United States Patent

[11] 3,568,677

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[73] Assignee **Brymill Corporation**
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[54] **SURGICAL VEIN STRIPPER**
2 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **128/303**
[51] **Int. Cl.** **A61b 17/00**
[50] **Field of Search** 128/303-
—304

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Primary Examiner—L. W. Trapp
Attorney—Melvin Pearson Williams

ABSTRACT: A surgical vein stripper comprises a rod of semirigid plastic material, such as nylon or Teflon, with means provided at the end thereof so as to permit nonslipping engagement with a vein, which is to be stripped, tied the end of the rod with a suture. The means may comprise a molded or forged enlargement, a transverse pin, suitable indentations or serrations, or a transverse annular ring which engages a loop in the rod of material.

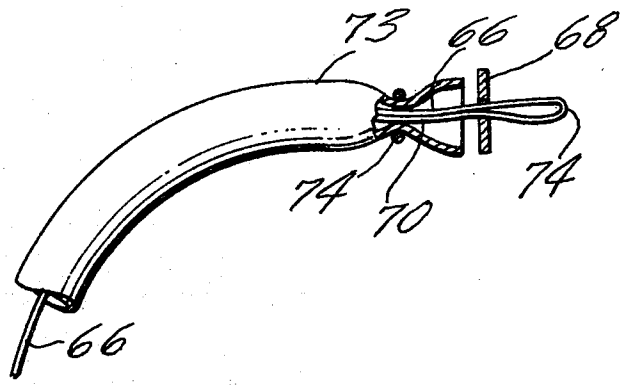


FIG. 1

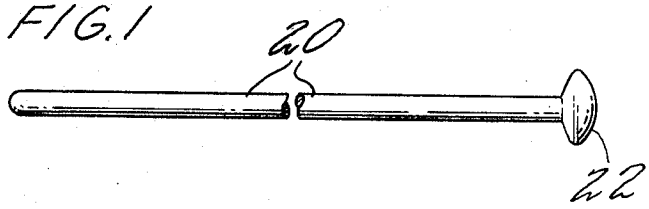


FIG. 2

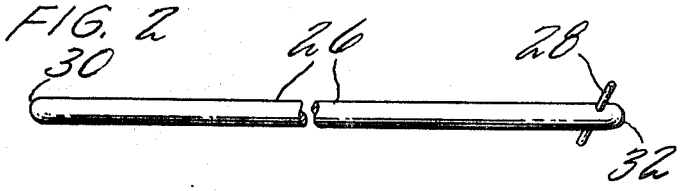


FIG. 3

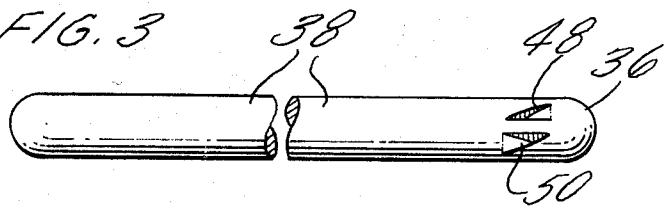


FIG. 4

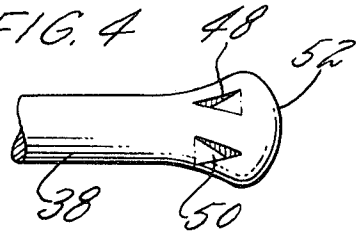


FIG. 5

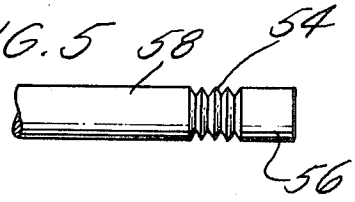


FIG. 6

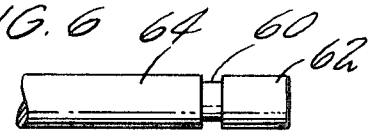


FIG. 7

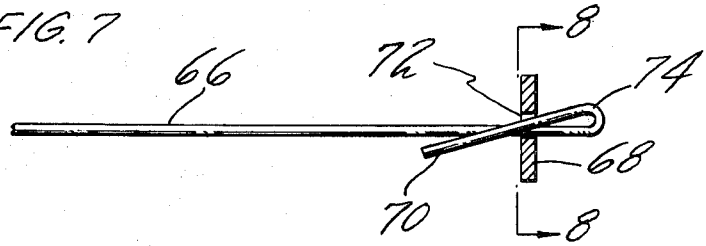


FIG. 8

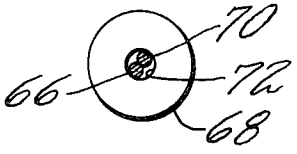


FIG. 9

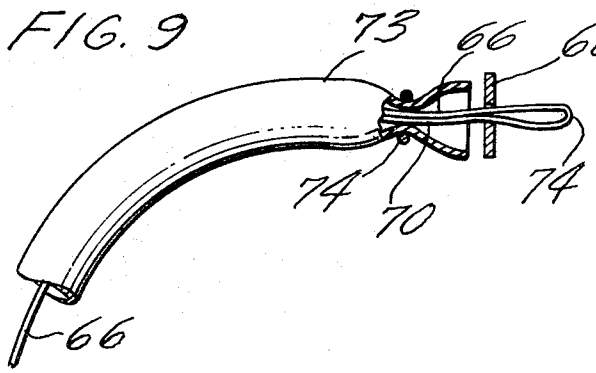
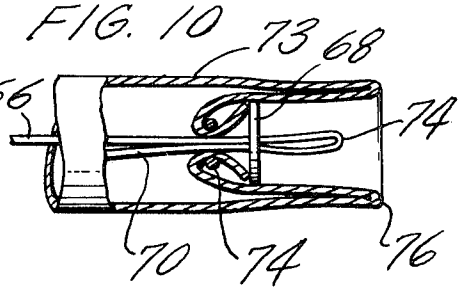


FIG. 10



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SURGICAL VEIN STRIPPER

BACKGROUND OF THE INVENTION

1. Field of The Invention

This invention relates to surgical vein apparatus, more particularly to surgical vein strippers and cutters.

2. Description of the Prior Art

One form of vein stripper known in the prior art comprises a surgical steel rod which is essentially not flexible. That is, although bends of extremely large radius of curvature can be made in the rod, the rod cannot follow tortuous routes which are frequently required due to the anatomical condition which is one of the primary reasons for removal of the vein. Thus, this rod cannot follow sharp bends in the vein and, therefore, may frequently puncture the vein. This can result in the need for multiple incisions and taking the vein out in sections. In addition, strippers made of surgical steel require sterilization