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F. S. DICKINSON

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HYPODERMIC NEEDLE

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Fig. 1.

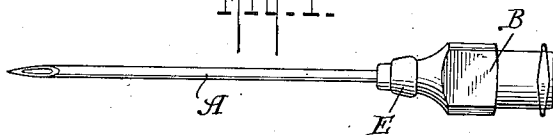


Fig. 2.

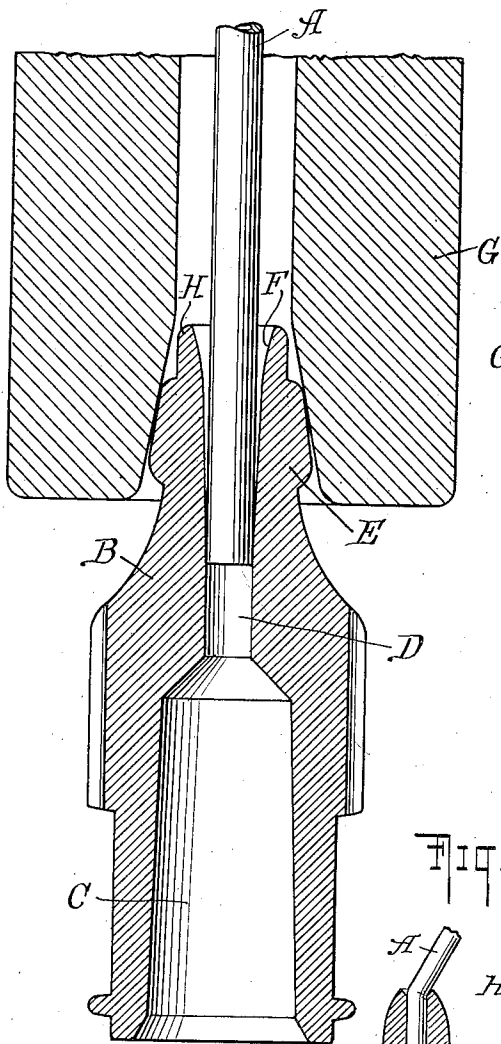


Fig. 3.

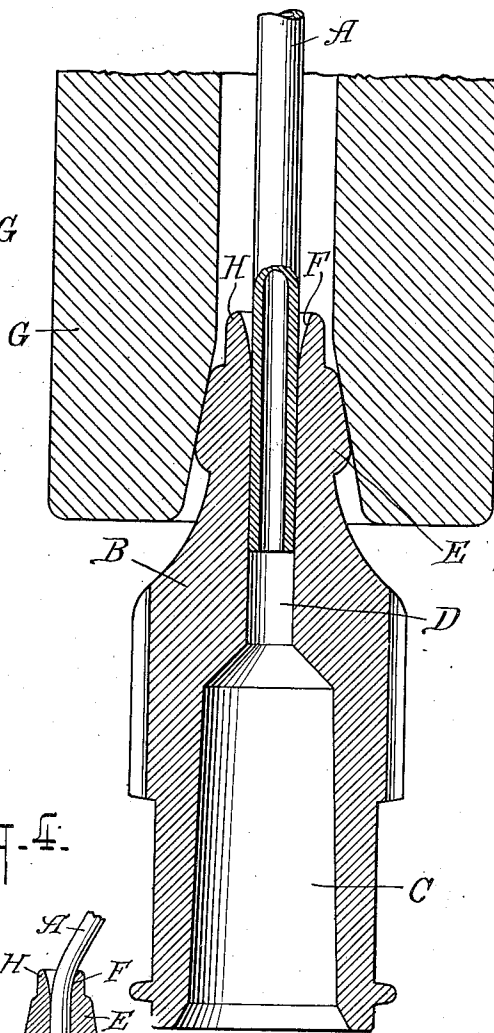
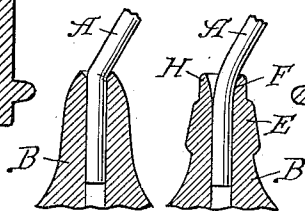


Fig. 4.



