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3,118,448

HYPODERMIC ASSEMBLY

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FIG. 1

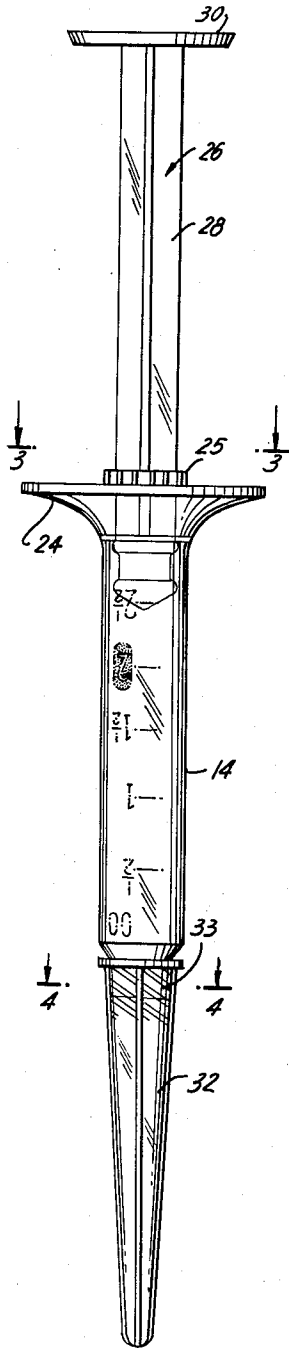


FIG. 2

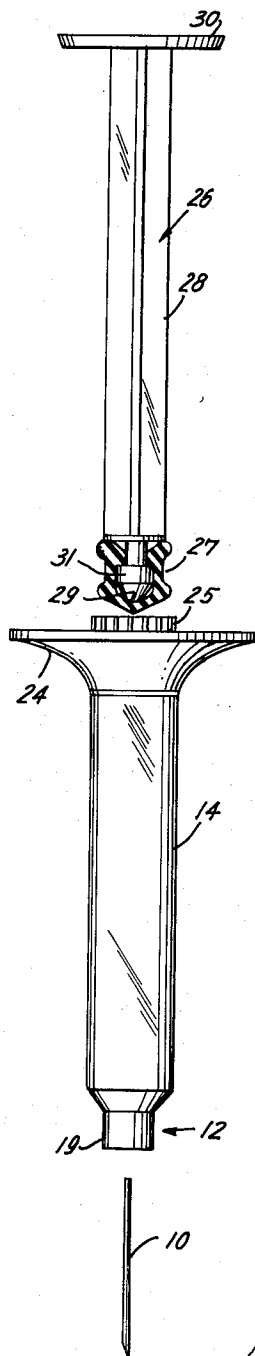


FIG. 3

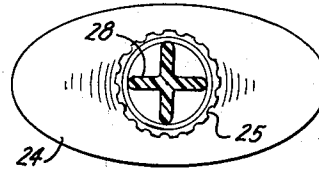


FIG. 4

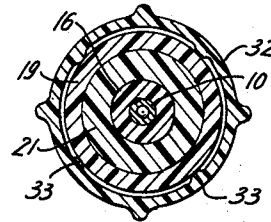


FIG. 5

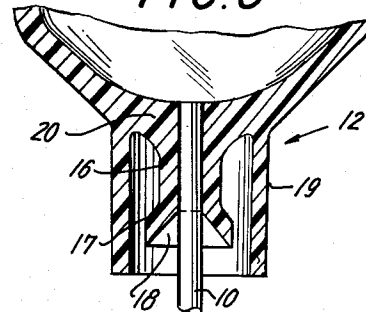
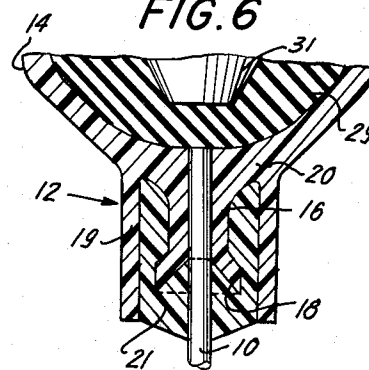


FIG. 6



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HYPODERMIC ASSEMBLY

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6 Claims. (Cl. 128—218)

This invention relates to an improved hypodermic assembly and to an improved needle supporting mounting for such an assembly.

