United States Patent

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[72] Inventor George K. Burke
Bethlehem, Pennsylvania

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[73] Assignee Burron Medical Products, Inc.
Bethlehem, Pennsylvania
a Corp. of Pennsylvania

[54] HYPODERMIC NEEDLE

2 Claims, 3 Drawing Figs.

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[50] Field of Search 128/216, 221

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

ABSTRACT: The plastic needle hub is formed of two parts, one of which comprises the hub proper which includes means engaging the cannula shank to stabilize same, the second part comprising an annular plastic insert which acts as a limit stop or support for the end of the cannula shank. Adhesive surrounds the cannula shank within the hub to maintain the cannula in the needle hub.

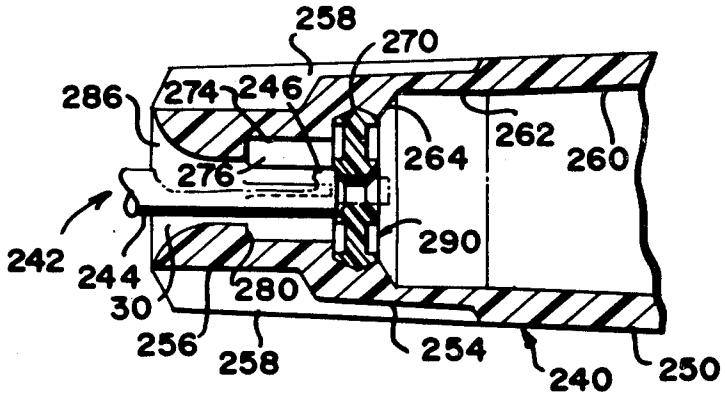


FIG. 1

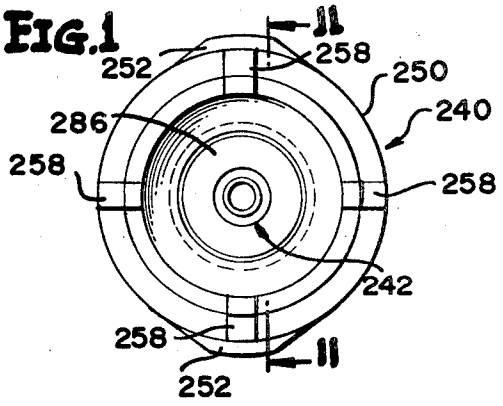


FIG. 2

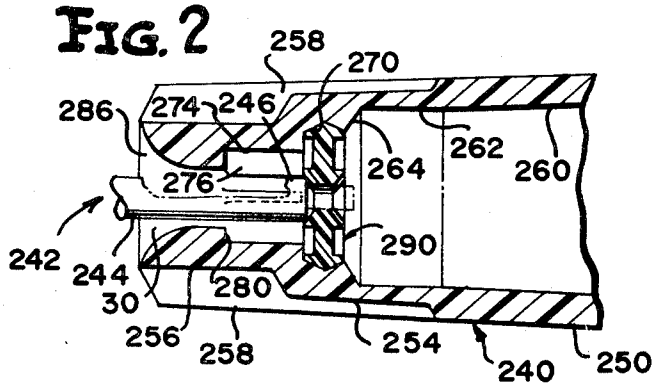
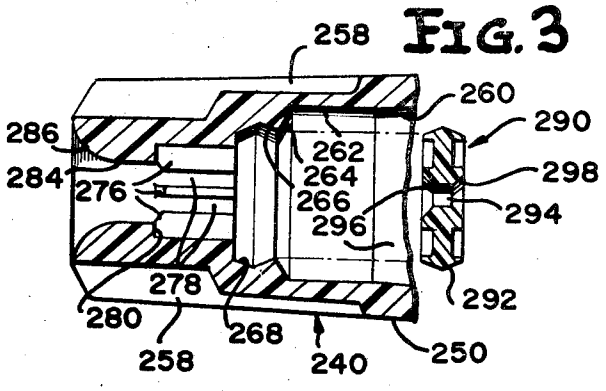


FIG. 3



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 Patent 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 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 beyween 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 inter- connection 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 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 an end view of the invention;

FIG. 2 is a sectional view, taken substantially along lines 11--11 of FIG. 1, looking in the direction of the arrows; and

FIG. 3 is a view similar to FIG. 2, illustrating certain of the components in exploded relationship to one another.

