

June 21, 1960

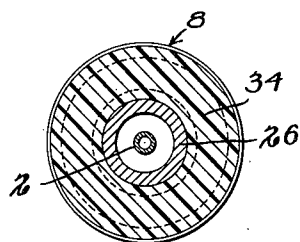
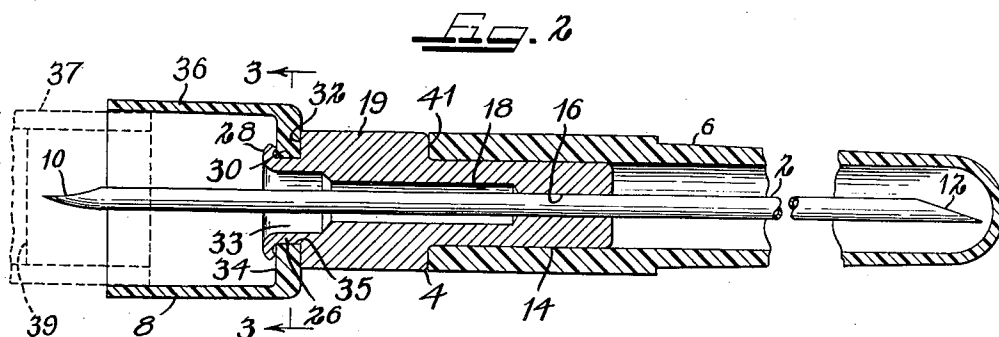
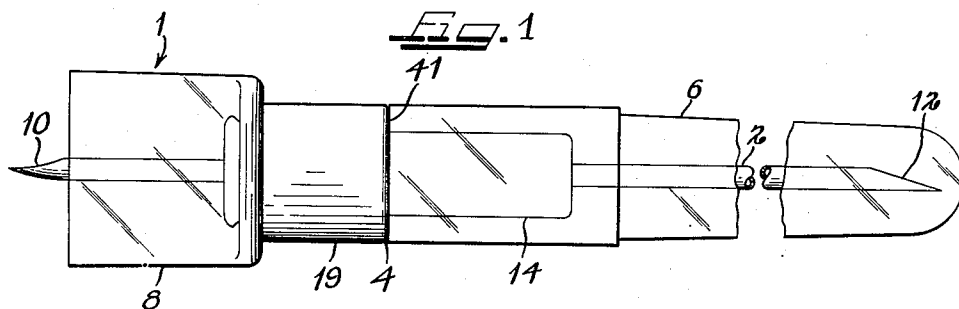
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2,941,531

HYPODERMIC NEEDLE ASSEMBLY

Filed Aug. 26, 1958

2 Sheets-Sheet 1



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Att.

