

[72] Inventor **George K. Burke**
Bethlehem, Pennsylvania
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 [73] Assignee **Burron Medical Products, Inc.**
Bethlehem, Pennsylvania
a Corp. of Pennsylvania

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218, 218.1, 218N

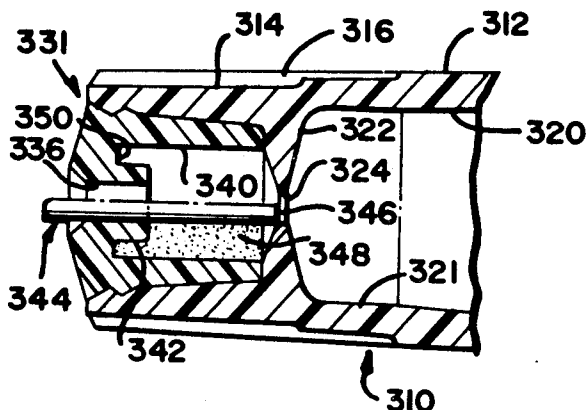
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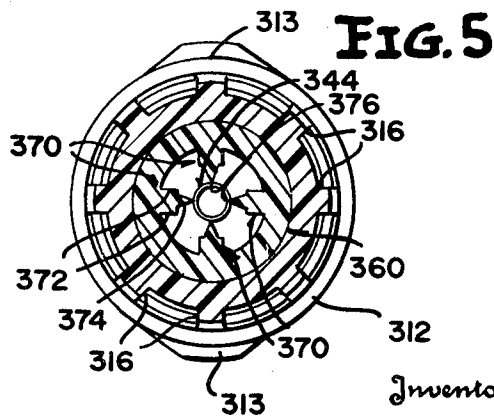
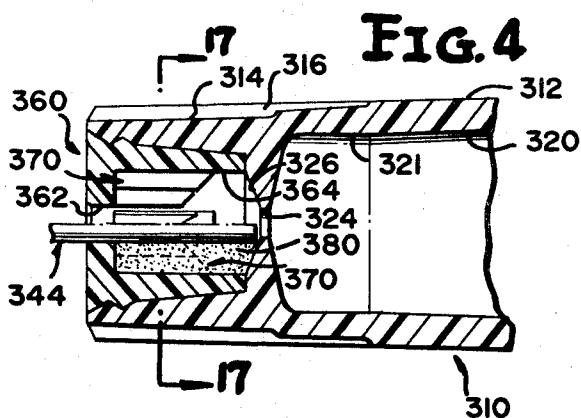
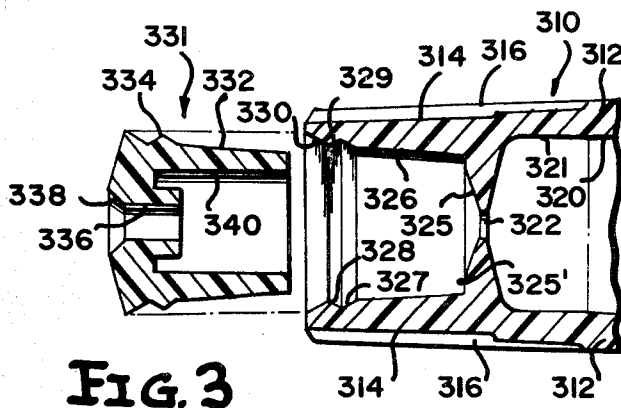
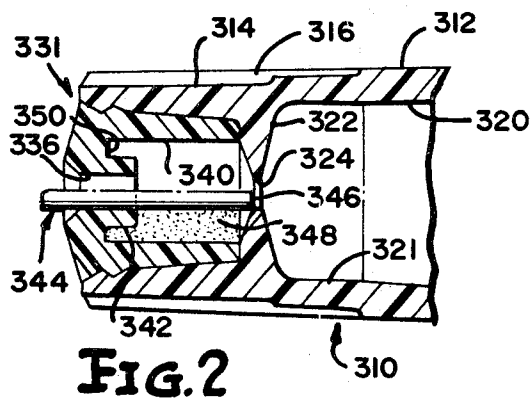
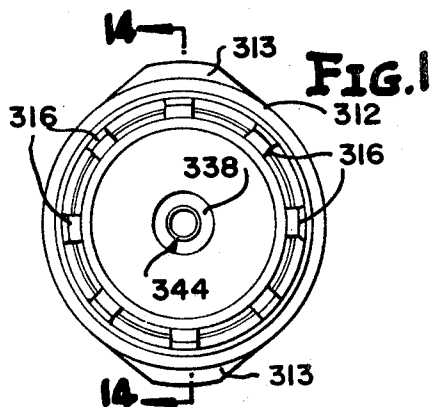
Primary Examiner—Warner H. Camp
Attorney—Shoemaker and Mattare

[54] **HYPODERMIC NEEDLE**
4 Claims, 5 Drawing Figs.

