

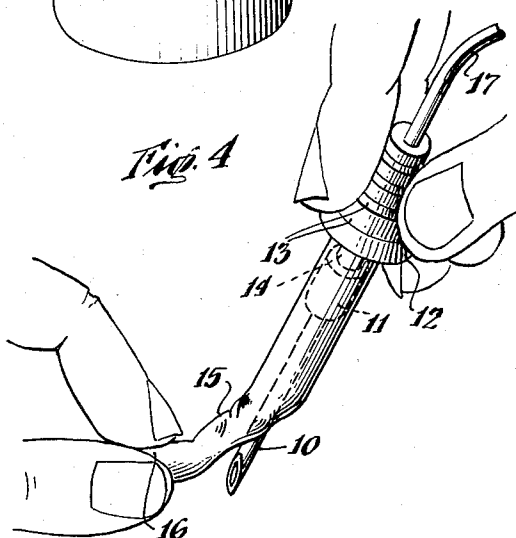
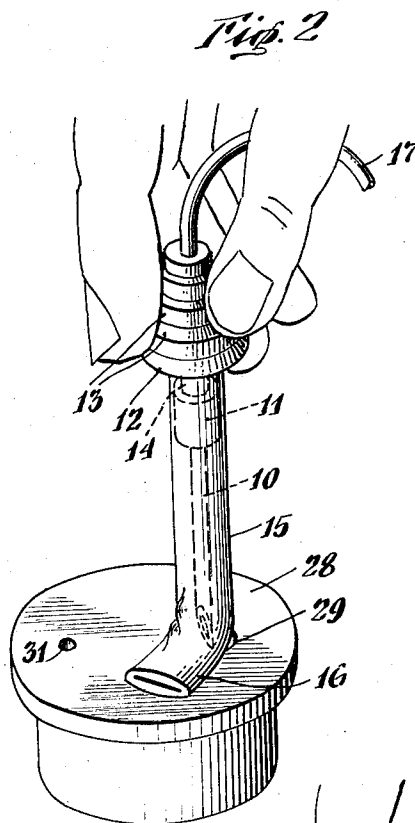
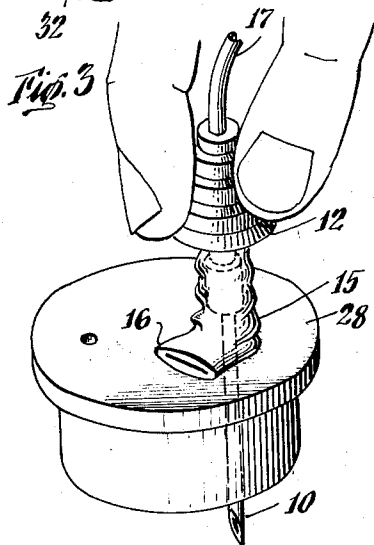
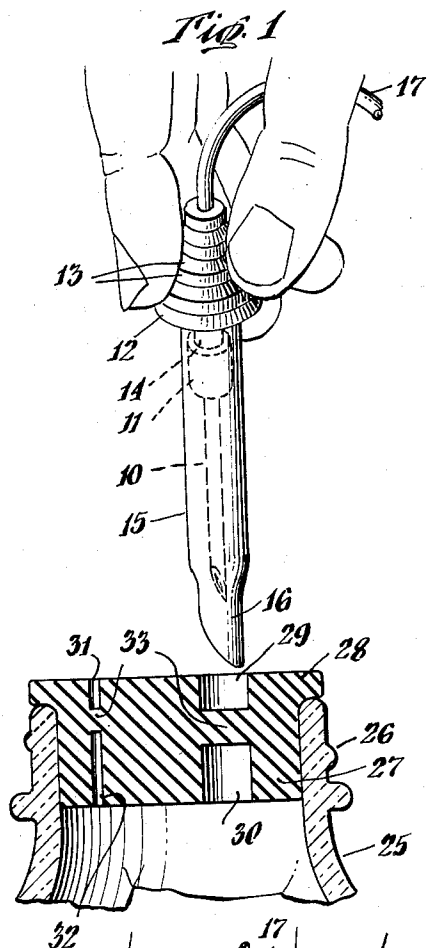
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J. Q. ADAMS
TRANSFUSION NEEDLE SHEATH