and additional handling so that they tend to become bent as a result of mishandling and from coming into contact with other objects during storage. Thus, as a result of general wear and tear, the facility of the surgical steel vein stripper to be easily moved along the inside of a vein is impaired with the life of the stripper. Of course, the length of vein stripper involved requires either that it be made in a jointed fashion or else it presents difficulties in being processed in an autoclave.

Another form of vein stripper known to the prior art is a flexible surgical steel stripper which may comprise either a spiral steel wire (similar to a plumber's snake) or a cable which is composed of braided steel wire. Strippers of this kind are too flexible and have a tendency to become kinked, coiled and entangled in the normal wear and tear of sterilization, handling and storage. In addition, due to the extreme flexible nature, this flexible sort of vein stripper also has the disadvantage of not being able to follow tortuous routes since it has no capability of transmitting axial compressive force: in other words, it cannot be pushed through a vein readily. In addition, the flexibility may tend to cause internal installment in one fashion or another, particularly where sharp bends in the vein exist.

A procedure not heretofore practical with vein strippers known to the prior art is a multiple vein procedure wherein not only the great saphenous vein, but also the small saphenous and other secondary veins exhibiting varicosity may be removed in a single operation. In such a procedure, it may be advisable to use separate strippers reached by different incisions at the extremity, a smaller stripper being inserted into a secondary vein and fed along the vein to the point where it joins the main vein (such as the femoral vein), and thereafter fed along the main vein, side-by-side with a larger stripper which has been fed into the main vein at the distal end thereof. In such a procedure, the small vein may then be inverted into the larger vein first, and then the larger vein may be stripped in the normal fashion, bringing with it the smaller vein. However, strippers of the prior art are either too rigid to follow the small vein, or because of which small veins follow, too flexible to be pushed along the tortuous route of the smaller vein.