[52] U.S. Cl. **128/221**

ABSTRACT: A plastic needle hub is formed with an open front end to receive an apertured plug through which the cannula extends. The plug includes means engaging the cannula shank to rigidify same and is locked in position in the hub proper to resist displacement. Adhesive further retains the cannula in position.





Inventor

GEORGE K. BURKE

By *Shoemaker and Mattare*

Attorneys

HYPODERMIC NEEDLE

This application is a division of Serial No. 480,617, filed August 18, 1965, now Pat. No. 3,472,227.

The present invention relates to a new and novel hypodermic needle, and more particularly to a hypodermic needle adapted to be used with a disposable syringe whereby the needle is ordinarily used one time and then discarded.

Since the hypodermic needle of the present invention is of the disposable type, it is essential from an economic standpoint that the manufacture of the needle be as inexpensive as possible. Hypodermic needles formed completely of metal have been used for many years, but it has been found that substantial reduction in cost can be obtained if certain portions of the needle are formed of a cheaper material such as plastic or the like.

The hypodermic needle as employed with conventional syringes generally includes two parts identified as the cannula portion and the hub portion. In order to provide a sufficiently sharp point to enable the needle to be inserted through human skin, the cannula portion, for all practical purposes, must be constructed of a metallic substance such as stainless steel.

On the other hand, the hub portion can be manufactured of other types of material, and the hub portion can be economically manufactured of a plastic substance such as polypropylene and the like.

It accordingly appears that the most desirable arrangement from an economic standpoint is to provide a hypodermic needle including a cannula portion of metal and a hub portion of plastic. However, when these two substances are employed in combination, it is difficult to provide a suitable means for securing the parts together. The most suitable substance for securing the metal cannula portion and the plastic hub portion together seems to be an adhesive substance such as an epoxy resin or the like. Conventional adhesive substances of this type have a good affinity for the metallic cannula portion, or in other words, the adhesive substance will form a very good bond with the metal. On the other hand, this type of adhesive substance does not form a particularly good bond with the plastic substance, although it is bonded thereto to a certain extent.

A particular problem then arises as to the manner in which a sufficiently good connection can be obtained with the plastic hub portion in order that the hypodermic needle may provide an adequate interconnection between the cannula portion and hub portion so that it can pass the pull test and push test ordinarily required for the needle to meet minimum standards required in the medical field. It is apparent that the cannula means must be fixed with respect to the hub means to a sufficient extent that the cannula means will not move into the hub means when the cannula portion of the needle is inserted into a bottle or into the skin of a patient. The hub means and the cannula means are accordingly provided with directly contacting interengaging portions which impede relative movement therebetween. These interengaging portions will tend to impede any relative movement and, therefore, will resist movement of the cannula means into the hub means as well as resist movement of the cannula means out of the hub means since it is also apparent that it is necessary for the cannula means to remain in the hub means when the needle is withdrawn from a bottle or a patient's skin.

The problem of obtaining a sufficiently good interconnection between the cannula means and the plastic hub portion is compounded by the fact that the adjacent surfaces of the cannula means and the hub portion are of very small dimension thereby providing a very small area for obtaining the necessary holding power between the parts. In a typical example wherein the cannula means may have a diameter of no more than approximately .040 inches, and further wherein the length of the adjacent surfaces on the cannula means and the hub portion are on the order of .225 inches in length, the total area available for obtaining a good interconnection between the cannula portion and the hub portion is only about .028 square inches. It is evident that this very small area does not

afford a sufficient contact area for obtaining a very effective adhesive bond.

In order to assure that the necessary holding power will be obtained between the cannula portion and the hub portion, the present invention incorporates a novel structural arrangement such that the adhesive substance is in contact with a maximum area of the cannula means to provide the greatest possible bond therewith, and further wherein the hub means incorporates a novel arrangement for providing an effective mechanical interconnection between the body of the adhesive substance and the hub means. The hub means, in fact, defines a holding surface which engages against the body of the adhesive substance to maintain the cannula means in operative position and to resist movement of the cannula means out of the hub means.

