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

[52] U.S. Cl.....	128/221
[51] Int. Cl.....	A61m 5/32
[50] Field of Search.....	128/221, 218, 218.1

ABSTRACT: A plastic needle hub is formed in two parts, one of which comprises an inner hub member retained in position in an outer hub member by complementary engaging means. Adhesive is utilized to retain a cannula in position engaging the inner hub member and also serving to secure the inner and outer hub members together.

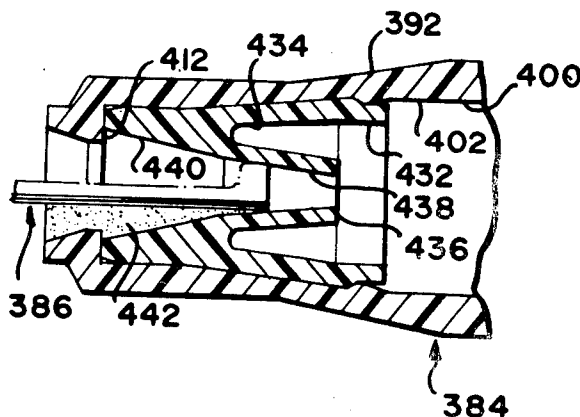


FIG. 1

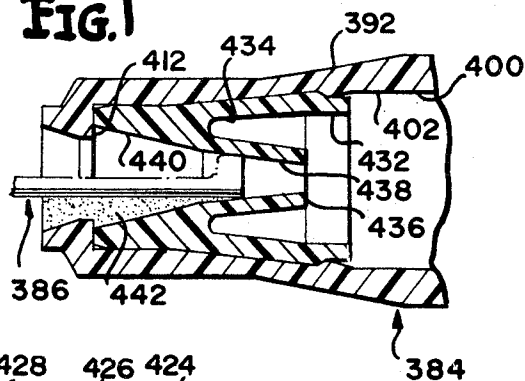


FIG. 2

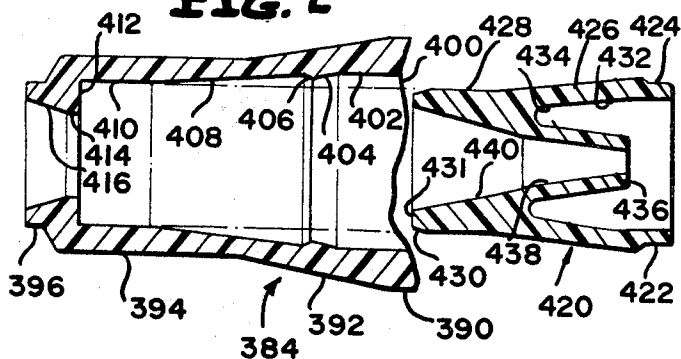


FIG. 3

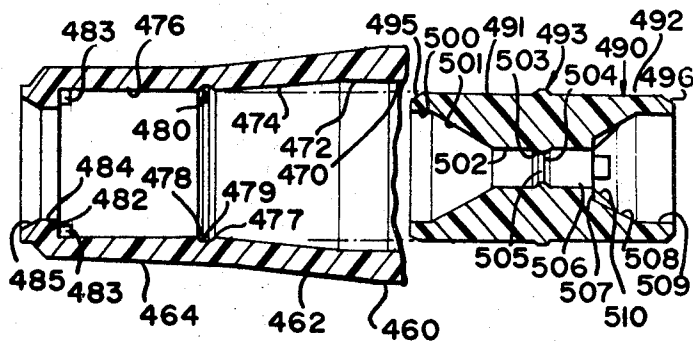
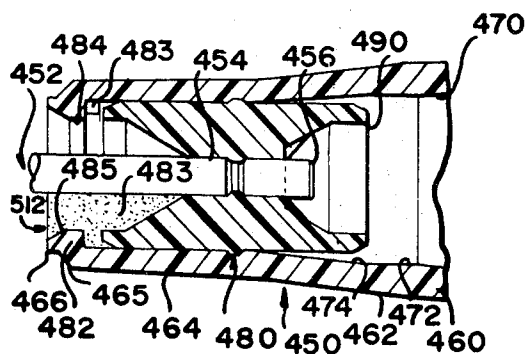


FIG. 4

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HYPODERMIC NEEDLE

This application is a division of Ser. No. 480,617, filed Aug. 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 outer or main body portion of the hub means or the inner separate hub 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:

FIG. 1 is a longitudinal section of the invention;

FIG. 2 is an exploded view of certain of the components illustrated in the structure shown in FIG. 1;

FIG. 3 is a longitudinal section through a modified form of the invention; and

FIG. 4 is an exploded view of certain of the components illustrated in the structure shown in FIG. 3.