From the foregoing discussion, it can be seen that all of the problems of vein strippers are compounded by the need for maintaining the useful original character of the stripper, while at the same time a great deal of handling and maintenance is required. It is therefore very difficult to maintain surgical vein strippers of the type known to the prior art at a suitable level of proficiency so as to perform a variety of vein stripping operations in a fashion which is consistent with high surgical standards.

Furthermore, because of the problems recited hereinbefore, vein stripping operations currently practiced frequently encompass excessive time, therefore requiring that the patient be subjected to excessively long periods of anesthesia.

SUMMARY OF THE INVENTION

The object of the present invention is to provide surgical vein strippers capable of easy insertion into veins of a variety of sizes along tortuous routes, the performance of multiple vein operations, avoidance of the deterioration of vein stripping equipment as a result of sterilization, handling and storage, and the performance of vein stripping operations in a time which is much shorter than that required with vein strippers of the prior art.

In accordance with the present invention, a vein stripper comprises a length of organic material, such as a polymer or fluorocarbon, having a characteristic that a vein tied to one end thereof will resist slipping as the vein is inverted into itself in the process of being stripped from the patient. In accordance with the invention still further, a vein stripper may have a molded or forged enlargement on one end, which enlargement prevents the slippage of a vein tied in juxtaposition therewith. In accordance further with the present invention, the vein stripper may have a transverse pin disposed therethrough, which transverse pin prevents the slippage of a vein tied in proximity thereto. In accordance still further with the present invention, various forms of molded, forged or machined indentations, serrations and notches may be provided in one end of the vein stripper so as to prevent slippage of the vein tied thereto. In still further accord with the present invention, a plain length of suitable material may be caused to engage a separate piece, such as an annular ring, by being threaded therethrough and then fed back so as to form a loop which will not pass through the object. The object then resists the tendency of a vein to slip on the stripper when tied thereto during the stripping operation.

A main feature of the present invention is its ease of insertion through the vein. Because of its flexure and surface characteristics, it progresses through the vein readily. This is partly due to the fact that there is less adhesion between the surfaces of vein strippers in accordance with the present invention and the lumen surfaces of the vein than there is between said surfaces and metal vein strippers known to the prior art.

Still another feature of the present invention is that it avoids the necessity of multiple incisions and multipiece vein strippers. Thus, the normal stripping operation may be performed with one incision at the distal end, and one incision at the proximal end of the vein, together with the use of a one piece vein stripper.

Another main feature of the present invention is that it makes possible the use of disposable vein strippers. Thus, the need for sterilization, handling and storage is overcome, and wear and tear on the stripper, which impairs the capacity to perform in a surgical fashion in subsequent stripping operations, is avoided. Furthermore, since the stripper does not comprise a surgical steel implement of the common type, it may be made accessible to users in bulk form, such as in spools or long lengths, from which suitable lengths of vein stripper may be separated. There exists also the capacity to have vein strippers in accordance herewith presterilized and surgically packaged, so as to be ready for use in the operating room, and thence to be thrown away upon the completion of an operation. In addition, because of the inherent nature of vein strippers in accordance with the present invention, it is possible for surgeons to have a wide variety of sizes and configurations available without a high capital outlay or the need to sterilize, store and handle a large number of tools. Thus, the central supply of a surgical facility may have vein strippers in accordance herewith with preshaped ends thereon in sterile packages which are best suited for certain types of vein stripping operations, and may also carry a variety of sizes of bulk vein stripping material to be used with a loop engaging object (such as an annular ring, as described hereinbefore), thereby to provide a variety of vein strippers so as to permit choice of optimum characteristics for the performance of any given vein stripping operation. The vein strippers in ac-

cordance herewith are much less expensive than those known to the prior art, and necessarily avoid a great deal of personnel expense in the sterilization, handling and storage thereof.

