(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 079 738 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
23.03.2005 Bulletin 2005/12

(21) Application number: **99918885.7**

(22) Date of filing: **28.04.1999**

(51) Int Cl.[7]: **A61B 17/02**

(86) International application number:
PCT/US1999/009230

(87) International publication number:
WO 1999/056633 (11.11.1999 Gazette 1999/45)

(54) **ILLUMINATED SURGICAL RETRACTOR**

BELEUCHTETER CHIRURGISCHER RETRAKTOR

ECARTEUR CHIRURGICAL ECLAIRE

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

(30) Priority: **01.05.1998 US 71786**

(43) Date of publication of application:
07.03.2001 Bulletin 2001/10

(73) Proprietor: **Teleflex-CT Devices Incorporated**
(A Delaware Corporation)
Plymouth Meeting, PA 19462 (US)

(72) Inventors:
- **HIPPS, W., Michael**
Augusta, GA 30904 (US)
- **CAMPBELL, Robert, F.**
Marietta, Georgia 30066 (US)

(74) Representative: **Frohwitter, Bernhard, Dipl.-Ing.**
Patent- und Rechtsanwälte,
Possartstrasse 20
81679 München (DE)

(56) References cited:
EP-A- 0 769 270
GB-A- 2 078 526
GB-A- 2 133 694
US-A- 4 562 832
US-A- 4 597 030
US-A- 4 836 190
US-A- 5 035 232

EP 1 079 738 B1

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates, in general, to vessel harvesting and, in particular, to a new and useful illuminated retractor for creating a working space for dissecting instruments in support of a surgical procedure such as a coronary bypass procedure or other type of vessel harvest procedures.

Background Art

[0002] In certain surgical procedures, it is necessary to remove a section of a blood vessel from a patient for use in another part of the patient's body or for transplanting into a second patient's body. For example, a section of the saphenous vein may be removed for use in coronary bypass surgery to replace coronary arteries which supply blood to the heart. As a result of aging and disease, coronary arteries may become blocked by plaque deposits, stenosis, or cholesterol. In some instances, these blockages can be treated with angioplasty, atherectomy or stent placement, and coronary bypass surgery is not required. Coronary bypass surgery is required when these other methods of treatment cannot be used or have failed to clear the blocked artery.

[0003] In the coronary bypass surgery, a vein is harvested from elsewhere in the body and grafted into place between the aorta and the coronary artery beyond the point of blockage. It is preferred to use a vein taken from the patient undergoing the bypass surgery since the patient is a ready source of suitable veins that will not be rejected by the body after transplantation. The saphenous vein in the leg is typically the best substitute for small arteries such as the coronary arteries because the saphenous vein is typically 3 to 5 mm in diameter (about the same size as the coronary arteries) and it is thus the preferred vein for use in coronary bypass surgery. Also, the venous system of the legs is sufficiently redundant so that after removal of the saphenous vein, other veins that remain in the leg are adequate to provide adequate return blood flow. The cephalic vein in the arm is an alternative that is sometimes used.

[0004] The conventional, non-endoscopic, surgical procedure for the removal of the long saphenous vein as a graft in coronary and vascular surgery may require the surgeon to make one long incision from the groin to the knee or the ankle of the patient's leg to allow access to the saphenous vein. Alternatively, if the surgeon uses several long incisions, one or more small skin bridges are left along the line of the incisions. While handling of the vein should be kept to a minimum, the vein must be separated from the connective tissue, and that requires the application of some force. After exposing the vein, the surgeon grasps it with his fingers while stripping off the surrounding tissues with dissecting scissors or other scraping instruments. The surgeon uses his fingers and/or blunt dissection tools to separate the vein from the surrounding tissue. To reach under the small skin bridges, the surgeon lifts the skin with retractors and dissects the vein free. When the vein has been completely separated from the surrounding tissue and the tributary veins that feed into the saphenous vein, the surgeon cuts the proximal and distal ends of the vein and removes the vein from the leg. After removal, the vein is prepared for implantation into the graft site and the long incisions made in the leg are closed, for example by suturing or staples.

[0005] As can be seen from the description of the conventional, non-endoscopic, vessel harvesting operation, the vessel harvesting operation is very traumatic in its own right. In the case of coronary artery bypass, this operation is carried out immediately before the open chest operation required to graft the harvested vein into the coronary arteries. Unfortunately, the vein harvesting operation is often the most troublesome part of the operation for the patent. The long incision, or incisions, involves the risk of injury to the medial lymph bundle and the risk of infection of the extensive operation site itself. The leg may thus, in addition to being very painful, be slow to heal, or may not heal properly, especially with those patients who have poor circulation in their extremities, and can consequently hinder the patient's recover from the operation. It is therefore desirable to perform the vessel harvesting procedure in as minimally invasive a manner as feasible.

[0006] One alternative for minimally invasive vessel harvesting uses an endoscopically controlled vessel removal. In contrast to the open long incision method, the surgeon can limit himself to 2-3 small incisions on the proximal thigh, at the level of the knee joint and perhaps the inner malleolus. Such minimally invasive or endoscopic vessel harvesting is known in the surgical field. Viewing the tools through an endoscope or laparoscope, or a video display from the endoscope, the surgeon typically grasps and holds the saphenous vein with a grasper which is introduced through the lumen of an endoscope. After connective tissue is dissected from around the vein, the vein is ligated and transected and removed via the lumen of the endoscope. Alternatively, as the vein is withdrawn into the lumen of the endoscope, the endoscope may be maneuvered along the length of the vein while side branches of the vein are ligated and transected whenever encountered. The endoscopic removal methods leave tissues intact and the vein is prepared and removed under visual conditions. With the same operating time relative to the vein harvesting, postoperative complaints and the risk of wound infection are considerably less than with the conventional, non-endoscopic, procedure.

[0007] EP 0 769 270 A1 for example describes novel instruments which are used to facilitate an endoscopic method for removal of a vessel like the saphenous vein.

Such instruments are an optical dissector, optical retractor, a vessel dissector, and a ligating device which all comprise a transparent concave head for enhanced visibility and illumination in multiple directions.

[0008] There are several drawbacks to the endoscopic vessel harvesting method described above. First, the endoscopic or laproscopic methods require the surgeon to view the tools and the operating field through the distorted visual perspective provided by the endoscope, laparoscope, or the video display from the endoscope, which is a poor substitute for the actually visualization of the surgical field by the surgeon's naked eye. Second, compounding the first drawback, in practicing this method there is limited visibility of the saphenous vein and its side branches because viewing is limited to the immediate area directly in front of the endoscope. Third, the illumination within the subcutaneous space created by this type of endoscope is also limited to the light emitted directly at the distal portion of the endoscope. Another drawback to this type of procedure is that the side branches of the saphenous vein limit the maneuverability of the endoscope since the outer edge of the endoscope body is prevented from advancing along the trunk of the saphenous vein until the encountered side branches arc ligated and transected thereby. Once freed, the endoscope is then maneuvered until the next side branch is encountered. Moreover, it has been found that methods that utilize this type of endoscope, i.e. an endoscope having a lumen, provide a working space that is very restricted because the side walls of the scope body constrain the working instrumentation to a limited area. It would be desirable to use a procedure that overcomes the drawbacks inherent to the endoscopic vessel harvesting method.

[0009] In an alternative minimally invasive technique for harvesting a blood vessel that overcomes the drawbacks of the endoscopic method, the surgeon utilizes 2-3 small incisions on the proximal thigh, at the level of the knee joint and perhaps the inner malleolus, which results in several long skin bridges between the incisions. To reach under the skin bridges, the surgeon lifts the skin with retractors and exposes the vein. After exposing the vein, the surgeon uses his fingers and/or blunt dissection tools to separate the vein from the surrounding tissues. It is desirable for the retractor to have some means of aiding the dissection of the surrounding tissues so that the trauma and time required for the procedure is limited. When the vein has been completely separared from the surrounding tissue and the tributary veins that feed into the saphenous vein, the surgeon cuts the proximal and distal ends of the vein and removes the vein from the leg. After removal, the vein is prepared for implantation into the graft site, and the 2-3 small incisions made in the leg are sutured or stapled closed. Because the dissection of the vein is accomplished by the surgeon's fingers and/or by blunt dissection, this technique may be accomplished by the surgeon in a more timely, manner than the endoscopic method. This alternative technique is a minimally invasive technique that, just like the endoscopic method described above, consequently minimizes the risks and complications of the surgery.

[0010] This technique overcomes the endoscopic method drawbacks of limited movement and limited workspace of the procedure enabling instrumentation and the limited and distorted visual perspective provided by the endoscope, laparoscope, or the video display from the endoscope. However, one drawback remains. Using prior art retractors, the illumination of the surgical field is poor.

In contrast, GB 2 078 526 A refers to a retractor for surgical purposes which is directly associated with illumination means whereby light can be directed towards an area of operation by directing the retractor itself. Plastic materials, e.g. such as a glass.like acrylic plastic, may be utilized fro light-conducting inserts or attachment of light conducting material.

[0011] By necessity of the minimally invasive nature of the procedure, the vessel harvesting procedure is primarily conducted under the long skin bridges left between the small incisions. Because the skin bridges are so long, it is difficult to sufficiently illuminate the subcutaneous space between the vessel and the subcutaneous tissue when retractors known in the art are used to retract the tissue away from the superior surface of the vessel. With insufficient illumination of the surgical field, the advantages of the surgeon being able to maneuver freely and to optically visualize the surgical field using the benefit of his own binocular vision during the course of the minimally invasive procedure are eroded. It is therefore desirable to provide a means of providing illumination to the subcutaneous space formed by the retractor so that the surgeon can efficiently view and operate in the entire surgical field exposed by the retractor.