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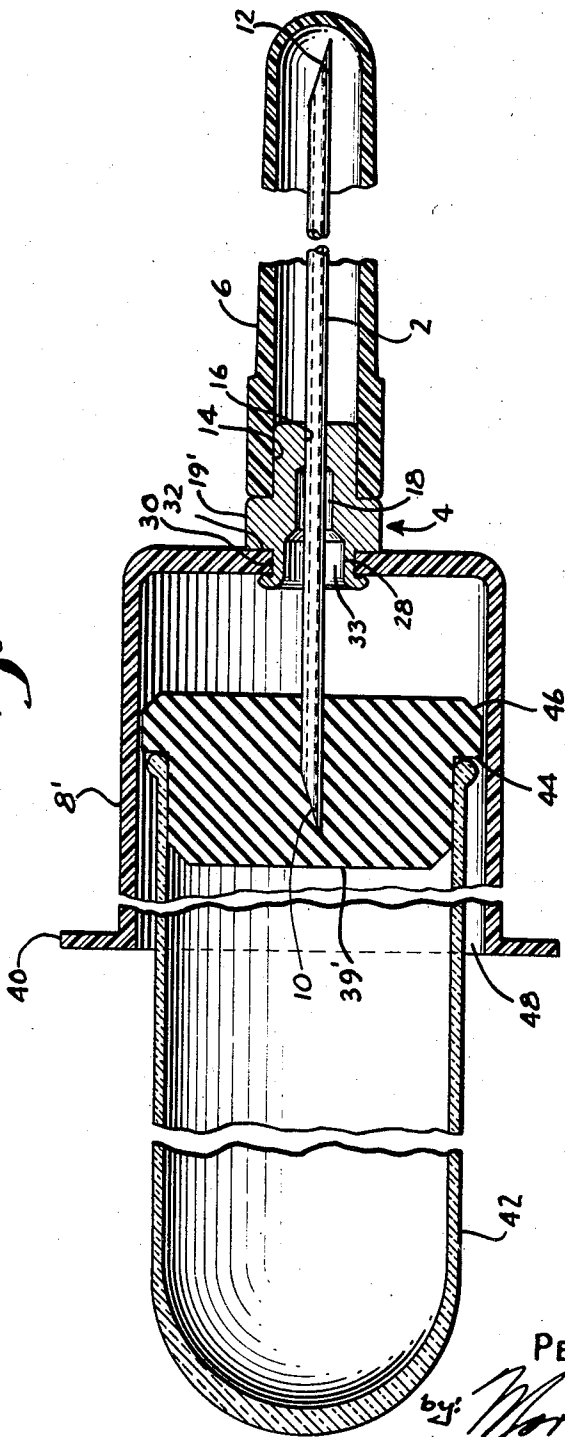
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Fig. 4



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2,941,531

HYPODERMIC NEEDLE ASSEMBLY

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6 Claims. (Cl. 128—221)

This application is a continuation in part of my co-pending application Serial No. 456,928 filed September 20, 1954 and allowed February 26, 1958.

This invention relates to hypodermic needle assemblies and the like.

It is customary to provide a hypodermic needle such as is used in the medical arts with a hub. In one type of needle the hub carries a skirt of polyethylene or the like for securing the needle to an ampule, so that the needle and the ampule may be handled as an assembly to facilitate use of the needle in connection with the ampule. The skirt surrounds a piercing point of the cannula of the needle. In the fabrication of the needle it is necessary to form the piercing point at one end of the cannula and the injection point at the opposite end thereof and it is also necessary at some stage of the fabrication of the needle to secure the hub and the skirt to the cannula.

One manner of fabricating a needle of the above-mentioned character is by performing the manufacturing operation in the following sequence:

(1) The cannula is ground and the core-piercing point is formed.

(2) The unit is then subjected to a molding operation where a plastic skirted polyethylene hub is molded around the cannula.

(3) The unit is then returned for grinding of the injection point.

It is necessary to grind the injection point after the hub has been secured around the cannula because the operation of molding a hub around the cannula would necessarily injure the delicate injection point.

The procedure above mentioned is extremely expensive because of the increased number of times that the cannula must be handled and because the grinding of a point on a cannula that already has a hub thereon is a problem by itself, particularly where mass production is desired and it is therefore desired to point a large number of cannulas at one time. This also complicates the problem of cleaning the pointed cannula because the presence of the hub on the individual needle necessarily complicates the handling of large masses of needles for cleaning purposes.

It is one of the objects of the present invention to provide a needle, of the above-mentioned character, having a skirt of polyethylene or the like, which needle is so constructed that the cannula may be pointed and cleaned before it is assembled with the hub, and wherein the cannula is then assembled with a sub-assembly consisting of the hub and the skirt in such a manner that the joining of the hub and skirt with the cannula does not involve a molding operation and therefore does not injure or contaminate the previously pointed and cleaned cannula.

The skirt must be made of a yielding material so that it can fit over the ampule with which the needle is to be used, and closely hugs the ampule. Polyethylene has been recognized as the ideal material for such pur-

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pose. If the hub is also made of polyethylene it becomes difficult to secure the hub to the cannula in the desired manner unless the hub is actually molded around the cannula. This applicant has discovered that it is not necessary, for the proper operation of the polyethylene skirt, that the hub be also made of polyethylene. Accordingly, it is one of the objects of the present invention to provide a sub-assembly of the polyethylene skirt with a metal hub, which sub-assembly can then be cleansed and treated independently of the cannula, whereby such treatment does not affect the sharpness or cleanliness of the pointed cannula. Thereafter, the sub-assembly of the skirt and hub may be staked onto the pointed and cleansed cannula.