DESCRIPTION OF THE DRAWING

FIG. 1 is a side view of a first embodiment of the present invention using a molded, forged or machined enlargement at one end;

FIG. 2 is a second embodiment of the invention utilizing a transverse pin;

FIG. 3 is a side view of a third embodiment of the invention having indentations therein;

FIG. 4 is a modification of the embodiment of FIG. 3 in which the indentations are accompanied by an enlargement;

FIG. 5 is a side elevation of an embodiment of the invention having serrations, which may either be threads or parallel serrations;

FIG. 6 is an elevation of an embodiment of the present invention where one end has a notch formed therein:

FIG. 7 is a partially sectioned, side elevation of another embodiment of the present invention in which a plain piece of vein stripping material is threaded back on itself through an object, such as an annular ring;

FIG. 8 is a side elevation and partial section taken on the line 8–8 in FIG. 7;

FIG. 9 is a partially sectioned, side elevation of the embodiment of FIGS. 7 and 8 after it has been tied to the vein prior to the vein stripping operation; and

FIG. 10 is a sectioned side elevation of the embodiment of FIGS. 7—9 after the vein stripping operation has begun, with the vein being inverted into itself.

The foregoing and other objects, features and advantages of the present invention will become more apparent in the light of the following detailed description as illustrated in the accompanying drawing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, a first form of the invention may consist of a suitable plastic which is sufficiently flexible so as to be bent in following the course of a vein, but sufficiently rigid so as to be able to transmit compressive force thereby permitting it to be pushed along the course of a vein. Such a suitable plastic may comprise a number of varieties of nylon or Teflon, or other polymers and polycarbonates as well as suitable other forms of plastic. The vein stripper in the embodiment of FIG. 1 comprises an elongated shank portion 20 which may be of any length suitable to the needs involved; for instance, the length should be chosen to be in excess of the length of vein which is to be stripped, along the route which must be threaded by the stripper through the vein, prior to the stripping operation. At the right hand end of the stripper in FIG. 1, an enlarged portion 22 may be formed by molding (in the case where the entire stripper is molded); it may be formed by machining (where a rod of larger diameter is used as the base material) and material is removed throughout the shank portion 20; or it may be formed by a forging process wherein the application of a suitable, mild heat along with pressure will cause material originally at the same diameter as the shank portion 20 to be forged into a foreshortened but enlarged portion 22. At the left hand end 24 of the vein stripper illustrated in FIG. 1, the stripper may be rounded in a semispherical fashion so as to permit easy insertion of the vein stripper as the stripper is inserted in a leftward direction as seen in FIG. 1.

Referring now to FIG. 2, any of the materials referred to hereinbefore may be utilized so as to provide an elongated shank portion 26, having a hole machined therein to permit insertion of a small pin 28. The pin may be of metal or a suitable plastic, wood, or other material, it serving merely to supply resistance to slippage of a vein after it is tied to the shank portion 26. Each of the ends 30, 32 may be rounded if desired so as to permit easy slippage of the vein stripper as it is being inserted into the vein prior to the stripping operation. On the other hand, since the size vs. flexibility factor, of vein strippers made in accordance with the present invention, promotes easy insertion, it is not necessary to provide rounded ends, the ends will be easily inserted through the vein even though flat. In the embodiment of FIG. 2, the end 32 would be inserted into the vein without the pin 28 in place, and after the stripper is inserted entirely through the vein and the end 32 has emerged out of the other end of the vein, the pin 28 is inserted through a hole in the stripper and the vein is then tied down to the stripper close to the pin 28. The pin therefore will resist the tendency of the vein to slip along the stripper toward the end 32, as the stripper is moved to the left (as shown in FIG. 2) in the vein removing operation.

In the embodiment of FIG. 3, a plurality of depressions may be formed in an end 36 of the vein stripper in such a fashion as to not significantly lower the tensile strength of the main shank 38 of the stripper. This embodiment may be particularly advantageous in the case of extremely small vein strippers where the provision of holes for the insertion of pins or of notches (as in the embodiment of FIG. 6 which is described hereinafter) would weaken a thin vein stripper to the point where it could rupture as a vein was being pulled. As illustrated in FIG. 3, each of the depressions 48, 50 is oriented in an opposite direction so as to maintain a suitable cross section of material for tensile strength, the narrow end of the depression being deep, and the wide end of the depression being shallow. Although two depressions are shown in FIG. 3, it is likely that three, four or more depressions might be desired in any given embodiment, which may be chosen to suit any implementation of the present invention. In FIG. 4 is illustrated another modification of the embodiment of FIG. 3 wherein the depressions 48, 50 would be forged under pressure with a little heat, thus resulting in a slight enlargement of an end 52 of the vein stripper. This enlargement will tend to resist slippage of the vein after it is tied thereto, during the vein stripping operation.

