June 1, 1965 E. J. JACOB 3,186,408

HYPODERMIC NEEDLE MOUNTING

Original Filed June 5, 1958

FIG. 1

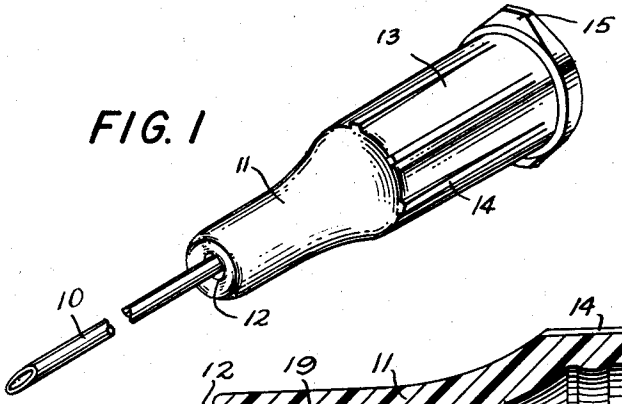


FIG. 2

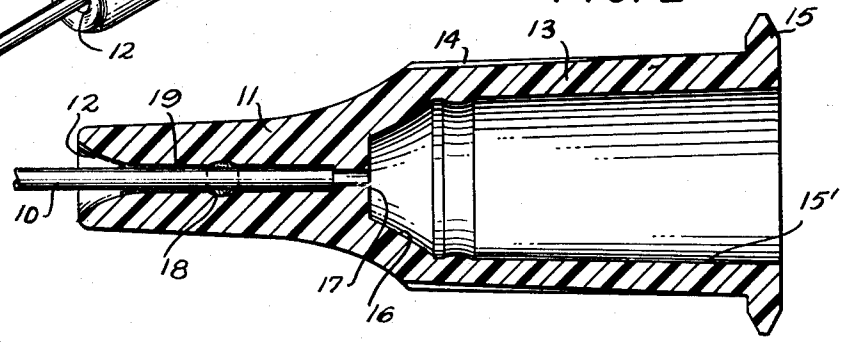


FIG. 3

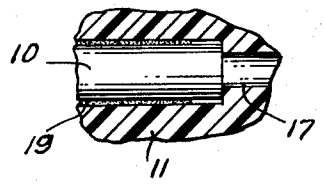


FIG. 4

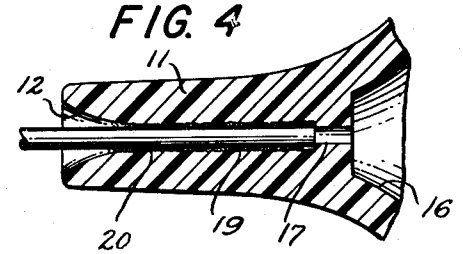


FIG. 5

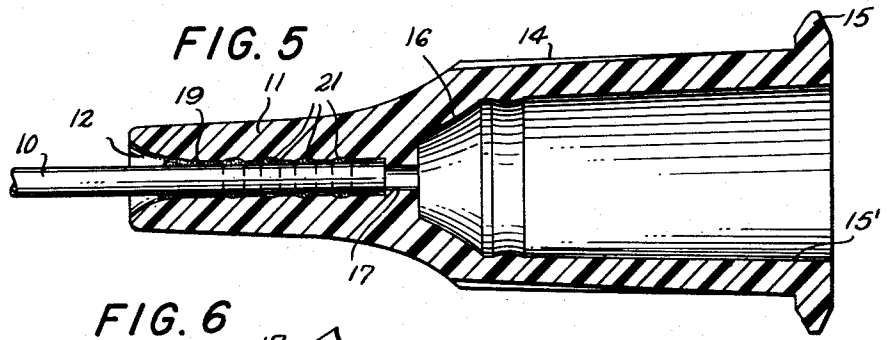
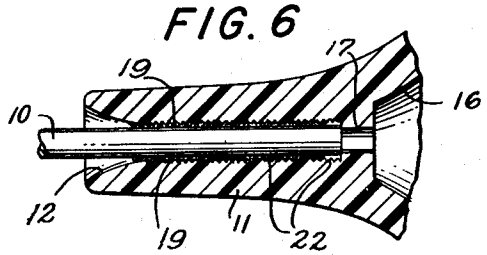


FIG. 6



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3,186,408

HYPODERMIC NEEDLE MOUNTING

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Continuation of application Ser. No. 740,063, June 5, 1958. This application Dec. 29, 1961, Ser. No. 163,123
2 Claims. (Cl. 128—221)

This application is a continuation of application Serial No. 740,063, filed June 5, 1958, now abandoned.