The needle or cannula in a hypodermic assembly must be securely supported in the mounting so as to withstand the thrust and tensile forces resulting from insertion and removal of the needle when making hypodermic injections. For many purposes, it is also desirable that the hypodermic assembly be disposable so as to avoid the nuisance and expense of sterilization before reusing and so as to avoid the danger of infection resulting from improper or inadequate sterilization. To be disposable, the hypodermic assembly must be relatively simple and inexpensive to manufacture. For many purposes, the size of the dose administered by the hypodermic assembly is critical and for this and other reasons it is desirable that the entire contents of a syringe barrel be expelled therefrom when the plunger is fully inserted therein. It is also desirable that the barrel and plunger of the hypodermic assembly be so constructed and that the finger engaging portions be so arranged as to give maximum stability to the assembly while the dose is being administered.

It is an object of the present invention to provide an improved hypodermic assembly in which the needle or cannula is securely supported in the mounting so as to withstand the thrust and tensile forces encountered in inserting and withdrawing the needle when making hypodermic injections; which is relatively simple and inexpensive to manufacture and assemble and therefore can be disposable; which is so constructed and arranged that the entire contents can be expelled from the hypodermic assembly in accurately measured doses; and which provides maximum stability while the dose is being administered.

In the accompanying drawing:

FIG. 1 is a side elevational view of a hypodermic syringe embodying my invention;

FIG. 2 is an exploded view in side elevation showing the several components of the hypodermic syringe of FIG. 1 and illustrating the piston in section;

FIG. 3 is a cross-sectional view in the direction of the arrows on the line 3—3 of FIG. 1;

FIG. 4 is a cross-sectional view in the direction of the arrows on the line 4—4 of FIG. 1;

FIG. 5 is a detailed sectional view of the butt end of the needle supported in the needle mounting prior to the application of the bonding material; and

FIG. 6 is a similar detailed sectional view showing the butt end of the needle supported in the needle mounting after the bonding material has been applied thereto.

My improved hypodermic assembly comprises a hypodermic needle 10 supported in an improved needle mounting 12 which in the illustrated embodiment is formed at one end of a hypodermic syringe barrel 14. The hypodermic needle 10 may be of the usual type consisting of a cannula having a butt end and a pointed end as shown and formed of a suitable metal such as stainless steel.

The needle mounting 12 may be in the form of a separate hub or may be an integral part of an ampoule or of a syringe barrel as shown.

In any event, the needle mounting comprises a chuck-

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like tip 16 tightly embracing the butt end of the needle as shown and formed with a flange 17 at the outer end thereof which flares outwardly and forwardly at an angle to provide a tapered entrance recess 18 to facilitate the insertion of the butt end of the needle into the tubular chuck-like tip 16. The butt end of the needle or cannula is inserted in the tip so as to be flush with the inner surface of the needle mounting which forms the inner end of the barrel as shown. The needle mounting also comprises the tubular collar 19 which is connected integrally to the chuck-like tip 16 at its inner end as shown at 20.

The several portions of the needle mounting as heretofore described, namely the chuck-like tip, the flange and the tubular collar are integrally formed from a suitable material, preferably a thermoplastic material. For this purpose, I prefer to employ polypropylene, although other suitable thermoplastic materials such as nylon, polystyrene or polyethylene may also be employed.

To securely support the hypodermic needle or cannula in the mounting so as to resist the thrust and tensile forces normally encountered in inserting and withdrawing the needle in making hypodermic injections, I employ a suitable bonding agent having high bonding affinity for the metal of the needle. For this purpose, I prefer to employ a resin bonding agent such as epoxy resin which has a high bonding affinity for the metal of the needle. The bonding affinity to the plastic is unimportant since the mechanical interference between the bonding agent and needle mounting serves to restrain any forces on the needle, not only along the axis of the needle but also along any vectors of force not parallel to the axis. The bonding material is shown at 21 and is most clearly illustrated in FIGS. 4 and 6. It is applied inside the collar 19 so as to fill the space between the collar 19 and the tip 16, between the collar 19 and the flange 17 and also the space inside the recess 18 and the space between the lower end of collar 19 and the portion of the hypodermic needle forwardly of the tip. In this connection, the bonding material 21 may project or taper outwardly from the collar 19 around the hypodermic needle 10 as most clearly shown in FIG. 6.

In assembling the hypodermic needle with the needle mounting, the tapered entrance recess 18 serves as a guide for the butt end of the needle. The end of the needle is guided by the tapered entrance recess into the chuck-like grip and the needle is inserted until the end thereof is flush with the inner surface of the syringe barrel. The chuck-like tip tightly embraces the butt end of the needle and serves to hold the needle in place while the epoxy resin is applied inside the collar to fill the entire space as previously described. When the epoxy resin has set, the needle is securely supported in the mounting so as to resist the thrust and tensile forces encountered in inserting and withdrawing the needle in making hypodermic injections.

