May 22, 1956 H. W. SORENSEN 2,746,454

INTRAVENOUS NEEDLE

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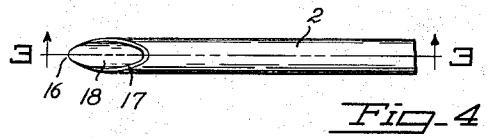



Fig. 4

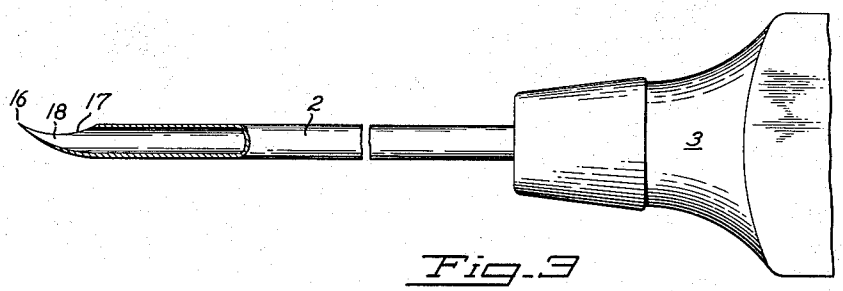



Fig. 3

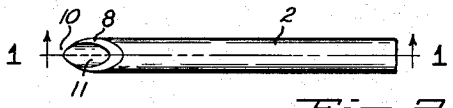



Fig. 2

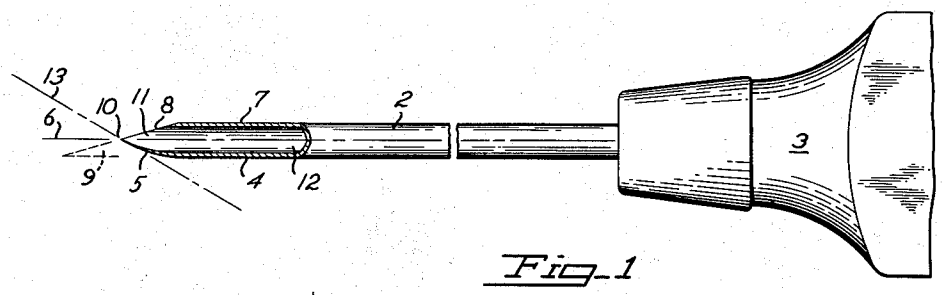



Fig. 1

INVENTOR
HANS W. SORENSEN
BY
Charles S. Evans
his ATTORNEY

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2,746,454

# INTRAVENOUS NEEDLE

Hans W. Sorensen, Walnut Creek, Calif.

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1 Claim. (Cl. 128—221)

My invention relates to medical instruments, and particularly to a hollow needle for injecting a medicament into a vein, or for withdrawing blood therefrom.

One of the objects of my invention is the provision of a hollow needle so shaped as to facilitate introduction of the point and point orifice into the vein without injury to the lumen on the far side of the vein, or penetration of the needle into the tissue on the far side.

Another object of the invention, probably looming larger in importance to the patient on whom my needle is used than to the physician or nurse using it, is the provision of a needle which with a minimum of skilled understanding and practice can be used with high efficiency and very little pain or discomfort.

Other objects of the invention together with the foregoing will be set forth in the following description of the preferred embodiments of my invention which are illustrated in the accompanying drawing. It is to be understood that I do not limit myself to the showing made by the said descriptions and drawings, as I may adopt variations of my preferred forms within the scope of my invention as set forth in the claims.

In the drawings which are all drawn to a scale about eight times actual size of a needle having a diameter of 20 mils, Fig. 1 is a side elevation, partly in vertical half section, of a needle embodying my invention. The plane in which the section is taken is indicated by the line 1—1 of Fig. 2. Portions of the needle are broken away to shorten the figure.

Fig. 2 is a plan view of the pointed end of the needle tube shown in Fig. 1.

Fig. 3 is a side elevation, partly in vertical half section, of a needle embodying my invention in slightly different form. The plane of section is indicated by the line 3—3 of Fig. 4. Portions of the needle are broken away to shorten the figure.

Fig. 4 is a plan view of the pointed end of the needle tube shown in Fig. 3.

In recent years, the medical profession has turned to increasing use of the intravenous needle for injecting directly into the blood stream, solutions carrying drug or chemical components for the treatment of bodily ills. Great progress has also been made in diagnosis by critical analysis of a patient's blood. Where this is to be done, sizable blood samples must be withdrawn; and patient reaction and response to the procedure may be important from several viewpoints.

Sometimes an injection is made into a superficial vein and sometimes into a deep lying one. In both cases the same problem arises, how to insert the needle through the near wall of the vein with the point orifice wholly within the vein, and at the same time avoid injury of the lumen on the far side, or worse still, penetration of both walls of the vein and injection into the adjacent tissue with consequent hematoma.

A considerable amount of skill is required by physician or nurse for proper use of the conventional needle, and unnecessary pain and minor localized injury from unskilled use is not uncommon. My needle does not make judgment and skill unnecessary in its use, but it makes wrong use easier to avoid and very materially aids injection directly into the blood stream with only a single penetration of the needle through the overlying tissue and into one side of the vein and with no other injury.