It is a still further object of the present invention to provide a needle assembly of the above mentioned character with a thimble or skirt secured thereto and which assembly may be used in combination with a sealed container having a pressure different from atmospheric pressure and closed by a plug that may be pierced by a hypodermic needle. The assembly may be one used to draw fluid (blood or other body fluid) from a patient, in which case the container would be an evacuated container to facilitate such drawing action, or it may be one to supply fluid to a patient, in which event the container could be under a pressure above atmospheric and would be used with the outlet side of the container bottommost.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawing forming a part thereof.

In the drawing:

Fig. 1 is an elevational view, partially broken away, of a needle assembly made in accordance with the present invention;

Fig. 2 is a longitudinal sectional view of the needle assembly of Fig. 1;

Fig. 3 is a transverse section taken along section line 3—3 in Fig. 2; and

Fig. 4 is a view similar to Fig. 2 but illustrating a modified construction.

In the accompanying drawing like reference numerals indicate like elements throughout.

The needle assembly 1 there shown comprises a double pointed cannula 2, a metal hub member 4 which snugly receives and is staked onto the cannula, a closure cap or guard 6 of polyethylene or the like which is press fitted over an end of the metal hub and covers one piercing end of the cannula, and a polyethylene thimble or skirt 8 mounted to the base of the metal hub and surrounding the base of the cannula at the opposite piercing end of the needle.

The cannula may be of conventional construction comprising a tube of a uniform outer diameter having a piercing point 10 which is adapted to pierce a rubber closure of a fluid-containing ampule without coring or otherwise removing any material therefrom, and a skin-piercing or injection point 12.

The hub 4 has a relatively thin walled front section 14 which has a small forward bore 16 which is staked around a medial portion of the cannula. The bore 16 merges with a larger central intermediate bore 18 which extends into an intermediate hub section 19 of a much larger diameter than the front hub section 14.

The rear end of the intermediate hub section 19 terminates in a thin-walled cylindrical neck 26 which is outwardly flared or curled at 28 to form an annular peripheral flange which defines a skirt-receiving groove 30 between the neck 26 and a transverse annular shoulder 32 at the rear face of the intermediate hub section. The neck has a large central bore 33 therein which joins the smaller in-

intermediate bore 18 in the intermediate hub section. The thimble or skirt 8 has an endwall 34 consisting of an internal annular flange which forms a central hole 35, the defining wall of which extends into the groove 30 of the neck 26 and surrounds the neck 26. The flared end or curl 28 of the hub bears against the inner face of the skirt end wall 34 and holds the skirt securely on the hub and makes an air-tight sealing fit around the hole 35 in the end wall 34.

The thimble 8 has a cylindrical body 36 which is spaced from the cannula and terminates just short of the closure piercing cannula point 10. The rear end of the skirt body is open.

The polyethylene closure 6 is press fitted over the thin wall front section 14 of the hub and protects the front end of the needle cannula from contamination. When fully inserted on the hub, the base of the cover 6 abuts the annular stop shoulder 41 at the front end of the intermediate hub section.

In the fabrication of the needle assembly, the preformed molded polyethylene thimble or skirt is fitted over the end of the hub neck, and then the neck end is flared to retain the skirt securely in place on the hub.

The cannula is pointed at both ends before the hub is placed on the cannula. The completely pointed cannula is then extended through the metal hub 19, the front bore 16 of which is initially a small amount larger than the diameter of the needle cannula. The front end of the front hub section 14 is then pinched or staked tightly about the needle cannula to secure the cannula and the hub together.