Referring now to FIGS. 1,2 and 3, the invention is illustrated wherein a hub means is indicated generally by reference numeral 240 and a cannula means is indicated generally by reference numeral 242, and including a substantially cylindrical main body portion 244 which terminates in an end portion 246 which has a substantially flat end extending substantially perpendicular to the longitudinal axis of the cannula means.

Hub means 240 is provided with an outer surface 250 which tapers to the left as seen in FIG. 2 and which may be provided with oppositely extending flanges 252 at one end thereof as indicated in FIG. 1. Surface 250 joins with a similarly tapered surface 254 of reduced dimension which, in turn, joins with an outer surface portion 256 of still further reduced dimension and which has ribs 258 extending outwardly therefrom and being substantially equally spaced about the hub means to strengthen and rigidify the structure.

Hub means 240 has a bore formed completely therethrough and opening through opposite ends thereof, the bore opening at one end thereof tapering inwardly along a surface 260 to define a conventional Luer tapered surface which joins with a substantially cylindrical surface 262 which in turn joins with an inwardly extending tapered surface 264. Surface 264 then joins with a pair of oppositely angled surfaces 268 which define a peripherally extending groove 270. A further bore portion 274 extends from the groove 270, and four substantially equally spaced inwardly directed ribs 276 extend inwardly from bore portion 274 and are adapted to engage spaced outer portions of the associated cannula means. A further bore portion 284 extends from the ribs 276 and then flares outwardly as indicated at 286 to the opposite end portion of the hub means.

A limit stop means in the form of a separate member indicated generally by reference numeral 290 is provided, member 290 having an outer surface 292 which is substantially complementary to the groove 270 in the hub means such that it may be snapped into place therein, it being understood that member 290 is also formed of a suitable plastic material with sufficient resilience to allow member 290 to be snapped into the operative position shown in FIG. 2.

Limit stop means 290 is provided with a hole 294 though the center thereof, and the hole is outwardly flared as indicated at 296 and 298 at opposite ends thereof. When the separate member 290 is snapped into its operative position as shown in FIG. 2, the tapered surface 296 thereof serves to engage the adjacent end of the cannula means and to limit inward movement of the cannula means with respect to the hub means. The cannula means will be supported by the ribs 276, and a body of adhesive material indicated by reference numeral 300 is disposed between the cannula means and the surrounding hub portion and substantially fills the space defined between these members.

A holding surface 280 as seen most clearly in FIG. 3 is defined adjacent ribs 276, and when the assembly is in its operative position as shown in FIG. 2, it is apparent that this holding surface 280 is adapted to be engaged by the body of adhesive substance so as to retain the cannula means in operative position and to prevent removal therefrom from the hub means.

In a typical example, bore portion 284 may have an inner diameter of approximately 0.050 inches and the innermost portions of the ribs 276 may be spaced approximately 0.035 inches from the diametrically opposite rib. The ribs may have a length of approximately 0.077 inches, and groove 270 may have a longitudinally extending dimension of approximately 0.031 inches. Annular member 290 may have an outer diameter of approximately 0.125 inches which corresponds with the diameter of the deepest portion of groove 270, the thickness of member 290 being approximately 0.031 inches. It is apparent that the central hole 294 through member 290 will be of less than 0.035 inches so as to retain the cannula means in the position shown in FIG. 2.

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, an outer hub member having a bore formed therethrough and open at opposite ends thereof, said cannula means extending within said bore through one of said open end portions thereof and in spaced relation to the wall of said bore, said outer hub member including at an intermediate portion thereof a plurality of longitudinally extending and radially inwardly directed spaced ribs defining therebetween a plurality of grooves, said ribs engaging the outer surface of said cannula means adjacent said opposite end portion thereof, holding means comprising an adhesive substance disposed in surrounding relationship to said cannula means adjacent said opposite end portion thereof and being in intimate bonded contact with the outer surface of said cannula means, said adhesive substance substantially filling the space defined between said cannula means and the surrounding hub portions and being disposed within said grooves, and separate limit stop means disposed in the bore of said outer hub member adjacent one end of said ribs and in engagement with said opposite end portion of said cannula means for limiting inward movement of the cannula means into the bore of said hub means.

2. Apparatus as defined in Claim 1 wherein said limit stop means is of generally annular configuration, said hub member having a peripherally extending groove formed therein, the outer surface of said limit stop means fitting snugly within said peripherally extending groove means so as to retain the limit stop means in operative position.