Due to the strong affinity between the epoxy resin and the metal of the needle, any attempt to withdraw the needle causes a wedging action between the epoxy resin and the outer surface of the flange 17 which in turn causes the chuck-like tip 16 to more tightly embrace the needle and hold it in place. Similarly, any thrust force exerted against the needle will cause the epoxy resin to engage the surface of the flange inside the tapered entrance recess and also the inner end of the mounting serving as a stop to resist any relative movement between the needle and mounting.

Mounting 12 is formed integrally and serves to close one end of the syringe barrel 14. The syringe barrel 14 is of cylindrical, tubular form and is open at its opposite end. It will be noted that its inner end adjacent

the needle mounting is of generally concave formation and the butt end of the needle which communicates with the interior or the barrel is flush with the inner surface thereof.

Adjacent but spaced from its open end, the tubular syringe barrel is formed with a finger engaging flange 24 projecting laterally therefrom. The open end of the tubular syringe barrel has a collar portion 25 which projects beyond the finger engaging flange 24.

The relative location of the finger engaging flange 24 and the provision of the collar 25 serve to impart greater stability to the assembly while a hypodermic injection is being administered. The barrel is provided with suitable markings or calibrations, as shown, indicating the capacity or cubic contents thereof, preferably in cubic centimeters. A significant marking, such as the 2 cc. marking in the illustrated embodiment, is preferably emphasized by being shown in silhouette form with the elliptical or circular field surrounding the marking being shown in one pigment or color and the numeral either being displayed in clear plastic or in a contrasting color.

Associated with the hypodermic syringe barrel is the plunger assembly 26 consisting of a piston 27 and a piston rod 28. The combined length of the piston and piston rod is greater than the length of the barrel so that the piston can be fully inserted in the barrel to completely expel the contents thereof outwardly through the hypodermic needle. In this connection, the forward end of the piston is preferably convex as shown at 29 and is complementary to the concave inner end surface of the barrel so that when the piston is fully inserted the entire end of the barrel will be occupied thereby to insure complete expulsion of the contents of the barrel. The upper end of the piston rod is preferably provided with a flat finger piece 30 to be engaged by the thumb of the operator.

Thus, when the finger engaging flange 24 is engaged by two of the fingers of the operator and the finger engaging top of the plunger 30 is engaged by the thumb, the assembly can be readily manipulated to cause the piston to be fully inserted into the barrel. The greater length of the piston rod not only enables the operator to fully insert the piston into the barrel but also imparts greater leverage when the piston is fully inserted therein. The relative location of the finger flange 24 and the provision of collar 25 serve to impart greater stability to the assembly as the injection is being made.

The piston rod may be cruciform in cross-section to impart greater stability thereto. The finger engaging portion 30 is preferably formed integral with the upper end thereof and a knob-like projection 31 is formed integral with the lower end and serves to attach the piston 29 thereto.

Piston 29 is in the form of a hollow body having an opening at the upper end whereby it may be applied over the knob 31. It is provided with a pair of peripheral flanges near its upper and lower ends as shown serving as piston rings to form sealing engagement with the inner surface of the barrel. The lower or outer end of the piston is convex as previously described and is complementary with the concave inner surface of the end of the barrel. Supporting knob 31 on the piston rod is shaped to lend support to the convex end of the piston. The piston is made of a suitable flexible, resilient material which is inert to the various liquids to be contained in the syringe barrel. For this purpose, I prefer to employ a suitable plastic material or synthetic rubber. The hollow piston body has tight engagement with the knob and is frictionally held in place. To apply it over the knob, it is simply necessary to stretch the open end thereof sufficiently so that the knob may be inserted therein.

The plunger or piston assembly 26 is preferably made of the same type of thermoplastic material from which the syringe barrel 14 is made.

To protect the hypodermic needle 10 from contamination and also to protect it from physical damage, I preferably encase it in a suitable sheath or cap as shown at 32. The cap may be molded out of similar thermoplastic material as the syringe barrel and plunger assembly. It is provided with a closed lower end and an opened upper end of a diameter to snugly engage the outer surface of the needle mounting collar 19. I preferably provide the cap or sheath with a helical thread on its inner surface near the upper open end thereof as shown at 33. The thread serves as a vent to atmosphere to relieve internal pressures in the sheath or cap and thereby preventing it from accidentally "popping off" the end of the tip or mounting. Because of its length and circuitous passage, however, it serves as a deterrent to airborne contamination. Suitable reinforcing ribs or flanges may be provided longitudinally of the cap and also around the upper end thereof as shown.