SUMMARY OF THE INVENTION

[0012] The present invention overcomes the disadvantages of the prior art. Specifically, as best shown in Figs. 1 and 2A, the present invention provides for an illuminated retractor for illuminating the subcutaneous space between a vessel, such as the saphenous vein which is located in a patient's leg, and the subcutaneous tissue when the illuminated retractor is used to retract the tissue away from the superior surface of the vessel.

[0013] In the contemplated minimally invasive operation for harvesting a blood vessel, the surgeon utilizes 2-3 small incisions on the proximal thigh, at the level of the knee joint and perhaps the inner malleolus which results in several long skin bridges between the incisions. To expose the length of the vein remaining under the long skin bridges, the surgeon lifts the skin and the subcutaneous tissue with the illuminated retractor. The illuminated retractor provides a large, well illuminated surgical field, extending the substantial length of the retractor within the subcutaneous space created by the

retractor. With the vein thus exposed, the surgeon uses his fingers and/or blunt dissection tools to separate the vein from the surrounding tissues. When the vein has been completely separated from the surrounding tissue and the tributary veins that feed into the saphenous vein, the surgeon cuts the proximal and distal ends of the vein and removes the vein from the leg. After removal the 2-3 small incisions made in the leg are sutured or stapled closed and the vein harvesting procedure is completed.

[0014] The illuminated surgical retractor has a handle, a first blade section, a second blade section, and a connector. The handle, which is preferably contoured to be gripped by the operating surgeon, is connected to the first blade section at the distal end of the first blade section, thus permitting one-handed use by the surgeon. The handle permits the retractor to be lifted at any angle with respect to the axis of the vein and, when a pulling force is applied to the handle, a corresponding pulling or retractive force is applied to the subcutaneous tissue via the first blade section, which creates the subcutaneous space beneath the subcutaneous tissue when the subcutaneous tissue is drawn away. The handle may also have an elongated rod extending from the opposite end of the handle that allows the retractor to be maneuvered into the desired position by the surgeon and then fixed in the desired relative position by clamping or grasping the retractor with the available operating table mechanisms.

[0015] The first blade section has a first blade proximal end, a first blade distal end, a first blade outer surface, and a first blade inner surface. Similarly, the second blade section, which is preferably substantially transparent, has a second blade proximal end, a second blade distal end, a second blade outer surface and a second blade inner surface. The second blade outer surface of the second blade section is connected to the first blade section inner surface of the first blade section such that the first and second blade sections are substantially parallel.

[0016] The first blade proximal end has a rounded shape or a smoothly radiused pointed shape that allows the retractor to be pushed into the small incision made by the surgeon and thrust forward and maneuvered through the connective tissue between the subcutaneous tissue and the vessel to be harvested. Similarly, the proximal end of the second blade section has a rounded shape or, alternatively, a smoothly radiused pointed shape. The shape of the second blade section proximal end is preferably complementary to the shape of the first blade section proximal end so that the proximal end of the retractor, when the first and second blade sections are connected, can readily penetrate the connective tissue under the subcutaneous tissue as the retractor is inserted into the small incision and maneuvered into position.

[0017] The illuminated surgical retractor may also have a bent dissecting tip which extends from the first blade section at the proximal end of the first blade section. This bent dissecting tip allows the surgeon to use the bent tip as a dissecting device as the retractor is inserted and maneuvered around and/or through the connective tissue surrounding the vessel to be harvested.

[0018] In order to enhance the reflective qualities of the illuminate retractor, the first blade inner surface of the first blade section preferably has a mirrored surface. Also, the second blade inner surface of the second blade section preferably has a graded dot screen surface. The mirrored surface of the first blade inner surface and the graded dot screen surface of the second blade inner surface act to minimize the light intensity loss of the light energy that is provided to the surgical field by the illuminated retractor.

[0019] The connector of the retractor is coupled to the illumination input end that is defined by the distal end of the second blade section. The connector is adapted to receive and releasably retain a distal connector of a light cable that is connected to a source of illumination so that the illumination input end is optically coupled to the source of illumination, thereby allowing light energy to enter the second blade section via the illumination input end. The light energy fills the second blade section and turns the second blade section into a "light pipe." The light energy is, in turn, radiated from the second blade section into the subcutaneous space between the vessel and the subcutaneous tissue exposed by the retractor. In this manner, light can be provided from the light source via the cable to the illumination input end of the second blade section so that the second blade section is illuminated, which results in an illuminated surgical field.

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWINGS

[0020] Embodiments of the invention are described by way of example with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of the manipulation of an illuminated retractor according to the present invention;

FIG. 2A is an exploded perspective view of the illuminated retractor according to the present invention;

FIG. 2B is a cross-sectional view of the first and second blade sections of the illuminated retractor shown in Fig. 1;

FIG. 3 is an exploded perspective view of a second embodiment of an illuminated retractor according to the present invention;

FIG. 4 is a perspective view of the manipulation of a third embodiment of an illuminated retractor according to the present invention;

FIG. 4A is an exploded perspective view of a third embodiment of the illuminated retractor according to the present invention;

FIG. 4B is a cross-sectional view of the first and second blade sections of the illuminated retractor shown in Fig. 4;

FIG. 5A is a perspective view of a first bayonet member and a second bayonet showing the capture of the distal end of the second blade section;

FIG. 5B is a fragmentary cross-sectional view of a bayonet fastener with the distal end of the second blade section secured;

FIG. 6A is an exploded perspective view of a fourth embodiment of an illuminated retractor according to the present invention;

FIG. 6B is an exploded cross-sectional view of the illuminated retractor shown in Fig. 6A;

FIG. 7 is an exploded perspective view of a fifth embodiment of the illuminated retractor of the present invention showing the bent dissecting tip of the retractor;

FIG. 8 is a fragmentary top-view of the bent tip outer surface showing the dissecting serrations of the illuminated retractor shown in Fig. 7;

FIG. 9 is a fragmentary cross-sectional view of the first blade section taken through line 9-9 of the illuminated retractor shown in Fig. 7 showing the profile of the dissecting serrations in the bent tip of the retractor and the obtuse angle formed between the bent tip and the extended longitudinal axis of the first blade section.

DETAILED DESCRIPTION OF THE INVENTION

[0021] The present invention is more particularly described in the following examples that are intended as illustrative only since numerous modifications and variations therein will be apparent to those skilled in the art. As used in the specification and in the claims, "a" can mean one or more, depending on the context in which it is used.

[0022] The present invention provides for an illuminated retractor for illuminating the subcutaneous space between a vessel, such as the saphenous vein which is located in a patient's leg, and the subcutaneous tissue when the illuminated retractor is used to retract the tissue away from the superior surface of the vessel.

[0023] Referring first to Figs. 1 and 2A, there is shown a first embodiment of the present invention encompassing an illuminated surgical retractor 10 having a handle 20, a first blade section 30, a second blade section 40, and a connector 50.

[0024] The handle 20 has a first handle end 22 and a second handle end 24. The second handle end 24 of the handle 20 is connected to the first blade section 30 at the distal end 32 of the first blade section 30 for permitting one-handed use by the surgeon. The angle α formed by the handle 20 and the first blade section 30 is acute and is preferably between 30° and 65°. The best combination of retractor mobility and application of retractive pulling force occurs when the acute angle α between the handle 20 and the first blade section 30 is approximately 45°. The handle 20 permits the retractor 10 to be lifted at any angle with respect to the axis of the vein and, when a pulling force is applied to the handle 20, a retractive force is applied to the subcutaneous tissue via the first blade section 30 which creates subcutaneous space beneath the subcutaneous tissue when the subcutaneous tissue is drawn away. The handle 20 of the retractor 10 is also preferably contoured to be gripped by the hand of a surgeon thus providing more tactile feel and feedback as well as increasing the surgeon's comfort in using and maneuvering the retractor.

[0025] The handle 20 may also have an elongated rod 26 extending from the first handle end 22. The elongated rod 26 allows the retractor 10 to be fixed or grasped by operating table mechanisms known in the art so that the retractor 10 may be fixed in position. The elongated rod 26 allows the retractor 10 to be maneuvered into the desired position by the surgeon and then fixed in the desired relative position thus freeing both of the surgeon's hands for the dissection of the exposed vessel.

[0026] The first blade section 30 has a first blade proximal end 34, a first blade distal end 32, a first blade outer surface 36, and a first blade inner surface 38. As shown in Fig. 2A, the first blade outer surface 36 and the first blade inner surface 38 extend from the proximal end 34 of the first blade section 30 to near the distal end 32 of the first blade section 30. More specifically, as the first blade section 30 nears the first blade distal end 32, the first blade section 30 tapers into a shaft shape 31 which then bends to form the preferred acute angle α with the handle 20. The first blade outer surface 36 and the first blade inner surface 38 correspondingly are eliminated as the first blade section 30 tapers into the shaft shape 31. As previously noted, the first blade distal end 32 is connected to the second handle end 24 of the handle 20. The first blade proximal end 34 has a rounded shape or a smoothly radiused pointed shape that allows the retractor 10 to be pushed into the small incision made by the surgeon and thrust forward and maneuvered through the connective tissue between the subcutaneous tissue and the vessel to be harvested.

