contamination; accidental penetration of the cartridge closure by the needle is eliminated.

In the specification and claims "distal" is used to denote a position or direction towards the needle and "proximal" a position or direction towards the plunger.

We claim:

1. A cartridge-needle unit comprising a ferrule crimped around the flanged end of a drug-containing tube, a penetrable closure secured to the flanged end of the tube by the crimped ferrule, and a double-pointed injection needle fixedly mounted in a hub, the ferrule being formed with an axial bore the distal part of which is a hollow inverted cylindrical cone and the hub being formed at its proximal end with a solid inverted cylindrical cone adapted to mate with the hollow cone of the ferrule and being provided with a resilient skirt surrounding the solid cone and

adapted to fit friction-tight over the distal end of the ferrule, the needle hub being engaged with the ferrule a sufficient distance to bring a point of the needle close to but not penetrating the cartridge closure, the dimensions of ferrule and hub being so chosen that when the said solid cone is seated in said hollow cone by longitudinal movement of the hub with respect to the ferrule, the needle penetrates the tube closure.

2. A cartridge-needle unit according to claim 1 in which the ferrule is provided with a fillet near its distal end and the skirt of the hub is provided with an internal circular groove adapted to mate with the fillet.

3. A cartridge-needle unit according to claim 1 in which the ferrule is provided with a fillet near its distal end and the skirt of the hub is provided with two internal circular grooves adapted to mate with the fillet, the grooves being spaced longitudinally so that one engages the fillet when the needle is not in communication with the contents of the tube and one engages the fillet when the needle is in communication with the contents of the tube and the solid cone of the hub is seated in the hollow cone of the ferrule.

4. A cartridge-needle unit according to claim 1 having an elastomeric sheath, closed at its distal end, surrounding the needle and at its proximal end surrounding the needle hub friction-tight.

5. A cartridge adapted to be packaged with an injection needle mounted thereon, comprising a tube having a flanged end, a penetrable closure on the flanged end and a ferrule crimped around the flanged end and securing the closure to the tube, said ferrule extending distally from the tube, having an axial bore in the form of an inverted hollow circular cone, and provided with a fillet near its distal end.

6. In combination a syringe body having a barrel adapted to receive a cartridge-needle unit, means to secure a cartridge-needle unit against longitudinal movement, and a cartridge-needle unit as defined in claim 1.

7. A cartridge-needle unit as defined in claim 1, in which the tube is provided at its proximal end with an exterior flange and which is closed at its proximal end by a slideable plunger having a threaded connection, in combination with a rigid hollow needle cover adapted to be removably mounted on the ferrule and surrounding the needle, the needle cover having an outside diameter less than the bore of the tube and having at its distal end a threaded connection adapted to mate with the threaded connection of the slideable plunger, whereby the needle cover may serve as a push rod and the combination constitute a disposable syringe.

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