It will thus be seen that I have provided an improved hypodermic assembly and an improved needle supporting mounting for such an assembly. It will also be seen that the needle is securely supported in the mounting so as to resist the thrust and tensile forces encountered in inserting the needle and withdrawing it while making hypodermic injections. It will also be seen that the assembly is relatively simple and inexpensive to make and therefore may be disposable. Due to the fact that the syringe barrel is made of plastic, it can be readily made of uniform bore and thus can be accurately calibrated to administer uniform doses. The complementary shape of the end of the piston and the end of the barrel together with the greater length of the piston rod assure that all of the contents of the barrel will be expelled therefrom. In addition, the relative location of the finger engaging flange together with the provision of the collar projecting beyond the flange impart stability to the assembly while the hypodermic injection is being made.

My improved assembly may be used in the usual manner for making hypodermic injections for withdrawing fluids from the body and for transferring fluids to and from containers having pierceable stoppers.

Modifications may be made in the illustrated and described embodiment of my invention without departing from the invention as set forth in the accompanying claims.

I claim:

1. A hypodermic assembly comprising: a hypodermic needle in the form of a metal cannula having a butt end and a pointed tip at the opposite end; and a needle mounting made of a thermoplastic material for supporting the needle and formed with a chuck-like tip tightly embracing the butt end of the needle and with an outwardly flared flange spaced from the butt end, a tubular collar surrounding said tip, flange and a portion of said needle forwardly of the tip, and a resin bonding material having bonding affinity for the needle and filling the space between said collar and the tip, flange and portion of the needle forwardly of the tip to support the needle to withstand relative thrust and tensile forces between the needle and mounting.

2. A hypodermic needle assembly as set forth in claim 1 in which the flange is formed at the forward end of the chuck-like tip and flares outwardly and forwardly at an angle to form a tapered entrance recess to facilitate insertion of the butt end of the needle into the tip.

3. A hypodermic assembly comprising: a hypodermic needle in the form of a metal cannula having a butt end and a pointed tip at the opposite end; and a needle mounting made of a thermoplastic material for supporting the needle and formed with a chuck-like tip embracing the butt end of the needle and with an outwardly flared flange spaced from the butt end, a tubular collar surrounding said tip, flange and a portion of said needle forwardly of the tip, and an epoxy resin bonding material having bonding affinity for the metal cannula and the

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thermoplastic mounting filling the space between said collar and the tip, flange and portion of the needle forwardly of the tip to support the needle to withstand relative thrust and tensile forces between the needle and mounting.

4. A hypodermic assembly as set forth in claim 3 in which the flange is formed at the forward end of the chuck-like tip and flares outwardly and forwardly at an angle to form a tapered entrance recess to facilitate insertion of the butt end of the needle into the tip.

5. A hypodermic syringe assembly comprising: a hypodermic needle in the form of a metal cannula having a butt end and a pointed tip at the opposite end; a needle mounting made of thermoplastic material for supporting the needle and formed with a chuck-like tip embracing the butt end of the needle with a flange formed at the forward end thereof and flaring outwardly and forwardly at an angle to form a tapered entrance recess to facilitate insertion of the butt end of the needle into the tip, a tubular collar surrounding said tip, flange and a portion of said needle forwardly of said tip, and an epoxy resin bonding material having bonding affinity for the metal cannula and the thermoplastic mounting and filling the space between said collar and the tip, flange and portion of the needle forwardly of the tip to support the needle to withstand relative thrust and tensile forces between the needle and the mounting; a tubular syringe barrel made of thermoplastic material and open at one end and closed at the opposite end by said needle mounting and formed integrally therewith with the butt end of the needle communicating with the interior of the barrel and with the closed inner end of the barrel being con-

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cave, said tubular barrel being formed with a finger engaging flange adjacent but spaced from the open end thereof with the open end of the barrel having a collar portion projecting outwardly beyond the finger engaging flange; and a plunger for said syringe barrel including a piston having sliding engagement with the interior of the barrel and a piston rod of greater length than the barrel with a finger engaging portion at the outer end thereof, said piston having a convex outer end complementary with the concave inner end of the tubular barrel so that when the piston is fully inserted in the barrel it will expel all of the contents thereof.

6. A hypodermic syringe assembly as set forth in claim 5 in which the syringe barrel is provided with markings identified numerically indicating the cubic capacity with one of the markings being emphasized by displaying the numerical indicating that marking in silhouette form.

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