This invention relates to a structurally and functionally improved hypodermic needle mounting primarily designed to have a "one-time" use, after which it will be discarded.

While the present teachings may be embodied in mountings of diverse characters, according to a preferred aspect of the invention such mounting will comprise a hub. Regardless of this, however, the mounting will be formed of a material such that if exposed to sterilizing temperatures of the range present in an autoclave, or even lower, the mounting will distort and become in effect inoperative for use in a hypodermic assembly. Accordingly, if, after initial use, the needle and its mounting are subjected to cleaning and heat-sterilizing actions, the proposed user will find the utility of the assembly to have been destroyed. Under these circumstances the needle and its mounting will have to be discarded, and there will be no danger of the patient to be injected being infected incident to the assembly having been used on a previous patient.

Another object is that of designing a hypodermic needle mounting which may readily and economically be produced and thereupon cleaned and sterilized. So sterilized, it will be suitably packaged and maintained free from contamination for indefinite periods of time and until it is to be used by a physician or technician.

With these and other objects in mind, reference is had to the attached sheet of drawings illustrating practical embodiments of the invention and in which:

FIG. 1 is a fragmentary perspective view of a needle and mounting hub;

FIG. 2 is a fragmentary sectional side view of one form of the assembly;

FIG. 3 is a similar view in enlarged scale, showing certain of the details of that assembly;

FIG. 4 is a view similar to FIG. 3 but showing a slightly different form of construction;

FIG. 5 is a view smilar to FIG. 2, and again showing an alternative construction; and

FIG. 6 is a view similar to FIGS. 3 and 4, but illustrating a still further form of structure.

In these several views the needle has been shown as associated with a mounting involving a hub. That hub, in accordance with conventional technique, is to be removably applied to the tip of a hypodermic syringe. While this is a preferred concept of the invention, it is to be understood that the mounting might embrace structures other than a hub. In such instances the needle would be directly mounted by the outer end of a syringe barrel or ampule. Therefore, except where otherwise limited in the claims, the foregoing views are to be taken in an illustrative sense, rather than by way of limitation.

Thus, in these several views the numeral **10** indicates a hypodermic needle the outer end of which is shaped to provide a piercing point. The inner end of the needle is—as shown—preferably unsharpened. The hub includes a tip portion **11** which may be flared in a rearward direction and is formed with a bore the outer end of which has a diameter greater than that of the cannula **10** and which is tapered, as indicated at **12**. To the rear of tip portion **11** the hub provides a body **13** conveniently

formed with an annular series of ribs **14**. Its rear end, as illustrated, may be defined by a flange including outwardly extending portions **15**.

Body **13** includes an enlarged bore portion **15'** preferably tapered in the direction of the needle point to correspond to the degree of tapering ordinarily embodied in the tip of a hypodermic syringe. Bore **15'** is continued in the form of a tapered face **16** communicating with the rear end of the bore embodied in tip **11**. That bore is constricted adjacent surface **16**, as indicated at **17**, to furnish an abutment. The passage through the latter should have a diameter substantially equal to the lumen of needle **10**.

In the form illustrated in FIG. 2, the bore of tip **11** is formed with an annular recess **18** located substantially midway of the length of the bore. A layer of bonding material **19** is interposed between the faces of this bore and the rear end of the needle. This bonding layer, after hardening, forms a cast sheath which surrounds the cannula and extends into the recess **18**, as shown especially in FIG. 2, thereby forming (in addition to an adhesive bond) a mechanical connection with the hub. In assembling the parts it is preferred to apply the bonding material to the outer face of the cannula adjacent its rear end. As that needle zone is introduced into the bore of tip **11** (FIG. 3), the material will engage with the face of the bore and tend to wipe away from the rear end of the needle, thus obviating any danger of the bonding material entering the lumen of the latter. The material will, of course, properly key into the recess **18** and will provide a cast sheath terminating within the throat of the flared surface **12**. Thereby, a proper and permanent adhesive-mechanical coupling is established between the needle and its mounting.