2,847,995

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2 Sheets-Sheet 1



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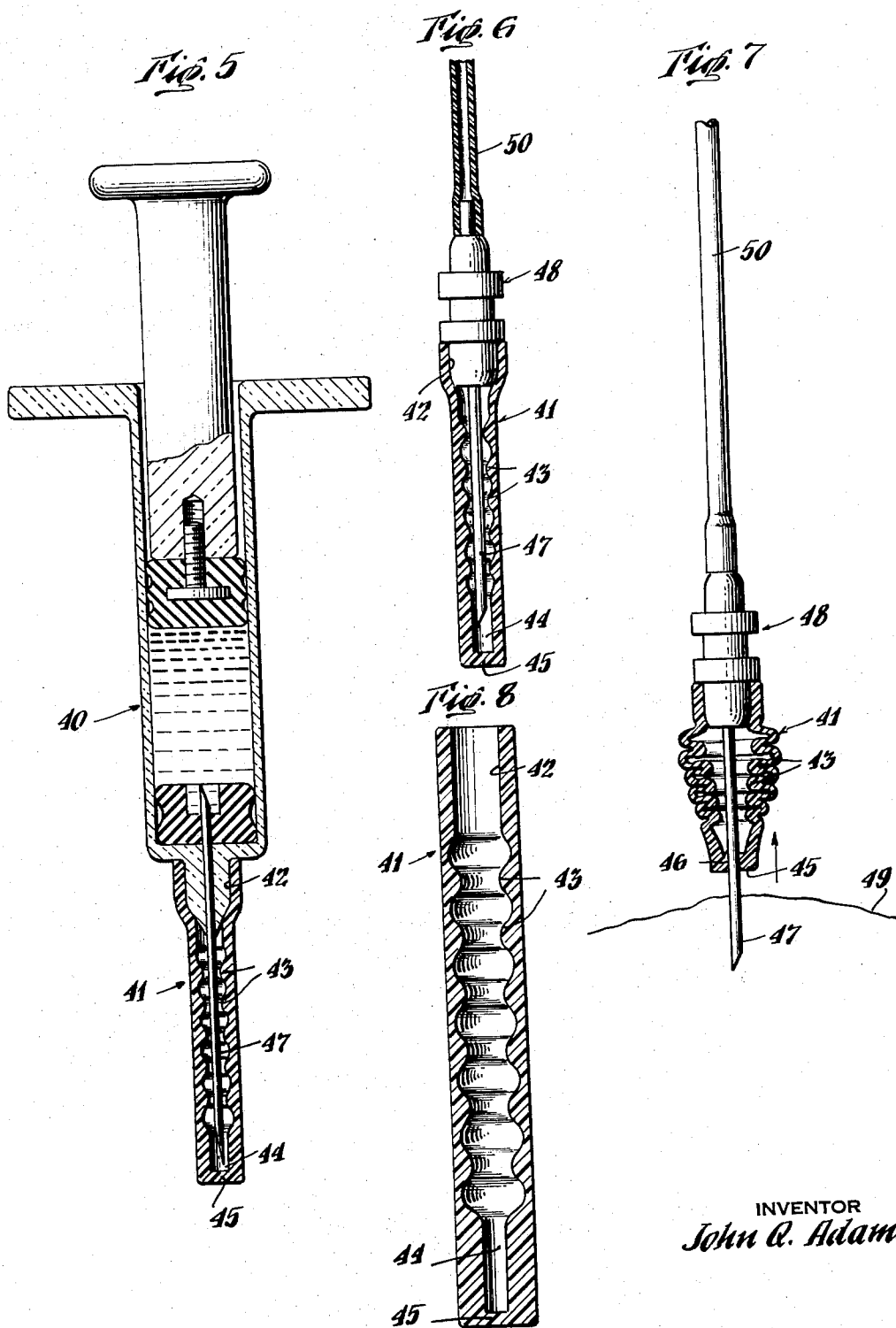
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TRANSFUSION NEEDLE SHEATH