The holding means for retaining the cannula means in the bore of the hub means may comprise the body of adhesive substance bonded both to the cannula means and the hub means and further having a mechanical interconnection with the hub means.

In addition to providing the necessary mechanical interconnection between the hub means and the cannula means, the arrangement of the present invention also ensures that an effective liquid-tight seal will be provided between these components so as to prevent any liquid from leaking between the cannula means and the hub means which is, of course, an important feature in any hypodermic needle. The interconnection will of course also be an air-tight arrangement so as to prevent air or any other gas from leaking past or between the hub portion and the cannula portion.

Certain portions of the hub means, which may be integral either with the main body portion of the hub means or the separate member incorporated in some forms of the hub means are adapted to be in contacting engagement with portions of the outer surface of the cannula means so as to ensure proper alignment of the cannula means with respect to the hub means and to resist any tilting or canting movement of the cannula means with respect to the hub means.

An object of the present invention is to provide a new and novel hypodermic needle of the disposable type which can be manufactured as economically as possible.

Another object of the invention is the provision of a hypodermic needle which is capable of passing the standard pull tests and push tests required in the medical field.

Still another object of the invention is to provide a hypodermic needle which employs relatively inexpensive materials which are ordinarily incompatible with one another and difficult to combine in an effective needle structure.

A still further object of the invention is to provide a hypodermic needle including a metallic cannula portion and a plastic hub portion interconnected by an adhesive substance and wherein a novel arrangement is incorporated for insuring a good mechanical interconnection between the adhesive material and the plastic material of the hub portion.

Yet another object of the invention is to provide a hypodermic needle including a metallic cannula portion, a plastic hub portion, and an adhesive substance to secure the portions together and wherein the arrangement is such that the adhesive substance will contact a maximum area of the cannula portion.

Yet a further object of the invention is the provision of a hypodermic needle including separate cannula and hub portions and wherein means is provided for forming an effective liquid and gas-tight seal between the cannula portion and the hub portion.

Still another object of the invention is to provide a hypodermic needle which is quite simple and inexpensive in construction, and yet which is quite efficient and reliable in use.

Other objects and many attendant advantages of the invention will become more apparent when considered in connection with the specification and accompanying drawings, wherein:

FIGURE 1 is an end view of the invention;

FIGURE 2 is a sectional view taken substantially along line 14-14 of FIGURE 1, looking in the direction of the arrows;

FIGURE 3 is an exploded view of certain of the components illustrated in FIGURE 2;

FIGURE 4 is a sectional view similar to FIGURE 2, illustrating a modification of the structure shown in FIGURE 2; and

FIGURE 5 is a sectional view taken substantially along lines 17-17 of FIGURE 4 looking in the direction of the arrows.

Referring now to FIGS. 1, 2 and 3, the invention is illustrated wherein the hub means is indicated generally by reference numeral 310 and includes an outer surface 312 which tapers to the left as seen in FIGS. 2 and 3 and which may have oppositely directed flanges 313 formed at one end thereof as seen in FIG. 1. Outer surface 312 in turn joins with an inner surface 314 of similar taper and having equally spaced ribs 316 extending outwardly therefrom for rigidifying the hub structure.

A conventional Luer taper bore portion 320 is provided which joins with a generally cylindrical bore portion 321 which in turn joins with an inwardly directed surface 322 defining an intermediate inwardly extending portion of the hub means which has a hole 324 formed therethrough.

Hole 324 is in communication with an outwardly flared surface 325 which in turn joins with a bore portion 326 which flares outwardly toward the opposite end of the hub means and joins with oppositely angled surfaces 327 and 328 defining a peripherally extending groove 329 which in turn joins with an outwardly flared surface 330 terminating in the said opposite end of the hub means.

A separate member is indicated generally by reference numeral 331 and is of generally cup-shaped configuration including an outer surface 332 having a peripherally extending rib 334 extending therearound which is complementary to the groove 329 and is adapted to be snugly received therein for holding separate member 331 in the operative position shown in FIG. 2.

A hole 336 is provided through an end wall of member 331 and is outwardly flared as indicated at reference numeral 338. Hole 336 is in communication with the central cavity 340 provided within member 331.

In FIG. 2, a cannula means 344 is illustrated, this cannula means having an end portion 346 which has a flat end surface extending substantially perpendicular to the longitudinal axis of the cannula means and which is adapted to rest against surface 325 to limit inward movement of the cannula means with respect to the hub means.