[0027] The second blade section 40 has a second

blade proximal end 44, a second blade distal end 42, a second blade outer surface 46 and a second blade inner surface 48. As shown in Fig. 2A, the second blade outer surface 46 and the second blade inner surface 48 extend from the proximal end 44 of the second blade section 40 to near the distal end 42 of the second blade section 40. More specifically, as the second blade section 40 nears the second blade distal end 42, the second blade section 40 tapers into a shaft shape 41 which then bends. This bend in the second blade section 40 allows the distal end 42 of the second blade section 40 to remain substantially relatively parallel to the first blade section 30 as the first blade section 30 bends. The second blade outer surface 46 and the second blade inner surface 48 correspondingly are eliminated as the second blade section 40 tapers into the shaft shape 41.

[0028] The second blade section 40 is preferably substantially transparent and is preferably made of a transparent plastic, such as a transparent acryl resin, which has the benefit of being highly resistant to breakage while retaining the ability to flex or deform under pressure and then return undamaged to the original, unstressed configuration. However, the second blade section 40 can also be made of glass or other types of known substantially transparent material.

[0029] The second blade outer surface 46 of the second blade section 40 is connected to the first blade inner surface 38 of the first blade section 30 such that the first and second blade sections 30, 40 are substantially parallel along the substantial length of the first and second blade sections 30, 40. The second blade section 40 may be connected to the first blade section 30 in any manner known in the art that is within the level of ordinary skill of one in the surgical field.

[0030] As shown in Fig. 2A, the second blade outer surface 46 may be chemically bonded to the first blade inner surface 38 through the use of an adhesive or by other chemical bonding means known to one skilled in the art. This chemical bonding may permanently affix the first and second blade sections 30, 40 or may preferably allow the first and second blade sections 30, 40 to be releasably connected for ease of sterilization of the respective blade sections 30, 40. Alternatively, the second blade section 40 may be mechanically fixed to the first blade section 30, by means apparent to one skilled in the art, such that the first and second blade sections 30, 40 may be releasably connected to each other.

[0031] The second blade proximal end 44 of the second blade section 40 has a rounded shape or, alternatively, a smoothly radiused pointed shape. The shape of the second blade proximal end 44 is preferably complementary to the shape of the first blade proximal end 34 so that the proximal end 11 of the retractor 10, when the first and second blade sections 30, 40 are connected, can readily penetrate the connective tissue under the subcutaneous tissue as the retractor is inserted into the small incision and maneuvered into position.

[0032] As illustrated in Fig. 2B, the first blade section 30 preferably has a curved cross-sectional shape. The curved cross-section of the first blade section 30 causes the first blade outer surface 36 to be convex. The convex cross-sectional shape of the first blade outer surface 36 of the first blade section 30 aids in the prevention of unnecessary trauma to the retracted tissue, as the first blade outer surface 36, which is in contact with the subcutaneous tissue when the pulling force is applied to the retractor 10, presents no sharp edges that could cause tearing of the tissue. Rather, the shape aids in distributing the force applied to the retracted tissue by the first blade section 30.

[0033] Still referring to Fig. 2B, the first blade inner surface 38 of the first blade section 30 is preferably concave in cross-section. The outer surface 46 of the second blade section 40 may define a convex curve in cross-section that is complementary to the preferred concave cross-sectional shape of the inner surface 38 of the first blade section 30. As will be obvious to one skilled in the art, if a complementary fit of the outer surface 46 of the second blade section 40 and the inner surface 38 of the first blade section 30 is desired, the outer surface 46 of the second blade section 40 may have any geometric cross-section that allows the second blade outer surface 46 to complementarily fit against the inner surface 38 of the first blade section 30, as there is no requirement that the first blade inner surface 38 be concave in cross-section.

[0034] There is no constraint requiring that the outer surface 46 of the second blade section 40 be complementarily shaped to the inner surface 38 of the first blade section 30 The only constraint on the shape of the geometric cross-section of the second blade section 40 is that the chosen geometric cross-section should allow the second blade section 40 to be connected, by means know in the art, to the first blade section 30 such that the first and second blade sections 30, 40 are connected and substantially parallel.

[0035] The inner surface 48 of the second blade section 40 may be concave in cross-section. Alternatively, the inner surface 48 of the second blade section 40 could be substantially flat or convex in cross-section.

[0036] In order to enhance the reflective qualities of the illuminate retractor 10, the first blade inner surface 38 of the first blade section 30 preferably has a mirrored surface 39. Also, the second blade inner surface 48 of the second blade section 40 preferably has a graded dot screen surface 49. The mirrored surface 39 of the first blade inner surface 38 and the graded dot screen surface 49 of the second blade inner surface 48 act to minimize the light intensity loss of the light that is provided to the surgical field by the illuminated retractor 10.

[0037] The illumination input end 43 at the second blade distal end 42 of the second blade section 40 allows light energy to enter the second blade section 40. The light energy fills the second blade section 40, turning the second blade section 40 into a "light pipe." The

light energy is, in turn, radiated from the second blade section 40, and particularly from the inner surface 48 of the second blade section 40, into the subcutaneous space between the vessel and the subcutaneous tissue exposed by the retractor 10. Since substantially the entire length of the second blade section 40 is illuminated, a large, well illuminated surgical field, extending the substantial length of the second blade section 40 of the retractor 10, is provided for the surgeon to operate. This allows the surgeon to dissect the vein in an minimally invasive manner without the need for viewing the surgical field through endoscopic visual devices.

[0038] The connector 50 is coupled to the illumination input end 43 which is defined by the distal end 42 of the second blade section 40 of the retractor 10. The connector 50 is adapted to receive and releasably retain a distal connector [not shown] of a light cable [not shown] that is connected to a source of illumination [not shown] so that the illumination input end 43 is optically coupled to the source of illumination. In this manner, light can be provided from the light source via the cable to the illumination input end 43 of the second blade section 40 so that the second blade section 40 is illuminated.

[0039] Fig. 3 shows a second embodiment of a illuminated retractor 12 of the present invention. The construction of the second embodiment is similar to the first embodiment and, accordingly, uses the same reference numbers for similar components. The components in Fig. 3 that use the same reference numerals as in Figs. 1-2B are substantially equivalent and, therefore, the description thereof is omitted for the second embodiment. The second embodiment of the present invention encompasses an illuminated surgical retractor 12 having a handle 20, a first blade section 30, a second blade section 40, a means for connecting the first and second blade sections, and a connector 50.

[0040] Still referring to Fig. 3, the means for connecting the first blade section 30 to the second blade section 40 preferably comprises a plurality of screws 60, or, alternatively, bolts, releasably connecting the outer surface 46 of the second blade section 40 to the inner surface 38 of the first blade section 30. It is preferable to locate the screws 60 along the periphery of the second blade section 40 to minimize the shadows caused by the screws 60, which could degrade the light illumination of the retractor 12.

[0041] Figs. 4-4B show a third embodiment of an illuminated retractor 13 of the present invention. The construction of the third embodiment is similar to the first embodiment and, accordingly, the figures use the same reference numbers for similar components. The components in Figs. 4-4B that use the same reference numerals as in Figs. 1-2B are substantially equivalent and, therefore, the description thereof is omitted for the third embodiment. The third embodiment of the present invention encompasses an illuminated surgical retractor 13 having a handle 20, a first blade section 30, a second blade section 40, a means for connecting the first and second blade sections, and a connector 50.

[0042] Referring to Fig. 4A, the means for connecting the first blade section 30 to the second blade section 40 comprises a socket means 70 and a pinning means 80. The socket means 70 releasably receives the distal end 42 of the second blade section 40 while the pinning means 80 releasably receives the proximal end 44 of the second blade section 40 so that the second blade section 40 may be releasably connected to the first blade section 30. Referring to Figs. 4A-4B and 5A-5B, the socket means 70 is preferably a bayonet fastener 71 having a first bayonet member 72 that is connected to the first blade section 30 near the distal end 32 of the first blade section 30 and a second bayonet member 76 that is connected to the second blade section 40 near the distal end 42 of the second blade section 40. The first bayonet member 72 and the second bayonet member 76 are complementarily sized and shaped so that the first bayonet member 72 and the second bayonet member 76 may be complementarily releasably engaged. Preferably, the first bayonet member 72 has an exterior first bayonet surface having a threaded surface 90 and the second bayonet member 76 has a complementary threaded interior second bayonet surface 92.

[0043] Preferably, the first bayonet member 72 has a first top surface 73 and a first bottom surface 74. A first bore 75 extends through the first bayonet member 72 from the first top surface 73 to the first bottom surface 74. Similarly, the second bayonet member 76 has a second top surface 77 and a second bottom surface 78 having a second bore 79 extending therethrough from the first top surface 73 to the first bottom surface 74. The second top surface 77 of the cap member defines a indented cap shape 91 having the threaded interior second bayonet surface 92 and a shoulder surface 94. The shoulder surface 94 surrounds the second bore 79 of the second bayonet member 76. Preferably, the second bore 79 is a keyway 96. The first bore 75 of the first bayonet member 72 and the second bore 79, *i.e.*, the keyway 96, of the second bayonet member 76 are substantially co-axially aligned when the first bayonet member 72 and the second bayonet member 76 are engaged.

[0044] The distal end 42 of the second blade section 40, which preferably has a shaped lip 45 around the distal end 42 of the second blade section 40 that matches the defined shape of the keyway 96 of the second bayonet member 76, can thereby extend into and through the keyway 96 of the second bayonet member 76. The distal end 42 of the second blade section 40 is then secured relative to the first blade section 30 upon the rotation of the second bayonet member 76 relative to the fixed first bayonet member 72. This rotation causes the keyway 96 of the second bayonet member 76 to correspondingly rotate, thus securing the shaped lip 45 of the distal end 42 of the second blade section 40 and preventing the detachment of the distal end 42 of the second blade section 40.