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4 Claims. (Cl. 128—214)

This invention relates to a structurally and functionally improved sheath or protecting assembly for use in connection with hollow needles of the hypodermic type; the present application being a continuation in part of the prior United States application in the name of Joseph J. Kleiner and myself on Blood Donor Assembly filed in Washington on May 15, 1951, and now issued under United States Patent No. 2,689,562 on September 21, 1954.

By means of the present teachings, a structure is presented which will properly encase and protect the operative parts of the hypodermic needle against contamination. Therefore, the physician or other user will be able to make an injection, transfer blood or other liquids and perform additional operations as required, with full assurance that the needle is in properly sterile condition. Also, by means of the present teachings an assembly is furnished which will require no conscious manipulation to render the needle available for the desired purpose.

Still another object is that of designing an encasing or sheath structure for a needle in association with, for example, a hypodermic syringe or blood donor set, and which assembly will be of simple design and capable of manufacture according to quantity production methods at a relatively nominal figure; the sheath maintaining the needle in properly sterile condition for indefinite periods of time.

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

Fig. 1 is a partly perspective view showing the end of a blood donor set and illustrating the same in process of application to a receptacle which has been illustrated in a fragmentary sectional manner;

Fig. 2 is a perspective view of the sealing stopper of the receptacle and illustrating the initial association of a needle therewith;

Fig. 3 is a similar view showing the needle after it has penetrated the stopper;

Fig. 4 illustrates a further perspective view of the end of the donor set and illustrating its manipulation after removal from association with the stopper.

Fig. 5 shows an alternative and improved form of sheath structure applied to a hypodermic syringe;

Fig. 6 illustrates that structure included in and applied to the end of a donor set;

Fig. 7 shows that set in use; and,

Fig. 8 is an enlarged sectional side view of the sheath per se as illustrated in Figs. 5, 6, and 7.

Referring primarily to Figs. 1 to 5 it will be seen that the reference numeral 10 indicates the shank of a cannula or hypodermic needle which, in accordance with conventional construction, has a pointed outer end. A hub 11 may form a portion of the needle adjacent to the rear of the latter; the hub being continued, if desired, in the form of a neck 14. A manipulating head 12 which as illustrated may be in the form of a truncated cone is attached to the rear end of the needle and is conveniently formed with a ribbed surface 13 so that the fingers may

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readily grasp the same. While numerous different materials may be employed to provide this head, it is preferred to utilize natural or synthetic rubber of a suitable degree of hardness.

Disposed in sealing relationship with respect to the mounting provided by head 12 and/or hub 11, is a sheath 15 preferably formed of natural or synthetic rubber. That sheath is tubular and has an internal diameter adequate to accommodate the needle. Also, its length should be such that the sheath bore is open to a zone beyond the piercing point of the needle. Beyond that point the sheath is conveniently flat and sealed to present an end portion 16. The sheath may obviously be formed of any suitable flexible material such as plastic, natural or synthetic rubber. The sealing of the bore embraced within its end portion 16 may be effected by heat or otherwise.

The assembly as shown in the figures under consideration comprises one end of a blood donor set. That set is employed, for example, in transferring venous blood from a donor to a suitable receptacle. Also, it has numerous other uses such as permitting a transfer from one receptacle to another, or from a receptacle to the vein of a recipient. To this end a flexible tube 17 is connected to head 12 and neck portion 14, so that its bore is in free communication with the lumen of the needle. A more or less standard form of receptacle and its closure has been shown in Fig. 1.