Referring now to FIGS. 1 and 2, the invention is illustrated wherein the hub means is indicated generally by reference numeral 384, and the cannula means is indicated generally by the reference numeral 386. The hub means includes an outer portion or hub member having an outer surface 390 which may have a pair of outwardly directed flanges formed at one open end thereof. Surface 390 joins with an inwardly tapered surface 392 which in turn joins with a substantially cylindrical outer surface 394 which tapers inwardly to a further surface 396 of reduced dimension.

The bore is formed completely through this hub member and includes a surface 400 which may comprise a Luer taper surface which joins with a substantially cylindrical surface 402 which in turn joins with an inwardly directed surface 404. Surface 404 then joins with an outwardly flared surface 406 for a purpose hereinafter described. Surface 406 joins with a further inwardly tapered surface 408 which in turn joins with a substantially cylindrical surface 410 which further joins with a substantially radially inwardly directed flat surface 412. A hole 414 is defined through surface 412 and joins with an outwardly flared bore portion 416 which opens through the opposite end of the hub member.

A second or inner hub member is indicated generally by reference numeral 420 and includes an outer surface 422 which joins with an outwardly flared surface 424 which fits snugly up against the surface 406 on the other hub member as seen most particularly in FIG. 1 so as to hold member 420 in place within the first described hub member.

Surface 424 then joins with an inwardly tapered surface 426 which is adapted to rest snugly against surface 408 previously described. The surface 428 on member 420 in turn rests snugly against surface 410 provided on the inner surface of the outer hub member. Surface 428 then tapers inwardly as indicated at 430 to an end surface 431 which is adapted to rest against the end surface 412 previously described so as to fixedly secure inner hub member 420 in position within the outer hub member.

Hub member 420 is provided with an inner bore surface 432 which joins with a bore surface 434 which extends substantially parallel with surface 426. Surface 434 in turn joins with the outer surface of a generally frusto-conical shaped portion 436 formed within member 420 and which has a taper bore 438 formed therethrough which in turn joins with a further surface 440 which flares outwardly toward the end surface 431 of member 420.

It is apparent that inner hub member 420 may be snapped into the operative position shown in FIG. 1 and the cannula means 386 inserted therewithin whereupon the end of the cannula means engages the surface 438 of member 420 to limit inward movement of the cannula means into the hub means.

A body of adhesive substance 442 is provided in surrounding relationship to the cannula means and is bonded thereto as in parent application Serial No. 480,617, now Patent No. 3,472,227. This body of adhesive substance substantially fills the space between the cannula means and the surrounding hub portions, and it is apparent that the surface 412 will provide a holding surface which engages the setup body of adhesive means so as to retain the cannula means in operative position and to resist movement of the cannula means out of the bore of the hub means.

In a typical example wherein the hub means may have an over-all length of approximately 0.578 inches, the hole 414 may have an inner diameter of approximately 0.075 inches, and cylindrical surface 410 may have an inner diameter of approximately 0.125 inches. The cylindrical surface 402 may have a diameter approximately .155 inches, and surfaces 404 and 406 together may have a longitudinally extending dimension of approximately 0.028 inches. The smallest diameter defined by the tapered surface 438 may be approximately 0.018 inches, and the largest diameter defined by this surface

may be approximately 0.043 inches. The largest diameter defined by the surface 440 may be approximately 0.095 inch. The right-hand end of the frusto-conical portion 436 as seen in FIG. 2 may be spaced approximately 0.036 inches from the right-hand end of member 420.

In FIGS. 1 and 2, the hub members may be formed of a suitable plastic substance such as high density polyethylene and the like. This material will permit the components of the hub structure to be readily snapped into the operative position as shown and will further enable member 420 to be securely locked in the desired operative relationship.

Referring now to FIG. 3 and 4, a modified form of the invention is illustrated wherein the hub means is indicated generally by reference number 450, and the cannula means is indicated generally by reference numeral 452. As in the previous example, the hub means may be formed of a suitable plastic such as polypropylene, and the cannula means may be formed of stainless steel and the like. The cannula means includes a substantially cylindrical outer hub member or main body portion 454 which terminates in a relatively flat end portion 456 which extends substantially perpendicular to the longitudinal axis of the cannula means.