The skirt 8 of a sterile needle assembly is telescoped over the end of an ampule 37 (shown in dotted lines in Fig. 2) containing the injection liquid, with the cannula point 10 extending only partly through the ampule closure 39. The skirt 36 is stretched by the ampule and makes a sealing fit therearound.

This constitutes the commercial product wherein the needle and the ampule are held in assembly, ready for instant use, and wherein the plug 39 maintains the lumen at the adjacent end of the cannula closed and out of contact with the medicament in the cannula. Clearance is left to permit further movement of the ampule toward the hub a sufficient distance to extend the closure piercing point 10 all the way through the ampule closure 39 for the injecting operation.

The plug 39 is made of self sealing material, such as rubber, as is conventional, so that the plug seals around the cannula that has penetrated it. As may be seen from Fig. 2 the portion of the plug 39 pierced by the cannula is of an axial thickness greater than the axial length of the opening of the lumen at the penetrating point. As a result, the cannula opening at the heel or trailing end of the penetrating point has become embedded in the pierced portion of the plug 39 before the penetrating point has penetrated through the plug 39. As a result the cannula opening at the plug penetrating end of the needle is sealed by the plug 39 when the needle and plug are in the relative positions illustrated in Fig. 2. Also, when the needle is being pushed further through the plug 39 to penetrate the same the opening at the penetrating point of the needle will never bridge the penetrated portion of the plug. This is of importance because if it did provide such a bridge, even momentarily, that bridge would permit leakage of the contents of the ampule through the plug at the cannula.

The present invention is not limited to use with ampules such as the ampule 37 containing a liquid to be injected. For instance, the structure 37 may be a sterile tube sealed by the closure plug and evacuated and may optionally contain some needed chemicals. With such a tube in position the structure of Fig. 2 may be used for taking blood or other body fluid from a person. Such an assembly of the thimble or skirt 8 and its connected cannula, all sterile in a sealed package with or without a plugged evacuated tube may constitute an article of commerce.

When such a unit is to be used the sealed tube for receiving the body liquid is inserted into the thimble 8 into the position illustrated in Fig. 2 (if it is not already in that position), the closure 6 is removed, the penetrating point 12 of the cannula 2 is inserted into proper position for taking blood or other body liquid from a patient, for instance, in the arm of a patient, and then the tube 37 is moved further into thimble 8 a distance sufficient to extend the piercing point 10 all the way through the closure 39, whereupon blood will flow from the patient through the cannula and into the tube 37 because of the vacuum in the tube 37.

In Fig. 4 there has been shown a structure similar to that of Fig. 2 but designed specifically for use in drawing blood. Insofar as the parts of this structure are identical with the parts illustrated in the embodiment previously described a further description is not necessary because the same reference numerals have been used. In this case the intermediate hub section 19', which corresponds to the hub section 19 of Fig. 2, has been made appreciably shorter in axial length. This hub is staked to the cannula 2 in the same manner as previously described. In this embodiment the thimble or skirt is indicated by the reference numeral 8'. It may be made of any desired material, preferably a transparent rigid plastic. In this instance the open end of the skirt 8' is provided with an outwardly extending flange 40 to facilitate manual telescopic movement of the skirt with respect to an evacuated test tube 42 stoppered by a stopper 39' of rubber or the like, which may be pierced by the cannula and is self-sealing around the cannula as is customary with ampule closures, and is self-sealing as the cannula is withdrawn. The test tube may be made of glass.

The plug 39' has an outwardly projecting peripherally extending head or rim 44 that prevents the plug from being drawn into the tube 42 by the preponderance of the atmospheric pressure over the vacuum within the tube. A peripherally extending bevel or taper 46 is provided around the outer edge of the head 44 to facilitate guiding of the head 44 into the circular opening 48 of the thimble or skirt 8, where it makes a sliding fit.