Thus in that view, the numeral 25 indicates the upper end of a receptacle or bottle such as is commonly used in connection with medical work to receive blood, plasma, etc. The neck of the container is conveniently formed with an exterior thread 26 for the mounting and retention of a cap (not shown). A closure in the form of a stopper is employed to seal the receptacle. This stopper includes a plug portion 27 and a head 28, the flange of which overlies the upper edge of the receptacle neck. Conveniently to one side of the center of this closure its upper face is formed with a recess 29 which extends through the head portion 28 and into the plug portion 27. A second recess 30 is formed in the inner face of the closure in line with recess 29. At a diametrically opposite point, the upper and lower faces of the closure may be formed with recesses 31 and 32 which are aligned with respect to each other. In this manner, pierceable diaphragm portions 33 are provided, intervening the base portions of the aligned recesses. A venting needle or cannula is disposable through the partition or diaphragm intervening recesses 31 and 32. A liquid transferring needle is projectible through the partition intervening recesses 29 and 30. Such a needle is a cannula of the type heretofore identified at 10.

In use it will be assumed that the closure is to be pierced for the purpose of transferring liquid to the interior of receptacle 25. To this end head 12 is grasped as in Fig. 1 and the needle 10 has its piercing point aligned with recess 29. Now by moving that needle inwardly toward the closure, as in Fig. 2, it will be seen that the flattened or closed end 16 of sheath 15 will bear against the upper surface of the stopper, as in Fig. 2. The point of the needle will therefore engage the lower face of the sheath and under continued axial thrust, the pointed end of the needle will penetrate the sidewall of the sheath and pierce the diaphragm portion 33 to extend through and beyond recess 30 as shown in Fig. 3. Thus, the seal is punctured and the desired transfer of liquid may occur.

The operator will thereupon again grasp head 12 and exert a retractive force through the same upon needle 10 to withdraw the latter through recess 29. In such withdrawal it will be apparent that as the parts clear each other, the outer zone of the needle will remain in a position ordinarily extending through the wall of the sheath and projecting beyond the same. This is illustrated in Fig.

4. To properly protect and enclose the sheath, the operator may therefore grasp the end portion 16 of the same and exert a pull thereon such that the sheath is tensioned or stretched. Under these circumstances, the sheath being elongated, the pointed needle end is withdrawn into the bore thereof. Thereupon, after releasing the parts, the original condition as existing in Fig. 1, will be re-established with the pointed end of the needle and its shank portion completely enclosed and protected by the sheath and with the perforation established by the needle being substantially sealed.

In Fig. 8 there has been shown an alternative and in many respects a preferred form of sheath, which conveniently includes a substantially smooth and circular exterior face. This sheath is formed of any desired material, although it is most desirably constructed of pure gum rubber. This sheath will include an upper open end terminating in a preferably smooth bore portion 42. Inwardly of the latter the sheath surface may be corrugated throughout a major portion of its bore, as indicated in 43. This bore terminates in a part 44 which is preferably of reduced diameter and an integral end wall 45, constituting a pierceable portion. The length of the total bore should be slightly in excess of the overall effective length of a needle assembly to which it is applied.

Thus, as in Fig. 5 in which the parts have been illustrated in association with one form of hypodermic syringe, it will be noted that bore portion 42 intimately engages the mounting provided by the syringe tip adjacent the base of the needle. Therefore, it sealingly contacts the surfaces of the latter and prevents the entrance of air or any foreign materials which would contaminate the parts. The bore portion which is corrugated extends concentrically and spaced with respect to the needle. The pointed outer end of the latter projects into the bore portion 44 which acts as a guide for the outer needle end during a limited portion of its movement. The needle point lies immediately adjacent the inner face of pierceable portion 45.

In Figs. 6 and 7 the form of sheath as shown in Fig. 8 has been illustrated in association with one end of a blood donor set. In those views the numeral 47 indicates a piercing needle of the hypodermic type which is provided with a hub assembly 48. To one end of the latter there is attached a flexible tube 50 the bore of which communicates with the lumen of the needle. The outer zone of bore surface 42 engages the mounting provided by the opposite hub end. Initially the parts will be disposed in the manner shown in Fig. 6. However, when a piercing action occurs in response to an axial projection of the needle, the point of the latter will penetrate end wall 45. Thereupon, as the needle plunges into the tissues or the material of a closure (for example), the sheath will retract along the shank of the needle. The opening through end wall 45 has, of course, been formed by needle-piercing action. Therefore, the adjacent surfaces of the sheath will grip the needle as indicated at 46. This will prevent an automatic retraction of the sheath from the position shown in Fig. 7 to that illustrated in Fig. 6. Accordingly, if it is desired to again enclose the needle after the latter is withdrawn, a deliberate manipulation of the parts may be resorted to as in Fig. 4.