[0045] When secured, the distal end 42 of the second

blade section 40 projects above the shoulder surface 94 of the second bayonet member 76. This allows the illumination input end 43, located at the distal end 42 of the second blade section 40, to be disposed near the first bore 75 of the first bayonet member 72 when the first and second bayonet members 72, 76 are engaged. The first top surface 73 of the first bayonet member 72 is shaped and adapted to act as the connector 50 for the retractor 13, thereby allowing the connector 50 at the first top surface 73 of the first bayonet member 72 to receive and releasably retain a distal connector [not shown] of a light cable [not shown] that is connected to a source of illumination [not shown], so that the illumination input end 43 of the second blade section 40 is optically coupled to the source of illumination. In this manner, light can be provided from the light source via the cable to the illumination input end 43 of the second blade section 40, so that the second blade section 40 is illuminated.

[0046] Referring to Fig. 4A, the pinning means 80 is preferably a plurality of angled pins 82 extending from the inner surface 38 of the first blade section 30 near the proximal end 34 of the first blade section 30. The pins are sized so that the first and second blade sections 30, 40 are mated to each other, forcing the second blade section 40 into close cooperation with the first blade section 30, when the proximal end 44 of the second blade section 40 is inserted underneath the pins 82. The pins 82 grasp and secure the abutting portions of the second blade section 40 near the proximal end 44 of the second blade section 40 when the first and second bayonet members 72, 76 are complementarily engaged.

[0047] When the first blade section 30 and the second blade section 40 are connected by the bayonet fastener 71 and the plurality of pins 82 in the fashion described above, the cross-sectional shape of the outer surface 46 of the second blade section 40 may be, but is not required to be, complementarily shaped to the cross-sectional shape of the inner surface 38 of the first blade section 30.

[0048] Figs. 6A-6B show a fourth embodiment of a illuminated retractor 14 of the present invention. This embodiment is a variation of the third embodiment. Specifically, the pinning means 80 is varied. The construction of the fourth embodiment is similar to the first and third embodiments and, accordingly, the figures use the same reference numbers for similar components. The components in Figs. 6A-6B that use the same reference numerals as in Figs. 1-5B are substantially equivalent and, therefore, the description thereof is omitted for the fourth embodiment.

[0049] The fourth embodiment of the present invention encompasses an illuminated surgical retractor 14 having a handle 20, a first blade section 30, a second blade section 40, a means for connecting the first and second blade sections, and a connector 50. Referring to Fig. 6A, the means for connecting the first blade section 30 to the second blade section 40 comprises a socket means 70 and a pinning means 80. The socket means 70 releasably receives the distal end 42 of the second blade section 40 while the pinning means 80 releasably receives the proximal end 44 of the second blade section 40, so that the second blade section 40 may be releasably connected to the first blade section 30. The socket means 70 used in the fourth embodiment is preferably the same as described for the third embodiment above. The pinning means 80 used in the fourth embodiment is preferably a plurality of tabs 84 extending from the inner surface 38 of the first blade section 30 near the proximal end 34 of the first blade section 30. The tabs 84 are sized so that the second blade section 40 is forced into cooperation with the first blade section 30 when the proximal end 44 of the second blade section 40 is inserted into close cooperation with the tabs 84. The preferred shape of the tabs 84 is a dovetail shape, however other geometric shapes are contemplated.

[0050] The tabs 84 grasp and secure the abutting portions of the second blade section 40 near the proximal end 44 of the second blade section 40 when the first and second bayonet members 72, 76 are complementarily engaged. Referring to Fig. 6B, the tabs 84 define a grasping surface 86 between the upper surface 85 of the tabs 84 and the first blade inner surface 38. The grasping surface 86 of the tabs 84 preferably forms an acute angle Δ with the inner surface 38 of the first blade section 30. This acute angle Δ of the grasping surface 86 aids in mechanically forcing and retaining the second blade section 40 in cooperation with the first blade section 30. The tabs 84 have the added advantage of not extending above the second blade inner surface 48 of the second blade section 40 when the first blade section 30 is connected to the second blade section 40, as the upper surface 85 of the tabs 84 is substantially planer to the outer surface 46 of the second blade section 40, so that the proximal end 11 of the retractor 14 is substantially smooth and presents no projections that could inflict unnecessary trauma on the patient's tissues or to the operating physician's hands.

[0051] The combination of the bayonet fastener 71 and the tabs 84 act to secure the second blade section 40 to the first blade section 30 so that the illuminated retractor 14 can be used in a surgical environment in which force is required to be applied to the retractor 14, via the handle 20, in order to expose the necessary subcutaneous space between the vessel to be harvested and the subcutaneous tissue. However, the bayonet fastener 71 and the tabs 84 also allow the second blade section 40 to be separated from the first blade section 30 by simply rotating the second bayonet member 76 to align the keyway 96 of the second bayonet member 76 with the shaped lip 43 of the distal end 42 of the second blade section 40, which has a complementary key shape, withdrawing the distal end 42 of the second blade section 40 from the keyway 96 of the second bayonet member 76, and pulling the second blade section 40 free of the tabs 84 extending from the inner surface

38 of the first blade section 30. This allows the first and second blade sections 30, 40 to be readily separated for ease of sterilization of the retractor 14 components or for the replacement of the second blade section 40.

[0052] When the first blade section 30 and the second blade section 40 are connected by the bayonet fastener 71 and the plurality of tabs 84 in the fashion described above, the cross-sectional shape of the outer surface 46 of the second blade section 40 may be, but is not required to be complementarily shaped to the cross-sectional shape of the inner surface 38 of the first blade section 30.

[0053] Figs. 7-9 show a fifth embodiment of an illuminated retractor 15 of the present invention. The construction of the fifth embodiment is similar to the first and fourth embodiments and, accordingly, the figures use the same reference numbers for similar components. The components in Figs. 7-9 that use the same reference numerals as in Figs 1-6B are substantially equivalent and, therefore, the description thereof is omitted for the fifth embodiment.

[0054] The fifth embodiment of the present invention encompasses an illuminated surgical retractor 15 having a handle 20, a first blade section 30, a second blade section 40, a bent tip 100, and a connector 50. The first blade section 30 may be connected to the second blade section 40 in any manner known in the art that is within the level of ordinary skill of one in the surgical field. The second blade outer surface 46 of the second blade section 40 may be chemically bonded to the first blade inner surface 38 of the first blade section 30 through the use of an adhesive or by other chemical bonding means known to one skilled in the art. This chemical bonding may permanently affix the first and second blade sections 30, 40 or it may preferably allow the first and second blade sections 30, 40 to be releasably connected for ease of sterilization of the respective blade sections 30, 40. Alternatively, the second blade section 40 may be mechanically fixed to the first blade section 30, by means apparent to one skilled in the art, such that the first and second blade sections 30, 40 may be releasably connected to each other.

[0055] Preferably, as shown in Fig. 7, the first blade section 30 is connected to the second blade section 40 by a socket means 70 and a pinning means 80. The socket means 70 releasably receives the distal end 42 of the second blade section 40 while the pinning means 80 releasably receives the proximal end 44 of the second blade section 40, so that the second blade section 40 may be releasably connected to the first blade section 30. The socket means 70 used in the fifth embodiment is preferably the same as described for the third embodiment above. The pinning means 80 used in the fifth embodiment is preferably the same as described for the fourth embodiment above.

[0056] The first blade section 30 has a first blade section proximal end 34, a first blade section distal end 32, a first blade outer surface 36, and a first blade inner surface 38. As shown in Fig. 7, the first blade outer surface 36 and the first blade inner surface 38 extend from the proximal end 34 of the first blade section 30 to near the distal end 32 of the first blade section 30. More particularly, as the first blade section 30 nears the first blade distal end 32, the first blade section 30 tapers into a shaft shape 31 which then bends to form the preferred acute angle α with the handle 20. In the fifth embodiment, the preferred acute angle α is approximately 60 degrees. The first blade outer and inner surfaces 36, 38 correspondingly taper as the first blade section 30 tapers into the shaft shape 31. As previously noted, the first blade distal end 32 is connected to the second handle end 24 of the handle 20.

[0057] Still referring to Fig. 7, the second blade section 40 has a second blade proximal end 44, a second blade distal end 42, a second blade outer surface 46, and a second blade inner surface 48. The second blade outer and inner surfaces 46, 48 extend from the proximal end 44 of the second blade section 40 to near the distal end 42 of the second blade section 40. More specifically, as the second blade section 40 nears the second blade distal end 42, the second blade section 40 tapers into a shaft shape 41 which then bends. This bend in the second blade section 40 allows the distal end 42 of the second blade section 40 to remain substantially relatively parallel to the first blade section 30 as the first blade section 30 bends.

[0058] To aid in the dissection of the connective tissue and to more efficiently use the force applied to the retractor 15 as the retractor 15 is maneuvered through and around the connective tissue, this embodiment uses a bent tip 100 having a bent tip distal end 101 which is connected to the proximal end 34 of the first blade section 30. Preferably, the bent tip 100 extends, as a simple extension, from the proximal end 34 of the first blade section 30. As shown in Fig. 9, the bent tip 100, having a bent tip longitudinal axis T, forms an obtuse angle θ relative to a first blade section longitudinal axis L. This obtuse angle θ can be between 95° - 175° and is preferably approximately 160°.