WITNESS

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Fig. 4^a

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HYPODERMIC NEEDLE

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8 Claims. (Cl. 128-221)

The invention relates to hypodermic needle units such as are constituted of a pointed tubular needle element and a hub which carries the needle element and which is adapted for association with a hypodermic syringe. The object of the invention is to improve the connection between these two elements, i. e. the needle proper and the hub, to minimize the possibility of separation, to afford increased protection against breakage of the needle and to prevent the likelihood of reduction in the diameter of the needle passage in forming the connection between the needle and the hub.

Heretofore it has been customary and general practice, after shaping the hub, to drill and ream a passage whereby the cavity of the hub is connected with the exterior and into this passage the non-pointed end of the cannula or needle is then introduced. A die then compresses the material of the hub by pressure applied against the top surface portion of the annulus where the needle projects from the hub, the compressive force of this die being thus, in the main, exerted in a direction which is axial of the hub. The pressure-created frictional contact is the sole agency which is relied upon to hold the needle and the hub permanently together. The effect of this type of compression is in part, frequently, to compress the walls of the steel needle, thus reducing the diameter of its bore, which is undesirable; but obviously, if insufficient pressure is used, the danger of having the needle separate itself from the hub is increased. One of the most troublesome factors of this type of structure is that the front portion of the hub, where the hub ends and the needle projects, forms a shoulder against which the needle bears when the needle is bent and which causes the needle to bend more or less at a distinct angle, the result being that if the needle is frequently bent in use it will break off at this shoulder.

According to the present invention these disadvantages are eliminated and a structure provided which is far more reliable and long-lived than the present standard type of hypodermic needle.

The invention is illustrated in the accompanying drawing in which Fig. 1 is a plan view of the new hypodermic structure; Fig. 2 is an enlarged section showing the relation between the die, the needle, and the needle hub prior to effective action on the part of the die; Fig. 3 is a sectional view similar to Fig. 2 showing the relation of the parts when the die has completed its action; Fig. 4 is a view showing the effects produced by

bending an old standard type of needle; and Fig. 4a is a view showing the effects produced by bending the needle of the new structure.

In the drawing A represents the cannula or needle usually made of steel or a steel alloy. B is the needle hub. The needle hub in its initial manufacture is ordinarily provided with a tapered cavity C adapted to fit upon a correspondingly tapered nozzle of a syringe, but, of course, it may be screw-threaded or otherwise configured if the syringe nozzle is of the screw-threaded or other type. A passage D is drilled and reamed to connect the cavity C with the exterior of the hub. This passage is slightly tapered toward the cavity C so that its outer end is slightly larger than the diameter of the needle, while its inner end is slightly smaller than the diameter of the needle. This arrangement permits the needle to be readily inserted in the passage D to a position which lies intermediate between the cavity C and the lower end of the annular enlargement E of the hub B. The hub is usually made of a softer material than that of which the needle is constituted, generally brass. An annular enlargement E is provided near the outer end of the hub, said enlargement being conical, its outer surfaces preferably extending at a very acute angle with reference to the axis of the hub and needle. In the preferred embodiment of the invention the conical exterior surface of the enlargement E is longer than the diameter of the needle and in fact approximately about half as long in the longitudinal direction as the length of the tube within the hub in order to obtain adequate and firm gripping contact between the hub and the needle and without subjecting the butt end section of the tube to the powerful compressing force which affects the tube where encompassed by the enlargement E. After the needle is inserted in the passage D, a die G having a conical recess corresponding approximately to the angle of the surface of the annular enlargement E is forced down and causes the whole of the material of which the annulus E is constituted to be pressed against the outer surface of the needle in a direction which is substantially at right angles to the axis of the needle hub. The descent of the die is regulated so that the pressure will be sufficient to have the metal of the annulus E close tightly against the outer surface of the needle (as illustrated in Fig. 3) at all parts where the annular portion of the hub surrounds the needle and without compressing the needle to reduce its diameter. This method

of forming the union between the needle and the hub forms a far more reliable and tenacious grip than was possible with the previously used methods.