Other types of relatively recessed bore portions to receive bonding material could be provided. One of the simplest of these is illustrated in FIG. 4, in which the bore face of tip **11** has been roughened, as indicated at **20**. In this manner numerous relatively recessed spaces are furnished into which the cast bonding layer **19** will key. Instead of using a single annular recess, as in FIG. 3, a series of recesses **21**, as in FIG. 5, may be employed, which recesses are spaced axially of the bore formed in tip **11**. In FIG. 6 the relatively recessed spaces are provided by, for example, threading the bore of tip **11**, as indicated at **22**.

While various materials may be employed to furnish the mounting, it is in many respects preferred to utilize polystyrene. It is found that by employing this material, it is feasible to furnish a mounting which will begin to distort when subjected to temperatures in excess of 165° F. Such distortion at relatively low temperatures is especially apparent where the mounting is a hub or otherwise includes relatively thin parts. In the case of a hub, the sealing surfaces providing the coupling between the needle assembly and the barrel tip embrace the exterior face of the latter and the bore face **15'** of the hub. These surfaces are maintained in proper engagement either by friction or by the projecting portions **15** of the flange, where a Luer fitting is associated with the barrel tip to draw the hub inwardly over that tip as the parts are tightened. They are relatively thin and thus will readily distort under the action of heat. In any event, it is apparent that when the hub or other mounting is subjected to temperatures which are necessary for sterilization (involving a range from the boiling point of water and upwardly from that temperature), one or more surfaces of the mounting will distort. Accordingly, the assembly may no longer be used in connection with hypodermic injections and must be discarded.

In one form of mounting the needle may, for example, have an external diameter of .028". The bore of the tip,

under these circumstances, conveniently embraces a diameter of .034". Thus, adequate clearance between these surfaces exists, so that the rear end of the cannula may be introduced into the bore with its adjacent zone coated with bonding material, as in FIG. 3. A proper cast anchoring structure will thus come into being between the bore and needle from a point adjacent the rear end of the latter through to the flared surface 12. The mounting being of a material such as polystyrene, within limits it will be stretchable or conformable, so that a proper distribution is assured during this positioning of the parts.

Where—as is preferred—the bonding agent is made of a material unaffected by heat in the indicated temperature range, it may be made of a thermosetting resin or a high-temperature thermoplastic resin. It is recommended, in following the present teachings, that an epoxy resin be employed. Insofar as the material of the mounting is concerned, while it is preferred to employ polystyrene, other materials may be utilized.

For example, cellulose acetate, ethyl cellulose, cellulose nitrate, low-melting vinyl acetate, vinyl chloride and polymers thereof may be employed. Examples of thermosetting plastic materials, modified by or blended with thermoplastic material from which the mounting is made so that the latter becomes visibly distorted or is rendered non-usuable within the indicated temperature range, include polyester resins blended with 10% to 30% by weight of low-melting compatible resins such as butyl methacrylate or a low-melting blend of a thermoplastic resin such as polyvinyl chloride together with a suitable plasticizer. Also there may be employed an epoxy resin mixed with 10% to 30% of a thermoplastic resin compatible with epoxy resins, such as polyvinyl chloride. In the case of polystyrene, it is recommended that a material such as Styron No. 475, made by the Dow Chemical Company, be utilized.

Regardless of the particular materials employed, it will be understood that a needle mounting is furnished which in its initial stage will be leak-proof and usable in a manner identical with assemblies as heretofore produced. After such use, however, if an attempt is made to clean and resterilize the assembly by the ordinarily available methods such as autoclaving, the usefulness of the article for future hypodermic injections will be destroyed. After the assembly is provided as aforetaught, sterilization techniques such as chemical or gas sterilization may be resorted to.