[0059] Referring to Fig. 8, the bent tip proximal end 102 has a rounded shape or a smoothly-radiused pointed shape that allows the retractor 15 to be pushed into the small incision made by the surgeon and maneuvered through the connective tissue between the subcutaneous tissue and the vessel to be harvested. The bent tip 100 further has a bent tip outer surface 104 having a plurality of dissecting serrations 106. Each of these serrations 106 are preferably at a substantial right angle to the bent tip longitudinal axis T and preferably extend substantially across the width of the bent tip 100. It is contemplated that the serrations 106 may be placed at an angle, other than the right angle described above, relative to the bent tip longitudinal axis T. It is also contemplated that the serrations 106 might be placed at series of angles to form a graphic series of serrations 106. One example of which would be the use of a plurality of

arrow, or v-shaped, serrations 106 with the point of the arrow oriented toward the proximal end 102 of the bent tip 100.

[0060] As shown in Fig. 9, the dissecting serrations 106 preferably have a saw-tooth cross- sectional profile 108. This profile 108 allows the serrations 106 to aid in dissecting intervening connective tissue when the retractor 15 is pressed forward into the subcutaneous space and lifted or withdrawn slightly from the subcutaneous space. It is contemplated that other geometric cross-sectional profiles of the serrations 106, such as a triangle profile, may also be used.

[0061] Preferably, as shown in Figs. 7 and 9, both the first blade outer and inner surfaces 36, 38 preferably have a curved cross-sectional shape. This curved cross-sectional shape causes the first blade outer surface 36 to be convex and the first blade inner surface to be concave 38. The outer surface 46 of the second blade section 40 may have a convex cross-sectional shape that is complementary to the concave cross-sectional shape of the inner surface 38 of the first blade section 30. However, there is no requirement or constraint that the second blade outer surface 46 must have a complementary cross-sectional shape to the inner surface 38 of the first blade section 30.

[0062] Still referring to Figs. 7 and 9, the bent tip 100 preferably has a substantially planer or flat cross-sectional shape. Alternatively, the bent tip 100 could have a curved cross-sectional shape which is complementary to the curved cross sectional shape of the first blade outer surface 36.

[0063] The purpose of the bent tip 100 of the retractor 15 of this embodiment is to help the surgeon translate some of the applied force to the retractor 15 into a dissecting force by letting the bent tip 100, with the dissecting serrations 106, perform some of the required dissecting work. By having the retractor 15 accomplish some of the dissecting required by the vessel harvesting procedure, the surgeon can, while still performing in a minimally invasive manner, more rapidly complete the surgical procedure, which results in reduced surgical time and possibility of trauma to the patient from the surgery.

[0064] The present invention has been described in reference to use in harvesting blood vessels. It would be obvious to one skilled in the art that the present invention could also be used in other minimally invasive surgical procedures in which the illumination of the minimally invasive surgical field is desired.

[0065] Although only four types of connecting means are shown in Figs. 2A-6B for detachably connecting the second blade section 40 to the first blade section 30 of the retractor, any type of connecting means can be utilized. Thus, the detachable connection feature of the second blade section 40 of the present invention is not limited to the connecting means described above, but, rather, can be connected in a manner well within the level of ordinary skill of one in the surgical field. Furthermore, although the present invention has been described with reference to specific details of certain embodiments thereof, it is not intended that such detail should be regarded as limitations upon the scope of the invention except as and to the extent that they are included in the accompanying claims.

List of references

[0066]

10	illuminated surgical retractor
20	handle
22	first handle end
24	second handle end
26	elongated rod
30	first blade section
32	first blade distal end
34	first blade proximal end
38	first blade inner surface
40	second blade section
42	second end distal end
43	illumination input end
44	second blade proximal end
46	first blade outer surface
48	second blade inner surface
50	connector
100	bent tip
101	bent tip distal end
102	bent tip proximal end

Claims

1. A surgical retractor (10) for retracting tissue away from the superior surface of a vessel comprising:

a handle (20) having a first handle end (22) and a second handle end (24);
a first blade section (30) having a first blade proximal end (34), a first blade distal end (32), and a first blade inner surface (38), extending from the first blade proximal end (34) to near the first blade distal end (32), the second handle end (24) of said handle connected to the first blade distal end (32) of said first blade section (30) such that said handle forms an acute angle with said first blade section (30);
characterized by
a second blade section (40) having a second blade proximal end (44), a second blade distal end (42), a second blade outer surface (46), extending from the second blade proximal end (44) to near the second blade distal end (42), and a second blade inner surface (48), extending from the second blade proximal end (44) to near the second blade distal end (42), said second blade section (40) connected to said first

blade section (30) such that said first and second blade sections are substantially parallel, the second blade distal end (42) of said second blade section (40) defining an illumination input end (43); and
a connector (50) coupled to the illumination input end (43) said connector (50) adapted to optically couple the illumination input end (43) to a source of illumination, thereby allowing light energy to enter the second blade section (40) via the illumination input end, so that said second blade section (40) is substantially illuminated.

2. The illuminated surgical retractor (10) of claim 1 wherein said first blade section (30) has a first blade outer surface (46) that defines a convex curve in cross-section, and wherein the first blade inner surface (38) of said first blade section (30) defines a concave curve in cross-section.

3. The illuminated surgical retractor (10) of claim 2, wherein the second blade outer surface (46) of said second blade section (40) defines a convex curve in cross-section complementary to the second blade inner surface (48) and wherein the second blade inner surface (48) of said second blade section (40) defines a concave curve in cross-section.

4. The illuminated surgical retractor (10) of any of claims 1 to 3, wherein the first blade inner surface (38) has a mirrored finish.

5. The illuminated surgical retractor (10) of any of claims 1 to 4, wherein said second blade section (40) is substantially transparent.

6. The illuminated surgical retractor (10) of any of claims 1 to 5, wherein the acute angle formed between said handle and said first blade section (30) is from 30° to 65°.

7. The illuminated surgical retractor (10) of any of claims 1 to 6, wherein said handle has an elongated rod (26) extending from the first handle end (22), which allows the retractor (10) to be maneuvered into the desired position and to be fixed in the desired relative position with the available operating table mechanism.

8. The illuminated surgical retractor (10) of any of claims 1 to 7, wherein said handle is contoured to be gripped by a hand of an operator.

9. The illuminated surgical retractor (10) according to any of claims 1 to 8, wherein said first blade section (30) includes a bent tip (100) having a bent tip proximal end (102) and a bent tip distal end (101), the bent tip distal end (101) of said bent tip connected to the first blade proximal end (34) of said first blade section (30) such that said bent tip (100) forms an obtuse angle with said first blade section (30).

10. The illuminated surgical retractor (10) of any of claims 1 to 9, wherein said first blade section (30) has a rounded shape or a smoothly radiused shape to be received in a subcutaneous space of a patient between a vessel and subcutaneous tissue and said handle is oriented with respect to said first blade section (30) to enable the user to retract tissue away from vessel.

Patentansprüche

1. Chirurgischer Retraktor (10) zum Wegziehen von Gewebe von der oberen Oberfläche eines Gefäßes, der wie folgt umfasst:

einen Griff (20) mit einem ersten Griffende (22) und einem zweiten Griffende (24);
einen ersten Blattabschnitt (30) mit einem proximalen Ende (34) des ersten Blattes, einem distalen Ende (32) des ersten Blattes, und einer inneren Oberfläche (38) des ersten Blattes, sich erstreckenden von dem proximalen Ende (34) des ersten Blattes bis nahe dem distalen Ende (32) des ersten Blattes, wobei das zweite Griffende (24) des Griffs mit dem distalen Ende (32) des ersten Blattes des ersten Blattabschnitts (30) so verbunden ist, dass der Griff einen spitzen Winkel mit dem ersten Blattabschnitt (30) bildet;
gekennzeichnet durch
einen zweiten Blattabschnitt (40) mit einem proximalen Ende (44) des zweiten Blattes, einem distalen Ende (42) des zweiten Blattes, einer äußeren Oberfläche (46) des zweiten Blattes, sich erstrekkend von dem proximalen Ende (44) des zweiten Blattes bis nahe dem distalen Ende (42) des zweiten Blattes, und eine innere Oberfläche (48) des zweiten Blattes, die sich von dem proximalen Ende (44) des zweiten Blattes erstreckt, um sich dem distalen Ende (42) des zweiten Blattes zu nähern, wobei der zweite Blattabschnitt (40) mit dem ersten Blattabschnitt (30) so verbunden ist, dass der erste und zweite Blattabschnitt im wesentlichen parallel verlaufen, wobei das distale Ende (42) des zweiten Blattes des zweiten Blattabschnitts (40) ein Beleuchtungs-Eingangsende (43) definiert;
und
ein Verbindungsstück (50), gekoppelt mit dem Beleuchtungs-Eingangsende (43), wobei das Verbindungsstück (50) so eingerichtet ist, dass

es das Beleuchtungs-Eingangsende (43) mit einer Lichtquelle optisch verkoppelt, und **dadurch** Lichtenergie gestattet, über das Beleuchtungs-Eingangsende in den zweiten Blattabschnitt (40) einzutreten, so dass der zweite Blattabschnitt (40) im wesentlichen beleuchtet ist.

2. Beleuchteter chirurgischer Retraktor (10) gemäß Anspruch 1, wobei der erste Blattabschnitt (30) eine äußere Oberfläche (46) des ersten Blattes hat, die im Querschnitt eine konvexe Krümmung definiert, und wobei die innere Oberfläche (38) des ersten Blattes des ersten Blattabschnitts (30) im Querschnitt eine konkave Krümmung definiert.