5 In fashioning the hub member preparatory to the reception of the needle, the passage D at its outer end is caused to flare outwardly to provide the arched surface F. The function of this surface is to provide a curved resistance to bending strains applied to the needle. If in the
10 new structure the needle is bent say 45°, it will bend along the curved surface F and not at a sharp angle as was the case in prior needles. This is illustrated in Fig. 4 which is illustrative of the
15 standard prior structure while Fig. 4a illustrates the new structure. In both views the needles are bent at the same angle but in the former the bend is sharp while in the latter the bend is along an arched line.

20 The tip end H of the hub, which has been configured so as to have the surface F, is so positioned with reference to the enlargement E that the die will have no effect on the part H, although a pressure of a substantial degree is made effective upon the metal of said enlargement through-
25 out its extent.

In the die employed in the new method, said die not being obliged to exercise compressive forces axially in the immediate vicinity of the
30 periphery of the needle, the passage through it and into which the needle itself extends during the dieing operation is not required, as was heretofore essential, to be of approximately the same size as the needle, but may be very much
35 larger, thereby providing a clearance which will reduce the possibility of injuriously affecting the point of the needle during the descent of the die. In the old practice, if the needle were not absolutely straight, or being straight, were not seated
40 in the hub member in an absolutely vertical direction, the point of the needle would frequently strike against the die surface and be deflected into its needle passage. Such contact, however, was likely to affect the point of the needle. In
45 the new operations the clearance provided is so great that the point of the needle is never struck.

Attention is called to the circumstance that there is a slight divergence with respect to the angles of the effective die surface and the periphery of the enlargement E as shown in Fig. 2
50 of the drawing. The result of these configurations is in part to have the die in its initial motion close up the middle portion of the tapered aperture which for the sake of clearer illustration has been shown somewhat exaggerated in Fig. 2
55 so that the first action of the die will be to set up a condition such as shown in Fig. 3 before the die actually compresses the metal of which the enlargement E is constituted. A further
60 function of this arrangement of divergent angular relationship is that when the die has completed its work and has descended its full distance, it will be more readily separable from the needle hub; if the angular relationship were
65 identical from the beginning, the die would have to descend to a greater extent before efficient union between the hub and the needle is effected and this in turn would tend to make the hubs stick in the die so tightly as to make them re-
70 movable only with considerable difficulty.

Numerous modifications of structure may obviously be adopted without departing from the essence of the invention.

I claim:

75 1. A hypodermic needle composed of a pointed

metal tube and a hub firmly secured thereto, said hub being constituted of a single piece of metal softer than that of said tube and including a base section provided with a recess having a surface appropriate for attachment to the nozzle
5 end of a syringe and a tube supporting section having a central passageway which communicates with said recess and in which is disposed the butt end of said pointed metal tube, the butt
10 terminal of said tube being situated in said passageway and spaced from said recess and said tube supporting section being enlarged between the outer end thereof and the butt terminal of the tube, such enlarged portion of said tube sup-
15 porting section being in longitudinal extent approximately about half as long as the length of the tube within the hub and the metal of which such enlarged portion is constituted having been subjected to a greater compressive stress than the parts of the hub which surround the butt
20 terminal portion of the tube and in compression contact as well as in tight frictional engagement to the extent of approximately half the length of the tube within the hub, with the outer surface of a portion of the butt end of the tube situated
25 between the butt terminal and the region where the tube projects from the hub, the inside surface of the tube passage of the hub thereby uniting said tube firmly to said hub.