It will be noted as seen in FIG. 2 that the cannula means extends through the hole 336 of separate member 331, and a body of adhesive substance such as epoxy resin and indicated by reference numeral 348 is disposed within cavity 340 in surrounding relationship to the cannula means and in intimate bonded contact therewith.

It is apparent that the surface portions 350 as seen in FIG. 2 formed on separate member 331 will serve as a holding surface which is engaged by the body of adhesive material 348 to retain the cannula means in operative position and to resist pulling out of the cannula means from the hub means. It is further evident that the separate member 331 is locked in the operative secured position as shown wherein it has been snapped in place to be fixedly secured within the hub means.

In a typical example wherein the hub means 310 may have an over-all dimension of approximately 0.517 inches, hole 324 may have an inner diameter of approximately 0.035 inches. The intermediate wall portion within which hole 324 is formed may have a thickness at the hole of approximately 0.010 inches. The longitudinal distance from the flat surface 325' to the adjacent end of the hub means may be approximately 0.152 inches, and the center of the peripherally extending groove 329 may be spaced approximately 0.031 inches from the end of the hub means. The surface 326 may have an inner diameter of approximately 0.140 inches adjacent the groove portion 329, and the groove may have a longitudinally extend-

ing dimension of approximately 0.020 inches. Separate member 331 is so dimensioned that the hole 336 formed therethrough may be of slightly greater dimension than that of hole 324 so as to allow the cannula means to be moved into the operative position shown in FIG. 2. The outer diameter of the boss portion 342 formed by separate member 331 within cavity 340 may be approximately 0.060 inch.

Referring now to FIGS. 4 and 5, a further modified form of the invention is illustrated wherein the hub means is identical with that shown in FIGS. 1-3 inclusive. The separate member 360 has the same general outer configuration as the member 331 previously described, a hole 362 being formed through one end thereof and being in communication with a cavity 364 disposed therewithin.

A plurality of radially inwardly extending ribs indicated by reference numeral 370 are provided within cavity 364. Each of ribs 370 includes opposite side walls 372 which are generally radially inwardly extending and parallel with one another, and the innermost ends of the ribs are defined by oppositely disposed angular surfaces 374 which terminate in knife-like edges 376 adapted to engage the outer surface of the cannula means thereby supporting the cannula means at widely spaced points and affording a maximum area of the cannula which can be in contact with a body of adhesive substance indicated by reference numeral 380 and disposed within the cavity 364 as is the body of adhesive means 348 in the previously discussed modification.

It should be understood that the separate members 331 and 360 in the last two described modifications of the invention will also be formed of a similar plastic to the remaining hub portions so as to be readily snapped into place due to the resiliency of the plastic material such as polypropylene or the like.

As this invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, the present embodiment is therefore illustrative and not restrictive, and since the scope of the invention is defined by the appended claims, all changes that fall within the metes and bounds of the claims or that form their functional as well as conjointly cooperative equivalents are therefore intended to be embraced by those claims.

I claim:

1. A hypodermic needle comprising an elongated metallic cannula means having a sharp end portion and an opposite end portion, hub means formed of plastic material and having a bore therein and opening through one end portion thereof, said hub means defining an intermediate inwardly extending portion, said cannula means extending at least partially within said bore and having said opposite end portion thereof in engagement with said inwardly extending portion of the hub means to limit inward movement of the cannula means within said bore, and holding means including a separate member, said separate member including a cavity therewithin and having a hole through one end thereof in communication with said cavity, said cannula means extending through said hole and being disposed centrally within said cavity, said separate member being secured within the open end portion of said bore, and an adhesive substance disposed within said cavity in surrounding relationship to said cannula means and being disposed in intimate bonded contact with the outer surface of said cannula means, said adhesive substance substantially filling said cavity and being also bonded to said separate member for retaining said cannula means in operative position and resisting movement thereof out of said bore.

2. Apparatus as defined in Claim 1 wherein said hub means is provided with a peripherally extending groove adjacent the open end portion of said bore, said separate member having a peripherally extending rib formed on the outer surface thereof which is snugly received within said peripherally extending groove for securely retaining the separate member in operative position within said hub means.

3. Apparatus as defined in Claim 1 wherein said separate

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member includes a plurality of inwardly extending ribs the innermost ends of which are adapted to engage spaced outer portions of said cannula means for retaining the cannula means in proper operative position.

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4. Apparatus as defined in Claim 3 wherein the inner portions of said ribs are tapered so as to define relatively sharp edges at the innermost ends thereof so as to engage a minimum portion of the outer surface of said cannula means.

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