Another form of vein stripper in accordance herewith, as illustrated in FIG. 5, includes circumferential serrations 54, which may either be parallel or may be disposed as a single spiral (such as threads). The serrations 54 may be provided in an end 56 of a vein stripper 58, a portion of which has been broken away for simplicity. By tying the vein directly above the serrations, the tendency of the suture or thread used for tying is to cause compression of the vein into the serrations thereby providing sufficient resistivity to slippage so that the vein follows the stripper during the stripping operation.

An embodiment of the present invention which is best suited for use with large vein strippers is illustrated in FIG. 6. Therein, a notch 60 is provided near an end 62 of a vein stripper 64, most of which is broken away for simplicity. In such a case, the vein is tied so that the compression of the thread or suture used for tying is within the notch 60, thus securely holding the vein against slippage during the vein stripping operation.

A most important embodiment of the present invention is illustrated in FIG. 7. Therein, the vein stripper comprises a length of suitable plastic rod 66 which may be cut from a roll or long rod of material to any desired length. In this embodiment, the stripper is fed through the vein until the feed-end emerges from the opposite end of the vein, and then an annular ring 68, which may be comprised of surgical steel, plastic or other suitable material, is slipped over an end 70 of the stripper, then the end 70 is fed back through the ring 68. The ring 68 has a hole 72 therein which is sufficient to permit two sections of the stripper 66 to be fed therein, but the diameter is too small to permit a loop of the vein stripper 66, 74 to pass therethrough. It has been found that by selecting a ring 68 having a hole 72 with a diameter which is slightly less than twice the diameter of the stripper 66, the above condition is met. It can be readily seen that the embodiment of FIG. 7 makes it quite advantageous to have a supply of preselected diameter of vein stripper material 66 in elongated bulk, such as long rods or on spools, with a commensurate supply of

properly sized rings **68**, thereby to give the surgeon a wide variety of choice of vein stripper sizes which are readily available and are easily processed for the single operation and then may be thrown away. Additionally, the outside diameter of the ring **68** may be chosen to suit a suitable wall thickness for a particular vein which is being removed. It is therefore possible to provide vein strippers having various diameters with rings **68** having additional combinations of diameters so as to provide an overall combination of possibilities in excess of that possible with vein strippers known to the prior art.

The vein stripper illustrated in FIGS. **7** and **8** is applied to the vein as shown in FIG. **9**. Therein, the stripper has been threaded all the way through the vein **73** so that the end **70** has protruded from the vein; the ring **68** has been threaded over the stripper **66**, and then the end **70** has been fed back through the ring a sufficient distance so that it will not readily slip back through the ring, preferably under the area of the vein which is to be tied by a suture or thread **74**. As can be seen in FIG. **9**, the vein is tied very tightly to the stripper so that it will not slip as the stripper is pulled to the left in FIG. **9**. After the vein **73** is secured to the stripper by the suture or thread **74**, the stripper **66** is moved to the left (in FIG. **9**), which causes the vein to double back on itself internally, as illustrated in FIG. **10**. The vein stripping operation proceeds in the usual fashion, so that for every given unit of distance that the stripper **66** is moved to the left in FIG. **10**, a fold **76** in the vein **73** will move half that increment to the left until the entire vein has been turned inside out and is removed from the patient, in a fashion well known in the art.

Although the invention has been shown and described with respect to the preferred embodiments thereof, it should be understood by those skilled in the art that the foregoing and other various changes and omissions in the form and detail thereof may be made therein without departing from the spirit and the scope of the invention.

We claim:

1. A vein stripper comprising:

an elongated semiflexible plastic material; and

an annular ring through which said vein stripper is fed, and then fed back as to provide a loop, said ring having a hole of a diameter chosen so that it will not slip over said loop.

2. The vein stripper according to claim **1** wherein the inside diameter of said ring is slightly less than twice the diameter of said elongated semiflexible plastic material.