2. A hypodermic needle composed of a pointed
30 metal tube and a hub firmly secured thereto, said hub being constituted of a single piece of metal softer than that of said tube and including a base section provided with a recess having a surface appropriate for attachment to the nozzle
35 end of a syringe and a tube supporting extension having a central passageway which communicates with said recess and in which is disposed the butt end of said pointed tube, said tube sup-
40 porting extension comprising an outer tip section, an inner section, and an intermediate section having portions projecting outwardly from the axis of the hub to a greater extent than adjacent portions of said tip and inner sections said out-
45 wardly projecting intermediate section being in longitudinal extent about half as long as the length of the tube within the hub, the butt end of said tube extending through said tip and in-
50 termediate sections and into said inner section and the butt terminal of said tube being situated in said inner section and spaced from said recess, the metal of which said intermediate section is constituted having been subjected to a greater compressive strain than the parts of the hub which surround the butt terminal portion of the tube and in compression contact as well as in
55 tight frictional engagement to the extent of approximately half the length of the tube within the hub, with the outer surface of a portion of the butt end of the tube situated between the butt terminal and the region where the tube projects from the hub, the inside surface of the tube pas-
60 sage of the hub thereby uniting said tube firmly to said hub.

3. A hypodermic needle composed of a pointed
65 metal tube and a hub firmly secured thereto, said hub being constituted of a single piece of metal and including a syringe end provided with a recess having a surface appropriate for attachment to the nozzle of a syringe and a tube supporting end having a central passageway which com-
70 municates with said recess and in which is disposed the butt end of said pointed tube, said tube supporting end comprising an outer tip section, an inner section and an intermediate annu-
75 larly shaped section projecting outwardly from

the axis of the hub to a greater extent than adjacent portions of said tip and inner sections said annular outwardly projecting intermediate section being in longitudinal extent approximately about half as long as the length of the tube within the hub, the butt end of said tube extending through said tip and annular sections and into said inner section and the butt terminal of said tube being situated in said inner section and spaced from said recess, the metal constituting said annular section having been subjected to a greater compressive strain than the parts of the hub which surround the butt terminal portion of the tube and in compression contact as well as in tight frictional engagement to the extent of approximately half the length of the tube within the hub, with the outer surface of a portion of the butt end of the tube situated between the butt terminal and the region where the tube projects from the hub, the inside surface of the tube passage of the hub thereby forming a uniformly and transversely effective pressure joint around such outer surface of the tube and uniting said tube firmly to said hub.

4. A hypodermic needle composed of a pointed metal tube and a hub firmly secured thereto, said hub being constituted of a single piece of metal and including a syringe end provided with a recess having a surface appropriate for attachment to the nozzle of a syringe and a tube supporting end having a central passageway which communicates with said recess and in which is disposed the butt end of said pointed tube, said tube supporting end comprising an outer tip section, an inner section and an intermediate section having a conical exterior which tapers toward said tip section and which projects outwardly from the axis of the hub to a greater extent than adjacent portions of said tip and inner sections and conical outwardly projecting intermediate section being in longitudinal extent approximately about half as long as the length of the tube within the hub, the butt end of said tube extending through said tip and intermediate sections and into said inner section and the butt terminal of said tube being situated in said inner section and spaced from said recess, the metal constituting said intermediate section having been subjected to a greater compressive strain than the parts of the hub which surround the butt terminal portion of the tube and in compression contacts as well as in tight frictional engagement to the extent of approximately half the length of the tube within the hub, with the outer surface of a portion of the butt end of the tube situated between the butt terminal and the region where the tube projects from the hub, the inside surface of the tube passage of the hub thereby forming a uniformly and transversely effective pressure joint around such outer surface of the tube and uniting said tube firmly to said hub.