In broad descriptive terms my intravenous needle is shaped to provide a skid or runner-like surface extending from the point backwardly, and lying on the side of the needle tube opposite the point of orifice.

The angle at which the needle is thrust into the vein is closely related to the flow of the curve of the skid surface backwardly from the needle point, so that at the proper angle of penetration, the skid surface is quite literally one side of the sharp wedge point of the needle, permitting penetration substantially in the line of the needle axis without tendency to lateral drift. When the proper depth is reached, that is, when the needle has penetrated the near wall of the vein, a slight lowering of the hand to sharpen the angle of thrust brings the skid surface into operation, and instead of the point of the needle catching and penetrating the lumen on the far side of the vein, the end of the needle skids along the inside far surface until brought to a stop by the operator.

Of course all of these movements are of small magnitude; and after penetration of the near wall and a small sharpening of the angle of the line of thrust, further forward movement is only enough to insure full penetration of the near wall and the free flow of injection fluid from the point orifice into the blood stream.

A small prolongation of the pointed end of the needle with attendant lengthening of the skid surface, as shown in Fig. 3, aids in accurate introduction of the point orifice into a superficial vein. With this needle the two movements of the hand are of less magnitude, and are effected almost together, that is, an inward thrust to penetrate the overlying tissue and near wall, followed and then accompanied by a lowering of the hand to set the point of the needle and the point orifice within the vein. With a deeper vein, in which the needle shown in Fig. 1 is used, the range during which the two movements are effected together is shorter, since the needle is buried more deeply in the tissue, and the sharpening of the angle occurs near the end of the inward thrust instead of during the last half or third.

The values indicated by the drawings are not sharply critical; and are subject to some small variation without sacrifice of effectiveness and correct usage, which seeks to place the pointed end of the needle including the point orifice wholly within the vein without other injury than that inherent in the single penetration of the near wall and the overlying tissue.

The needle shown in Fig. 1 is for injection into or withdrawal from deeply buried veins. The cylindrical tube 2 and head 3 are of any conventional or desired type, the head having the usual tapered or threaded socket for attachment to the syringe nozzle. One side 4 of the tube, in the portion 5, is curved up toward the long axis 6 and opposite side 7; and intersects the edge 8, formed by cutting the tube in a plane lying at the sharp angle 9 of about 15° to the axis. The extreme outer point of intersection 10 lies in or very close to the axis as viewed in Fig. 1. This leaves the point orifice 11 of the needle somewhat larger than the cross section of the passage 12 through the needle; and the direction of discharge from the needle in a line substantially in parallelism with a line 13 tangent to the curve at the needle point. It is also to be noted that the point orifice 11, lying opposite to and substantially coextensive with the skid surface 5, is opened when the wall of the tube is cut to form the enclosing edge 8.

The curved portion **5**, constituting the skid surface of the needle, extends backwardly from the point **10** and merges with the cylindrical surface of the tube about opposite the innermost point of intersection of the plane of the edge **8**.

An excellent result is obtained by first grinding a 15° bevel on the end of the tube to form the edge **8**. The opposite wall is then a long pointed extension of the tube. This extension is then bent upwardly and the end beyond the plane of the edge **8** ground back to conform to the original bevel. Bending the tube extension, unless done in a die under pressure may cause slight deformation or crimping of the tube wall. This may be dressed off to leave a smooth and evenly curved skid surface merging into the cylindrical surface of the tube, and the rounded edge of the point, as best seen in Fig. 2, may then be dressed and sharpened as desired.

The needle shown in Fig. 3 differs structurally from that just described only in that in making it, the upturned end is retained, the extreme point **16** being approximately aligned with the uppermost element of the cylindrical tube as viewed in Fig. 3; and the edge **17** of the point orifice **18** lying in a concave and preferably cylindrical surface instead of in a plane as in Fig. 1. Both edge **8** of Fig. 1, and edge **17** of Fig. 3 surrounding the point orifices **11** and **18** respectively, extend from the point of the needle to a point on the cylindrical surface of the needle tube approximately opposite to the point at which the curve of the skid surface commences. The shape of the needle shown in Fig. 3 with its faint suggestion of a hook, lends itself to facile and skilled introduction of the needle into a superficial vein, with the combined thrust and dip motion previously explained.

It is to be noted that the point orifice of either one of my needles is of greater cross sectional area than that of the passage through the tube, so that no restriction is offered to the injection of a treatment fluid into the vein,



or the reverse movement of blood through the needle when it is used to withdraw blood from the vein.

It will also be seen that the skid surface of my needle aids the user in the selection of the precise point of entry and the angle at which penetration is to begin, since it may be pressed into the skin and drawn backwardly a short distance without injury to the skin while these values are determined. This procedure also tends to stretch the skin and ease penetration of the point.

I claim:

A hypodermic needle comprising a cannula and an integral pointed end, said cannula having right cylindrical outer and inner surfaces, said pointed end having an open side, a closed side and a penetrating point located between the longitudinal axis of the cannula and the outer surface adjacent said open side, the median line of said closed side being curved outwardly with respect to a straight line extending from the penetrating point to the end of said outer cylindrical surface, said open side comprising a surface surrounding an opening communicating with the lumen of the cannula, the last named surface curving inwardly with respect to a straight line extending from the penetrating point to the end of said outer cylindrical surface of the cannula, the surface of said open side of said pointed end comprising a substantially cylindrical portion.

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