3. Beleuchteter chirurgischer Retraktor (10) gemäß Anspruch 2, wobei die äußere Oberfläche (46) des zweiten Blattes des zweiten Blattabschnitts (40) im Querschnitt eine konvexe Krümmung Komplemenär zur inneren Oberfläche (48) des zweiten Blattes definiert und wobei die innere Oberfläche (48) des zweiten Blattes des zweiten Blattabschnitts (40) im Querschnitt eine konkave Krümmung definiert.

4. Beleuchteter chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 3, wobei die innere Oberfläche (38) des ersten Blattes einen spiegelnden Abschluss hat.

5. Beleuchteter chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 4, wobei der zweite Blattabschnitt (40) im wesentlichen transparent ist.

6. Befeuchteter chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 5, wobei der spitze Winkel, der von dem Griff und dem ersten Blattabschnitt (30) gebildet wird, 30° bis 65° beträgt.

7. Beleuchteter chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 6, wobei der Griff einen verlängerten Stab (26) besitzt, vom ersten Griffende (22) sich erstreckend, der gestattet, dass der Retraktor (10) in die gewünschte Position gebracht und in der gewünschten relativen Position mit dem zur Verfügung stehenden Operationstisch-Mechanismus befestigt wird.

8. Beleuchteter chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 7, wobei der Griff so geformt ist, dass er von einer Hand eines Benutzers gegriffen werden kann.

9. Beleuchteter chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 8, wobei der erste Blattabschnitt (30) eine gebogene Spitze (100) mit einem gebogenen proximalen Spitzenende (102) und einem gebogenen distalen Spitzenende (101) aufweist, wobei das gebogene distale Spitzenende (101) der gebogenen Spitze mit dem proximalen Ende (34) des ersten Blattes des ersten Blattabschnitts (30) so verbunden ist, dass die gebogene Spitze (100) einen stumpfen Winkel mit dem ersten Blattabschnitt (30) bildet.

10. Beleuchtete chirurgischer Retraktor (10) gemäß einem der Ansprüche 1 bis 9, wobei der erste Blattabschnitt (30) eine runde Form oder eine leicht abgerundete Form hat, die unter der Haut eines Patienten zwischen einem Gefäß und einem subkutanen Gewebe aufgenommen werden kann, und der Griff in Bezug auf den ersten Blattabschnitt (30) ausgerichtet ist, um den Benutzer in die Lage zu versetzen, das Gewebe von dem Gefäß wegzuziehen.

Revendications

1. Un écarteur chirurgical (10) pour écarter les tissus de la surface supérieure d'un vaisseau comprenant:

une poignée (20) ayant une première extrémité de poignée (22) et une deuxième extrémité de poignée (24);
une première section de lame (30) ayant une extrémité proximale de première lame (34), une extrémité distale de première lame (32), et une surface intérieure de première lame (38), s'étendant de l'extrémité proximale de première lame (34) jusqu'à près de l'extrémité distale de première lame (32), la deuxième extrémité de poignée (24) de ladite poignée reliée à l'extrémité distale de la première lame (32) de ladite première section de lame (30) tel que ladite poignée forme un angle aigu avec ladite première section de lame (30); **caractérisé par**
une deuxième section de lame (40) ayant une extrémité proximale de deuxième lame (44), une extrémité distale de deuxième lame (42), une surface externe de deuxième lame (46), s'étendant de l'extrémité proximale de deuxième lame (44) jusqu'à près de l'extrémité distale de deuxième lame (42), et une surface intérieure de deuxième lame (48), s'étendant de l'extrémité proximale de deuxième lame (44) jusqu'à près de l'extrémité distale de deuxième lame (42), ladite section de deuxième lame (40) reliée à ladite première section de lame (30) tel que lesdites première et deuxième sections de lame sont substantiellement parallèles, l'extrémité distale de la deuxième lame (42) de ladite section de la deuxième lame (40) définissant une extrémité d'entrée d'illumination (43); et
un connecteur (50) couplé à l'extrémité d'entrée d'illumination (43) dudit connecteur (50)

adapté pour coupler optiquement l'extrémité d'entrée d'illumination (43) à une source d'éclairage permettant de ce fait à l'énergie de la lumière d'entrer dans la section de deuxième lame (40) par l'intermédiaire de l'extrémité d'entrée d'illumination, de sorte que ladite deuxième section de lame (40) soit essentiellement illuminée.

2. L'écarteur chirurgical lumineux (10) selon la revendication 1 où ladite première section de lame (30) a une surface externe de première lame (46) qui définit une courbure convexe en coupe transversale, et où la surface intérieure de première lame (38) de ladite première section de lame (30) définit une courbure concave en coupe transversale.

3. L'écarteur chirurgical lumineux (10) selon la revendication 2, où la surface externe de la deuxième lame (46) de ladite section de deuxième lame (40) définit une courbure convexe en coupe transversale complémentaire de la surface intérieure de la deuxième lame (48) et où la surface intérieure de la deuxième lame (48) de ladite deuxième section de lame (40) définit une courbure concave en coupe transversale.

4. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 3, où la surface intérieure de la première lame (38) a une version miroir.

5. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 4, où ladite deuxième section de lame (40) est essentiellement transparente.

6. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 5, où l'angle aigu formé entre ladite poignée et ladite première section de lame (30) est de 30° à 65°.

7. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 6, où ladite poignée a une tige allongée (26) s'étendant à partir de première extrémité de la poignée (22), qui permet à l'écarteur (10) d'être manoeuvré dans la position désirée et d'être fixé dans la position désirée relative avec le mécanisme de la table d'opération disponible.

8. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 7, où ladite poignée est profilée pour être saisie par une main d'un opérateur.

9. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 8, où ladite première section de lame (30) inclut un bout coudé (100) ayant une extrémité proximale de bout coudé (102) et une extrémité distale de bout coudé (101), l'extrémité distale de bout coudé (101) dudit bout coudé relié à l'extrémité proximale de la première lame (34) de ladite première section de lame (30) tel que ledit bout coudé (100) forme un angle obtus avec ladite première section de lame (30).

10. L'écarteur chirurgical lumineux (10) selon l'une quelconque des revendications 1 à 9, où ladite première section de lame (30) a une forme arrondie ou une forme sans à-coup à rayons pour être reçue dans un espace sous-cutané d'un patient entre un vaisseau et le tissu sous-cutané et la poignée est orienté par rapport à ladite première section de lame (30) pour permettre à l'utilisateur d'écarter le tissu du vaisseau.