Hub means 450 is provided with an outer surface 460 which tapers to the left as seen in FIGS. 3 and 4 and which may be provided with oppositely extending flanges at one end thereof as in the previous modification. Surface 460 joins with an inwardly tapered surface 462 which in turn joins with a generally cylindrical outer surface portion 464 which in turn joins with a rather sharply tapered end portion 465 which joins finally with a small generally cylindrical surface 466 at the terminal end of the outer surface of the hub means.

The hub means 450 has a bore formed completely therethrough and opening through opposite ends thereof, the bore opening at one end thereof and tapering inwardly along a surface 470 to define a conventional Luer tapered surface which joins with a generally cylindrical surface 472 which in turn joins with a further inwardly tapered surface 474 and a less tapered bore portion 476 is disposed adjacent to inwardly tapered surface 474. Reversely angled surfaces 477 and 478 define angles of approximately 30° with the adjacent bore portions and are joined by a generally cylindrical surface 479, surfaces 477, 478 and 479 cooperating to define a peripherally extending groove 480 formed around the inner surface of the bore through the hub means.

A holding surface 482 is provided at one end of the bore, and a pair of diametrically opposite radially inwardly extending ribs 483 are provided. A generally cylindrical bore portion 484 is provided adjacent holding surface 482 and joins with an outwardly flared surface 485 which defines the end of the bore through the hub means.

The holding means of this form of the invention includes a separate inner hub member indicated generally by reference numeral 490 and having a pair of oppositely tapered outer surfaces 491 and 492 each of which tapers complementary to the wall portion 476 of the bore formed in the outer hub member so as to be snugly engaged therewith. This separate member is of unique construction in that either end of the separate member may be inserted into the bore in the hub means and in fact a separate member is symmetrical to serve this purpose. An outwardly directed peripherally extending rib indicated generally by reference numeral 493 is formed on the outer surface of the separate member between tapered surfaces 491 and 492 thereof, rib 493 being adapted to be received snugly within the groove 480 in the hub means so as to secure the separate member in the operative position shown in FIG. 3.

The two tapered surfaces 491 and 492 join with further more sharply tapered surfaces 495 and 496 at opposite ends of the separate member. Each of the tapered surfaces 495 and 496 defines an angle of approximately 30° with respect to the adjacent surfaces 491 and 492 respectively. It will be noted, as seen in FIG. 3, that when the inner hub member is in operative position, one end portion thereof is spaced slightly from the ribs 483 provided within the hub means as aforescribed.

The separate member 490 is provided with a bore formed therethrough, one end of the bore defining a generally cylindrical surface 500 which joins with an inwardly tapering surface 501 which in turn joins with a central bore portion 502 which is also generally cylindrical. Oppositely angled surfaces 503 and 504 are provided and are joined by a generally cylindrical surface 505, members 503, 504 and 505 defining a friction means or ring which extends peripherally of the central bore portion and radially inwardly for a purpose hereinafter described. Surface 504 joins with surface 506, surface 506 also being generally cylindrical, and it being noted that surfaces 503 and 504 define an angle of approximately 30° with respect to the adjacent surfaces 502 and 506 respectively.

Surface 506 in turn joins with a surface 507 which extends radially outwardly from the adjacent portion of surface 506, surface 507 joining with an outwardly flared surface 508 which in turn joins with a generally cylindrical surface 509.

In order to strengthen and rigidify the structure, four spaced ribs 510 are provided, these ribs being equally angularly spaced from one another and extending from one end of surface 506 to an intermediate point along surface 508.

As seen particularly in FIG. 3, the separate or inner hub member has been inserted in operative position within the outer hub member, and the cannula means has been inserted in position such that the cylindrical body portion 454 thereof is received snugly within the central bore portion provided in the separate member and defined by surfaces 502 and 506 previously described. It will be noted that the friction ring defined by surfaces 503, 504 and 505 is adapted to very tightly engage the outer surface of the cannula means so as to limit relative movement therebetween and to hold the cannula means firmly in operative position.

In addition, a body of suitable adhesive material is provided similar to that previously described, the adhesive material being defined by reference numeral 442. It will be noted that the adhesive material is in intimate contact with the outer surface of the cannula means and substantially fills the space between the outer surface of the cannula means and the adjacent portions of the inner and outer hub members. It will be evident that the adhesive substance will fill in the space around the ribs 483 and will engage the holding surface 482 to firmly hold the cannula means in operative position and to prevent removal therefrom from the hub means.

As in the previously described modification, the separate member may be formed of a suitable plastic material and in this example the material may comprise Alathon 7320 copolymer.