Resin bonding agents such as epoxy resin have a greater bonding affinity for the metal than for plastic material such as the present hub. To insure a balanced gripping of both the metallic and plastic surfaces, the bore of the hub in which the needle is mounted is provided with one or more annular recesses, as in FIGS. 2 or 5, or with a roughened surface such as is shown in FIG. 4 or an equivalent threaded surface as in FIG. 6. The resin bonding material flows into these recessed areas and, upon hardening, forms a cast sheath which: surrounds the cannula and adheres thereto because of its bonding affinity for the metal thereof; and is retained within the hub bore because of its bonding affinity (lower for the hub material) and the mechanical locking of the casting within the hub.

In the foregoing exemplification it will be observed that the bonding material is unaffected by sterilizing temperatures, while the mounting is distorted by such temperatures. Obviously, the operativeness of the assembly might be destroyed, when the same is exposed to autoclaving temperatures, by having the mounting of a material not necessarily affected by the heat range involved, while the material interposed between the cannular and the adjacent surfaces of the mounting would fail under these temperatures. For a disclosure of bonding materials of such nature, reference is had to my earlier application for United States Letters Patent, Serial No. 496,639, filed on March 25, 1955, now abandoned, and entitled "Hypodermic Needle and Method of Making the Same."

Thus, among others, the several objects of the invention as aforenoted are achieved. Obviously, numerous changes in construction and rearrangements of the parts may be resorted to without departing from the spirit of the invention as defined by the claims.

What I claim is:

1. In a hypodermic needle mounting adapted for one-time use comprising in combination: a metallic cannula having a pointed outer end and an inner end; a hub body formed of an organic plastic having a bore presenting inner and outer ends and having a diameter throughout a cannula mounting portion thereof greater than the outside diameter of said cannula, the latter having its inner end disposed in said bore with an annular space intervening its outer surface and the bore face, abutment means forming an integral part of said hub body and extending inwardly into said bore adjacent its inner end to provide a stop engageable by the inner cannula end to limit the entry of the cannula into said bore, said bore having at least one annular recess disposed intermediate the ends of said bore and within the zone in which the inner end of said cannula is disposed, and said outer end of the bore being flared outwardly; and an adhesive material filling said annular space short of the inner end of said cannula and said abutment means to assure against said adhesive material entering the lumen of the cannula, said adhesive material also filling said recess and forming a cast sheath surrounding said cannula along the entire inner end zone of the latter to attach the hub to the cannula, said adhesive cast sheath having relatively greater bonding affinity for said cannula than for said hub body, said cast sheath being mechanically locked into said mounting intermediate the ends of the bore at said annular recess whereby its relatively lower bonding affinity for said body is supplemented to provide increased attachment strength between said sheath and said hub, the material of said sheath being unaffected by a temperaturue of substantially 165° F., the material of said hub body becoming distorted when subjected to substantially such temperature.

2. In a hypodermic needle mounting adapted for one-time use comprising in combination: a metallic hypodermic needle having a pointed outer end and an inner end; a molded plastic mounting having an outer end and a bore extending inwardly therefrom for receiving the inner end zone of said needle to mount the latter, the diameter of said bore throughout its needle mounting portion being greater than the outside diameter of said needle whereby said mounting portion provides an annular space between the needle and the mounting, the diameter of said bore throughout a remaining portion thereof being less than the outside diameter of said needle, said mounting presenting an annular abutment in said bore at the juncture of said needle mounting portion and said remaining portion and said mounting including at least one annular recess along said bore intermediate its ends in its needle mounting portion, and the outer end of the mounting being flared outwardly from the bore; and adhesive material filling said annular space short of the inner end of said needle and said abutment to assure against said adhesive material entering the lumen of said needle, said adhesive material also filling said recess and forming a cast sheath surrounding said needle along the entire needle mounting portion of said mounting to attach the mounting to the needle, said adhesive cast sheath having relatively greater bonding affinity for said needle than for said plastic mounting, said cast sheath being mechanically locked into said mounting intermediate the bore ends at said annular recess whereby its relatively lower bonding affinity for said plastic mounting is supplemented to provide increased attachment strength between said sheath and said mounting, the annular abutment in said bore constituting a stop for positioning said needle in said mounting and for maintaining said adhesive mate-

rial in said annular space, the material of said sheath being unaffected by a temperature of substantially 165° F. and the material of said mounting distorting when subjected to substantially such temperature.

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