5. A hypodermic needle composed of a pointed metal tube and a hub firmly secured thereto, said hub being constituted of a single piece of metal and including a syringe end provided with a recess having a surface appropriate for attachment to the nozzle of a syringe and a tube supporting end having a central passageway which communicates with said recess and in which is disposed the butt end of said pointed tube, said tube supporting end comprising an outer tip section, an inner section and an intermediate section having a conical exterior which projects outwardly from the axis of the hub to a greater extent than adjacent portions of said tip and inner sections and which has a width greater than the

diameter of said tube, said conical, downwardly projecting intermediate section being in longitudinal extent approximately about half as long as the length of the tube within the hub, the butt end of said tube extending through said tip and intermediate sections and into said inner section and the butt terminal of said tube being situated in said inner section and spaced from said recess, the metal constituting said intermediate section having been subjected to a greater compressive strain than the parts of the hub which surround the butt terminal portion of the tube and in compression contact as well as in tight frictional engagement to the extent of approximately half the length of the tube within the hub, with the outer surface of a portion of the butt end of the tube situated between the butt terminal and the region where the tube projects from the hub, the inside surface of the tube passage of the hub thereby forming a uniformly and transversely effective pressure joint of greater width than the diameter of said tube around such outer surface of the tube and uniting said tube firmly to said hub.

6. A hypodermic needle composed of a pointed metal tube and a hub firmly secured thereto, said hub being constituted of a single piece of metal and including a syringe end provided with a recess having a surface appropriate for attachment to the nozzle of a syringe and a tube supporting end having a central passageway which communicates with said recess and in which is disposed the butt end of said pointed tube, said tube supporting end comprising an outer tip section, an inner section and an intermediate section projecting outwardly from the axis of the hub to a greater extent than adjacent portions of said tip and inner sections, said outwardly projecting intermediate section being in longitudinal extent approximately about half as long as the length of the tube within the hub, the butt end of said tube extending through said tip and intermediate sections and into said inner section and the butt terminal of said tube being situated in said inner section and spaced from said recess, the interior wall of said central passageway engaging with said tube from its butt terminal to the forward end of said intermediate section and the metal constituting said intermediate section having been subjected to a greater compressive strain than the parts of the hub which surround the butt terminal portion of the tube and in compression contact as well as in tight frictional engagement to the extent of approximately half the length of the tube within the hub with the outer surface of a portion of the butt end of the tube situated between the butt terminal and the region where the tube projects from the hub, the inside surface of the tube passage of the hub thereby forming a uniformly and transversely effective pressure joint around such outer surface of the tube and uniting said tube firmly to said hub, said tip section at its outermost end being flared to enable the tube to flex with respect thereto, the interior surface of said tip section being in non-compressive relation with said tube to approximately its juncture with said intermediate section.

7. A hypodermic needle assembly composed of a needle tube having a butt end section, an intermediate section, and a pointed end section, and a metal hub firmly secured thereto, the butt end section of the tube lying within the forward portion of the hub, said forward portion of the hub being provided with an integral outwardly extending enlargement, said enlargement having

a longitudinal extent approximating about half of the length of the tube within the hub and tapering in the direction of the pointed end of the tube and being positioned in a region between the butt end of the tube and the point where the tube emerges from the hub, the metal constituting such enlargement being, for a distance approximating about half of the length of the tube within the hub, in tight compressive contact against that section of the tube which is intermediate the butt end of the tube and its intermediate section, while the metal of the hub surrounding the butt end of the tube is in uncompressed condition, whereby the tube is retained in the hub by being compressively gripped at only an intermediate portion of the tube.

8. A hypodermic needle assembly composed of a pointed metal tube having a butt end section, an intermediate section, and a pointed end section, and a metal hub firmly secured thereto, the butt end section of the tube lying within the forward portion of the hub, said forward portion

of the hub having an interior gently flaring portion and being provided with an integral outwardly extending enlargement, said enlargement having a longitudinal extent approximating one about half of the length of the tube within the hub and tapering in the direction of the pointed end of the tube and being positioned in a region between the butt end of the tube and the outwardly flaring inner portion of the hub, the material constituting such enlargement being, for a distance approximating about half of the length of the tube within the hub, in tight compressive contact against that section of the tube which is intermediate between the butt end of the tube and the outwardly flaring portion of the hub, while the metal of the hub surrounding the butt end of the tube is in uncompressed condition, whereby the tube is retained in the hub by being compressively gripped at only an intermediate portion of the tube.

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