In compliance with the requirements of the patent statutes I have here shown and described a preferred embodiment of my invention. It is, however, to be understood that the invention is not limited to the precise construction here shown, the same being merely illustrative of the principles of the invention. What I consider new and desire to secure by Letters Patent is:

1. A hypodermic needle comprising a cannula having a sharpened penetrating point, a hub secured to the cannula and having at one end thereof a neck surrounding the extended end of the cannula, the hub having a peripherally extending shoulder around the end of the neck that projects from the body of the hub, a flexible cylindrical skirt loosely surrounding the neck and having an internally extending annular flange integral therewith, said flange closely surrounding the neck and bearing on said shoulder with the cylindrical portion of the skirt extending from the flange in the direction towards the penetrating end, the end of the neck being curled over the flange and making a sealing liquid-tight fit therewith around the entire periphery of the neck.

2. Apparatus comprising a cannula having a skin-penetrating point at one end and another penetrating point at the other end thereof, a metal hub around an intermediate portion of said cannula and secured thereto in pressure engagement therewith around the entire periphery thereof, said hub having a neck at the end thereof that faces the end of the cannula opposite the skin penetrating point which neck terminates in a shoulder, a preformed polyethylene skirt surrounding the other end of said cannula and having an end wall which surrounds the cannula and is sealed around the entire periphery of the cannula to said hub, the open end of said skirt being spaced from the other penetrating point of the cannula and adapted to make a slide fit with the end

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of an ampule, and the neck of said hub being flared outwardly so as to bear against said skirt end wall and hold the same securely against a shoulder portion of said hub to form an air-tight seal between the hub and the skirt.

3. A hypodermic needle comprising a cannula having a sharpened penetrating point, a hub secured to the cannula and having at one end thereof a neck surrounding the cannula, the hub having a peripherally extending shoulder around the end of the neck that projects from the body of the hub, a cylindrical skirt loosely surrounding the neck and having an internally extending annular flange integral therewith, said flange closely surrounding the neck and bearing on said shoulder with the cylindrical portion of the skirt extending from the flange in the direction towards the penetrating end, the end of the neck being curled over the flange and making a sealing liquid-tight fit therewith around the entire periphery of the neck.

4. Apparatus comprising a cannula having a skin-penetrating point at one end and another penetrating point at the other end thereof, a hub around an intermediate portion of said cannula and secured thereto around the entire periphery thereof, said hub having a neck at the end thereof that faces the end of the cannula opposite the skin penetrating point which neck terminates in a shoulder, a preformed skirt surrounding the other end of said cannula and having an end wall which surrounds the cannula and is sealed around the entire periphery of the cannula to said hub, the open end of said skirt being spaced from the other penetrating point of the cannula and adapted to make a slide fit with the end of an ampule, and the neck of said hub being flared outwardly so as to bear against said skirt end wall and hold the same securely against a shoulder portion of said hub to form an air-tight seal between the hub and the skirt.

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5. Apparatus comprising a cannula having a penetrating point at one end, a hub around said cannula and secured thereto around the entire periphery thereof, one end of the hub being spaced from the point of connection of the hub with the cannula, said hub having a neck which terminates in a shoulder, a preformed skirt surrounding the cannula and having an end wall which surrounds the hub and is sealed thereto around the entire periphery of the said hub, the penetrating point of the cannula terminating within the skirt, the open end of said skirt being spaced from the penetrating point of the cannula and adapted to make a slide fit with the end of an ampule or the like, and the neck of said hub being flared outwardly so as to bear against said skirt end wall and hold the same securely against a shoulder portion of said hub.

6. Apparatus comprising a cannula having a penetrating point at one end, a hub around said cannula and secured thereto, said hub having a neck which terminates in a shoulder, a preformed skirt extending from the hub in the direction towards the penetrating point, the cannula being coaxial with the skirt, the skirt having an end wall which surrounds the neck, the open end of said skirt being spaced from the penetrating point of the cannula and adapted to make a slide fit with the end of an ampule or the like, and the neck of said hub being flared outwardly so as to bear against said skirt end wall and hold the same securely against a shoulder portion of said hub, and finger gripping means projecting from the skirt for facilitating telescoping movement of the skirt with respect to an ampule or the like.

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