The same functioning of the parts will occur in connection with the syringe assembly as shown in Fig. 5. In other words, the sterilized needle will be maintained in an entirely protected condition until the apparatus is ready for use. At that time communication may be established between the body of liquid medicament and the rear pointed end of the needle by a suitable manipulation of the assembly. Then with the site of the injection having been selected, the syringe may be shifted axially to bring the outer face of wall or diaphragm portion 45 into contact with the epidermis. Under a con-

tinuing thrust, the needle point, guided within bore portion 44, will pierce end wall 45 and plunge into the tissues below the skin. When a suitable depth has been reached, the plunger of the syringe may be projected to expell the medicament through the bore of the needle. In the interim, the sheath will remain retracted along the needle shank as shown in Fig. 7 with surfaces 46 intimately engaging the needle face. Therefore, the retraction will be maintained as the needle is withdrawn after the hypodermic injection has been achieved. At that time, if desired, the sheath may be stretched or tensioned so as to again enclose the needle. In most instances, however, this will not be necessary in that the assembly will simply be discarded.

As will be understood, in connection with heavy gauge needles, it might be desirable to provide a structure which would assure a return of the sheath to its initial position. To this end any preferred expedient may be employed to assist the sheath in assuming an extended condition as illustrated, for example, in Figs. 5, 6 and 8.

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

I claim:

1. In combination, a hypodermic needle comprising a shank terminating in a pointed outer end and having an inner end for connection with a liquid-conducting unit, the lumen of said needle extending uninterruptedly from one to the other end of said shank, a tubular sheath of flexible material comprising a body having a closed outer end and an open inner end, said latter end being connected to said needle to provide a seal preventing access of fluid between the adjacent inner end surfaces of said needle and sheath, the inner lumen end being unobstructed by said sheath, such sheath being concentrically disposed around the length of said shank and extending beyond the outer end of said needle; an area of the sheath material extending adjacent such needle end being engageable with a pierceable body surface whereby—in response to an axial thrusting of the needle—its point will penetrate such area of the sheath and the adjacent pierceable body to provide for an unobstructed path of liquid flow through the lumen from the pointed needle end through to the inner end of the latter and the bore surface of said sheath being corrugated.

2. In the combination as set forth in claim 1, and the outer surface of said sheath being substantially cylindrical.

3. In combination a hypodermic needle having an outer end defined by a piercing point, a sheath of non-pervious material having a closed outer end and an open opposite end, said sheath enclosing said needle with the point of the latter disposed adjacent the closed outer end of said sheath, means whereby the zone of the sheath adjacent its open end is connected to said needle remote from its piercing point, said needle being projectible with respect to said sheath to cause its point to penetrate the sheath adjacent the closed end thereof and said sheath being formed of a material of such flexibility that—as the projection of the needle continues—the effective length of the sheath will diminish and excess sheath-material will be arranged in the form of corrugations concentrically disposed around said needle.

4. In combination a hypodermic needle assembly comprising a cannula pointed at one end, a hub secured thereto adjacent its opposite end, a sheath embracing a tubular body having an integral closed outer end portion and formed of a flexible and pierceable material, the inner end of said sheath enclosing and frictionally gripping said hub, the body of said sheath being cylindrical throughout its length and concentrically disposed with respect to said cannula and the closed end of said sheath lying adjacent the pointed end of that cannula, that point

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being unobstructed and piercing an area of said sheath in response to axial thrust of the cannula toward and into contact with a surface to be pierced.

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