In a typical example wherein the hub means may have an over-all length of 0.596 inches and the separate member 490 may have a length of approximately 0.240 inches, bore portion 484 may have an inner diameter of approximately 0.100 inches and ribs 483 may have a longitudinal dimension of approximately 0.150 inches. The separate member 490 may have an outer diameter at the junction of surfaces 491 and 495 as well as at the junction of surfaces 492 and 496 of approximately 0.130 inches, and the outer rib portion 493 may have a longitudinal dimension of approximately 0.028 inches, while the friction ring defined within the central bore portion of the separate member may have a longitudinal dimension of approximately 0.020 inches. The bore portions 502 and 506 within the separate member may have an inner diameter of approximately 0.036 inches, with the over-all length of the central bore portion including surfaces 502 and 506 as well as the friction ring therebetween being approximately 0.092 inches, thereby providing a substantial length of bore portion adapted to snugly engage an associated cannula means to assure that the cannula means remains in proper operative position while the adhesive substance applied thereabout is hardening.

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 comprising a generally cylindrical outer hub member providing a bore therethrough and a generally cylindrical inner hub member providing a bore therethrough, a peripherally extending holding surface adjacent one end of said bore through said outer hub member, said inner plastic hub being disposed within the bore of said outer plastic hub member, the outer surface of said inner plastic hub member substantially conforming to the configuration of said bore through said outer plastic hub member, one end of said inner plastic hub being in engagement with said holding surface to limit movement of said inner plastic hub member in one direction, interengaging means between said inner and outer plastic hub members for holding the inner plastic hub member in operative position within said bore of said outer hub member, a portion of said bore in said inner plastic hub member being tapered, said cannula means extending within the bore in said outer plastic hub member in spaced relation to the wall thereof and received within the bore in said inner plastic hub member in abutting contact with only a portion of the wall thereof, whereby said inner plastic hub member limits relative axial movement between said cannula means and said hub means, and an adhesive substance disposed in surrounding relationship to said cannula means in intimate engagement with and bonded to the outer surface thereof, said adhesive substance substantially filling the space between said cannula means and the surrounding inner and outer hub portions to retain said cannula means in operative position relative to said inner plastic hub member and to retain said inner plastic hub member in operative position within the bore in said outer plastic hub member.
2. A hypodermic needle (Apparatus) as defined in Claim 1 wherein said bore of said inner hub member includes friction means comprising a circumferentially extending radially inwardly directed integral portion of the inner hub member and adapted to engage the outer surface of the cannula means.
3. A hypodermic needle (Apparatus) as defined in Claim 1 wherein the interengaging means for securing said inner hub member in operative position within the bore of said outer hub member includes a peripherally extending groove formed on the inner surface of the outer hub member and a complementary peripherally extending outwardly directed rib formed on the outer surface of said inner hub member which fits snugly within said groove.
4. A hypodermic needle as defined in Claim 1 wherein said outer hub member is provided with a plurality of radially inwardly extending ribs formed adjacent one end portion thereof and extending into the bore therethrough, said ribs being disposed closely adjacent one end portion of said inner hub member when the inner hub member is in operative position, said adhesive substance substantially filling the space about said ribs and being in intimate contact therewith.
5. A hypodermic needle as in Claim 1 wherein the bore through said outer hub member includes a generally cylindrical portion and a frusto-conical portion and the outer surface of said inner hub member includes complementary cylindrical and frusto-conical portions.
6. A hypodermic needle as in Claim 1 wherein the bore through said inner hub member is tapered throughout its length and includes a first portion extending from one end thereof having a first taper and a second portion extending from said first portion to the other end thereof having a second taper, said cannula being engaged in said second portion.
7. A hypodermic needle as in Claim 1 wherein the bore through said outer hub member includes a cylindrical portion and a frusto-conical portion, the outer surface of said inner hub member includes complementary cylindrical and frusto-

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conical portions, the bore through said inner hub member is tapered throughout and includes a first portion extending from one end thereof having a first taper and a second portion extending from said first portion to the other end thereof having a second taper, the first portion being adjacent said holding surface on said outer hub member when said inner hub member is inserted therein, the diameter of the bore in said inner hub member being less than the diameter of the bore in

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said outer hub member at said holding surface whereby a radially inwardly extending shoulder is defined by said holding surface and said tapered bore in said first portion of said inner hub member, said adhesive substance substantially filling the space surrounding said cannula and forming a mechanical interlock with said shoulder to preclude movement of said cannula axially within said bore.

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