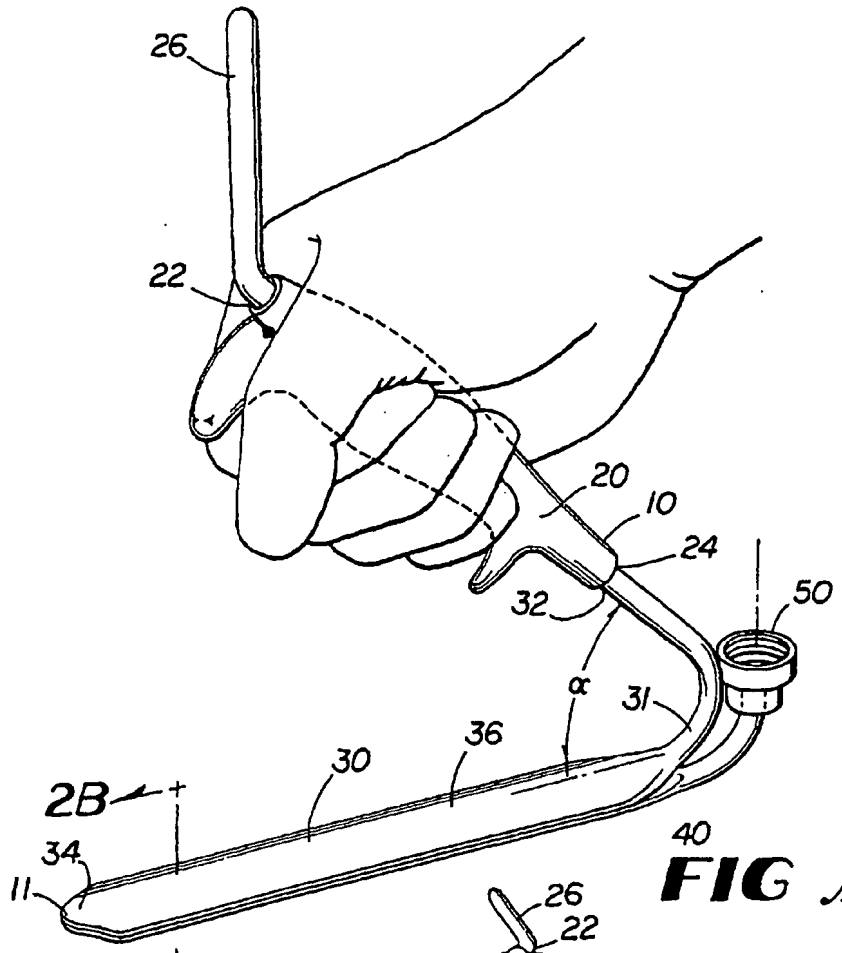

FIG 1

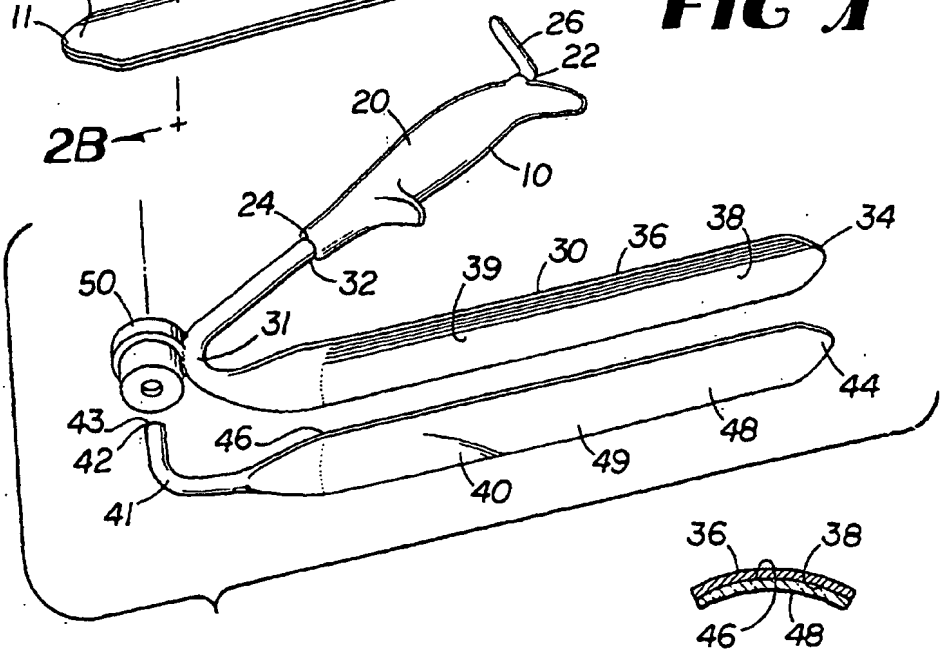

FIG 2A

FIG 2B

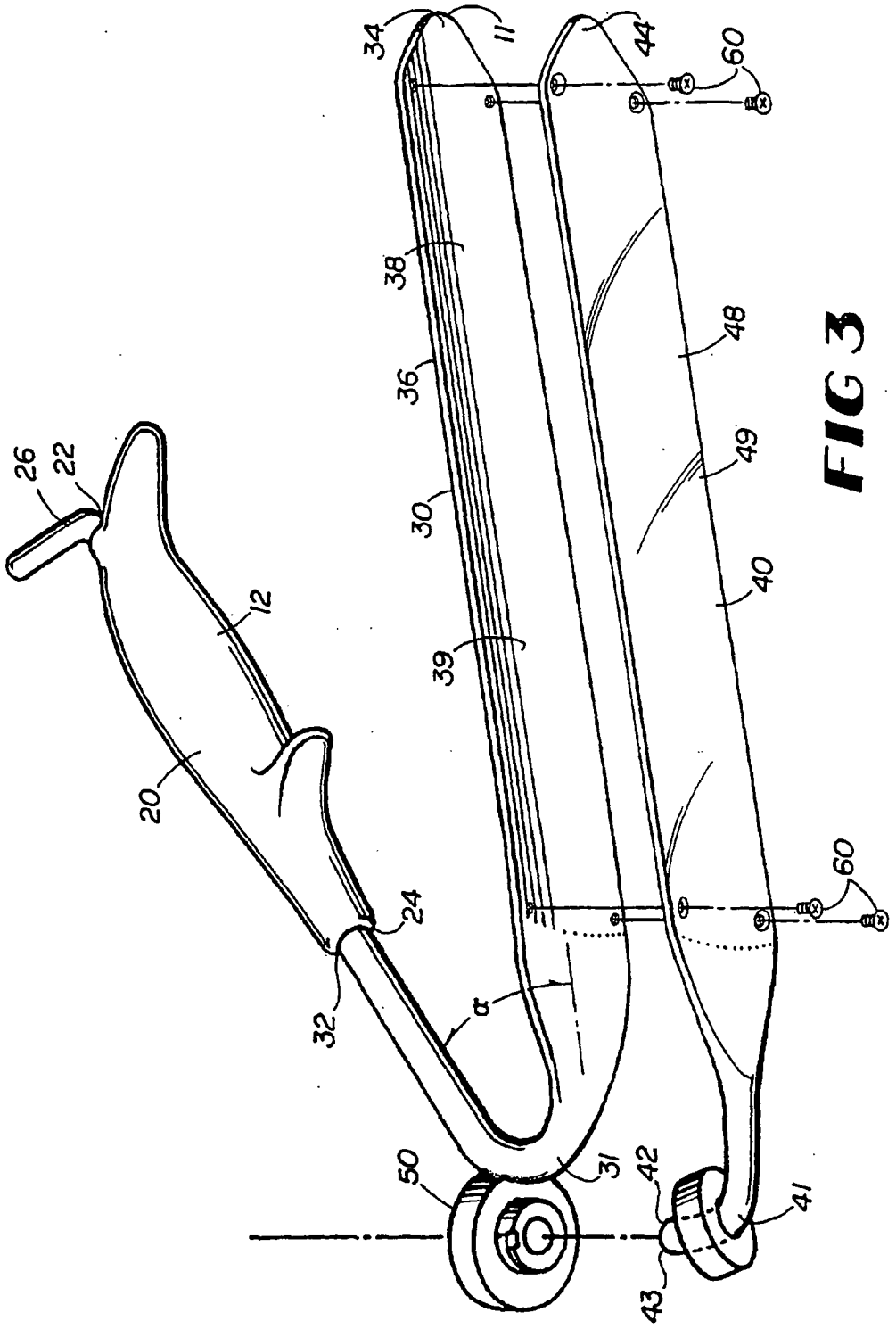

FIG 3

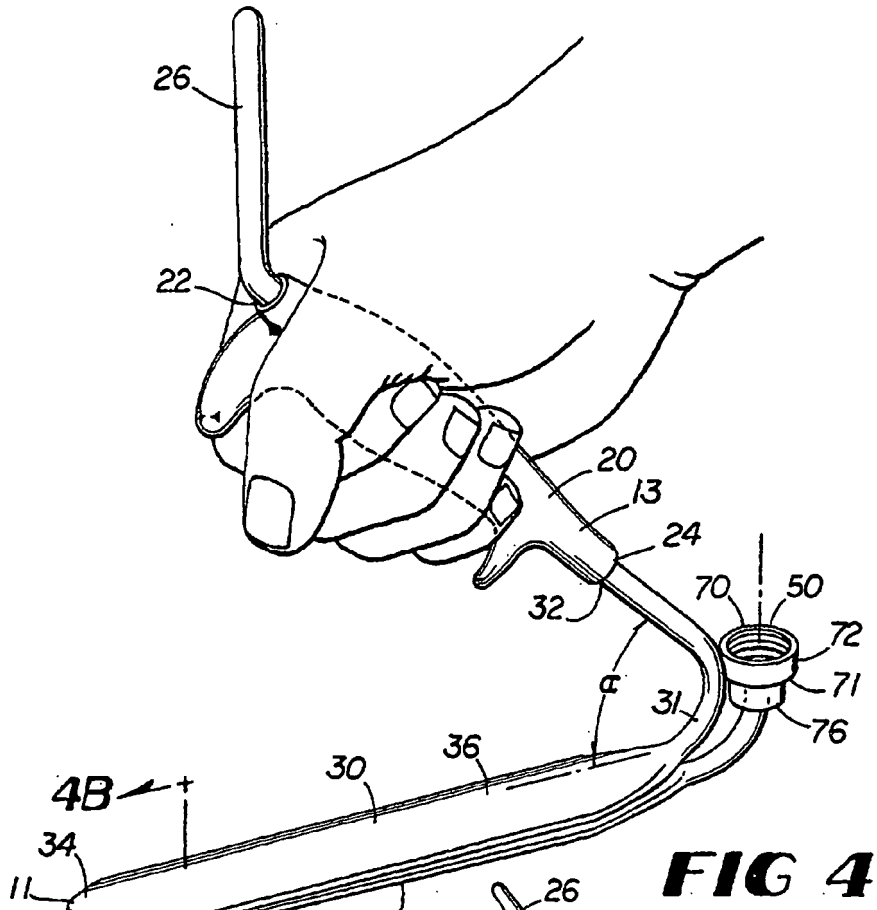

FIG 4

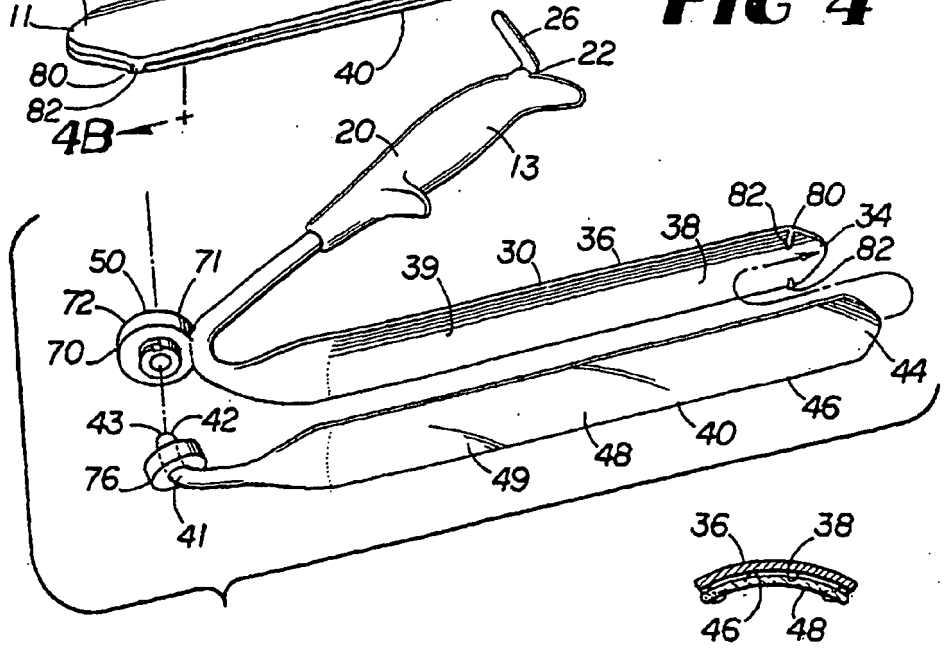

FIG 4A

FIG 4B

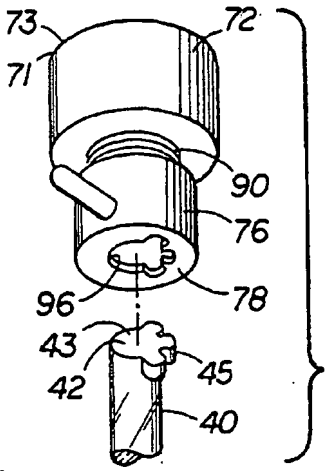

FIG 5A

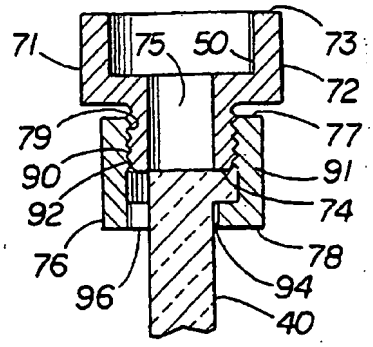

FIG 5B

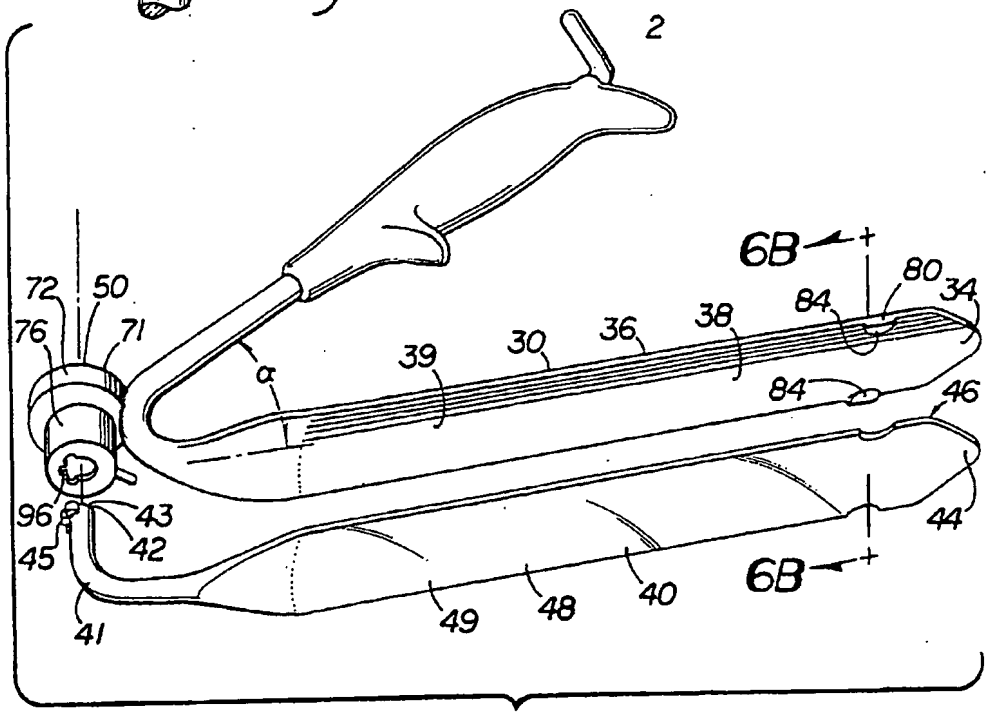

FIG 6A

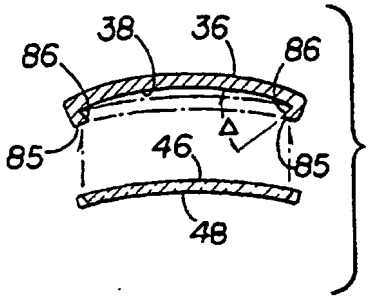

FIG 6B

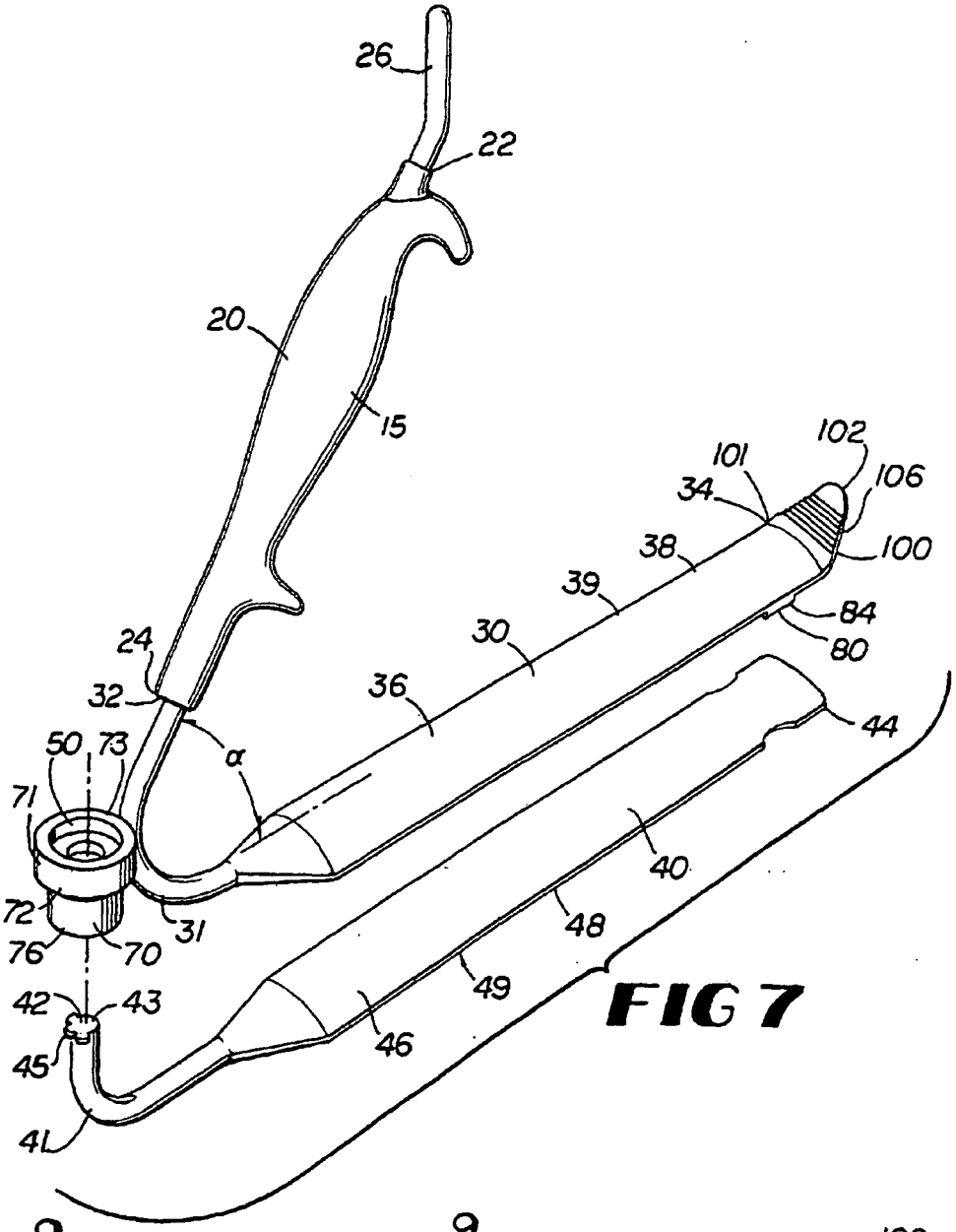

FIG 7

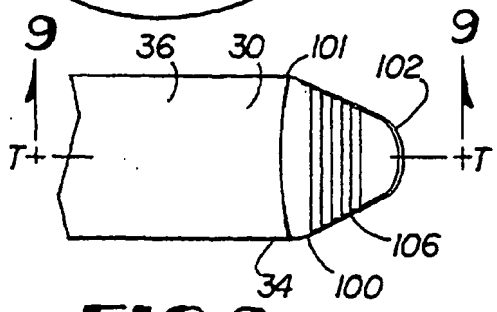

FIG 8

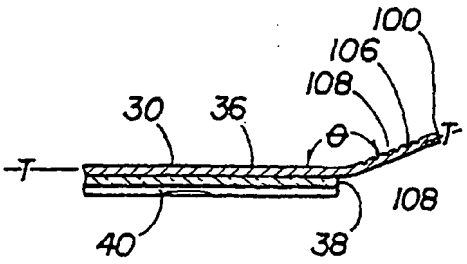

FIG 9