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(54) SURGICAL FASCIA CLOSURE INSTRUMENT, GUIDE AND METHOD

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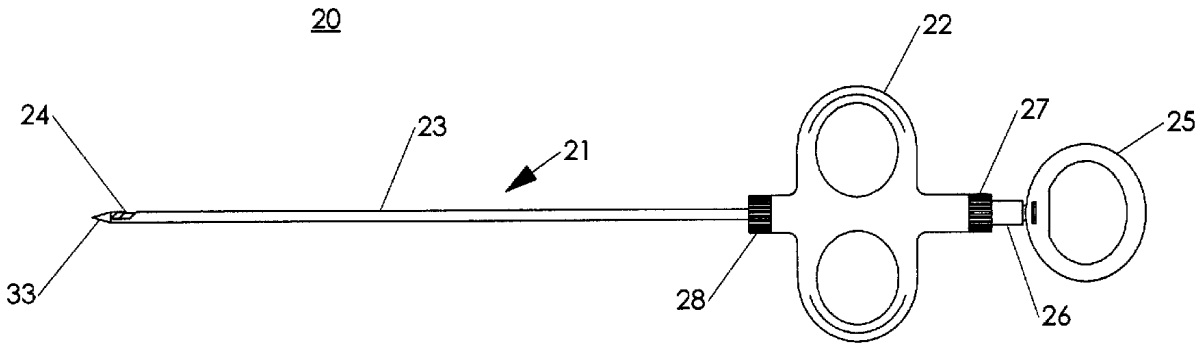
(57) ABSTRACT

A surgical instrument, a snap-on guide and method capable of being used for closure of fascia and other laparoscopic procedures that use large operative ports or trocars and is intended to help prevent post-operative hernia defects and is also used to stop acute bleeding from the abdominal wall. The instrument shaft with the needle tip is attached to a hand piece allowing the operator to control the retractable grasping surface. The needle guide directly applies onto the shaft of a trocar and it slides down to the level of the subcutaneous tissue helping the operator to place the needle. Once the suture is passed through the abdominal wall, it is released then the needle is re-inserted through the opposite "guide port". The suture creates an intra-abdominal loop of suture outside the abdomen. Suture ends will be tied, allowing closure of the fascial defect within the abdominal wall.



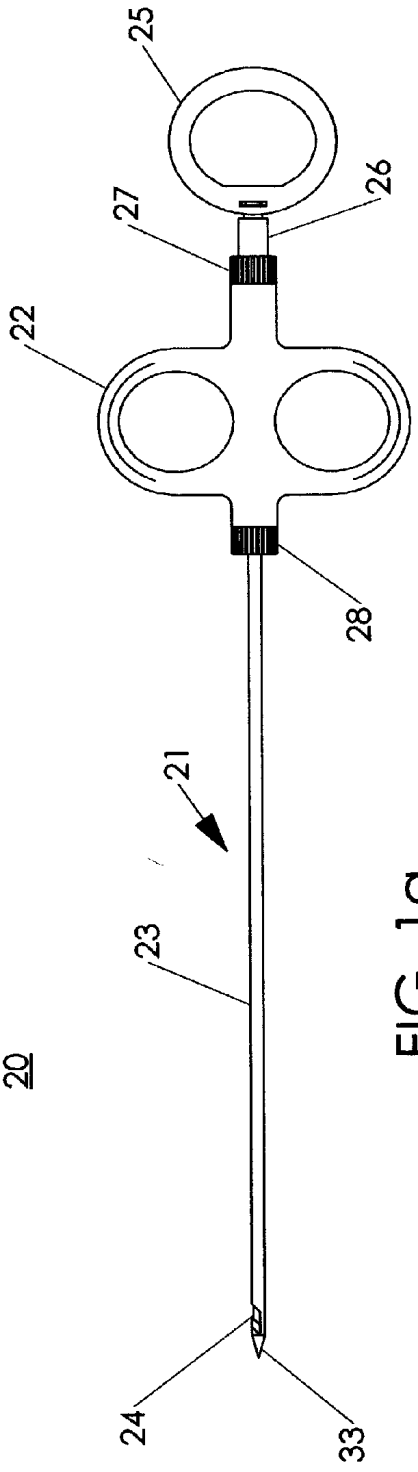

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FIG. 1a.

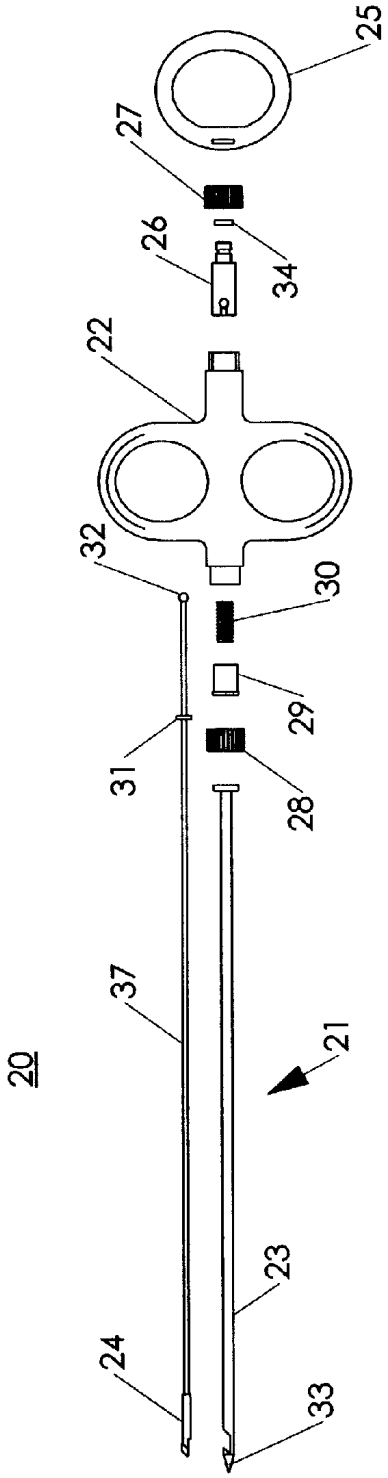
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FIG. 1b.

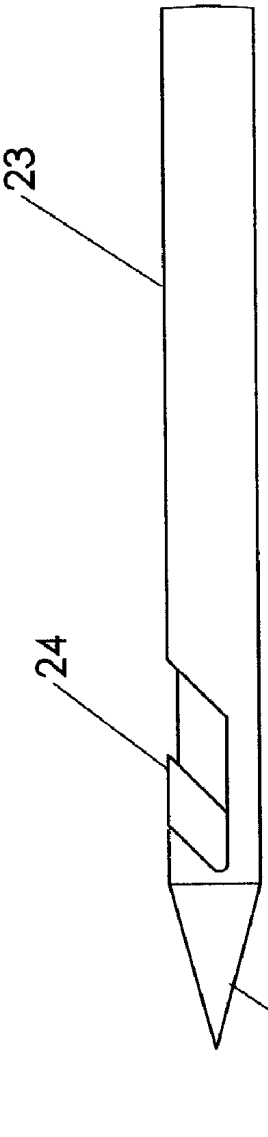


FIG. 2.

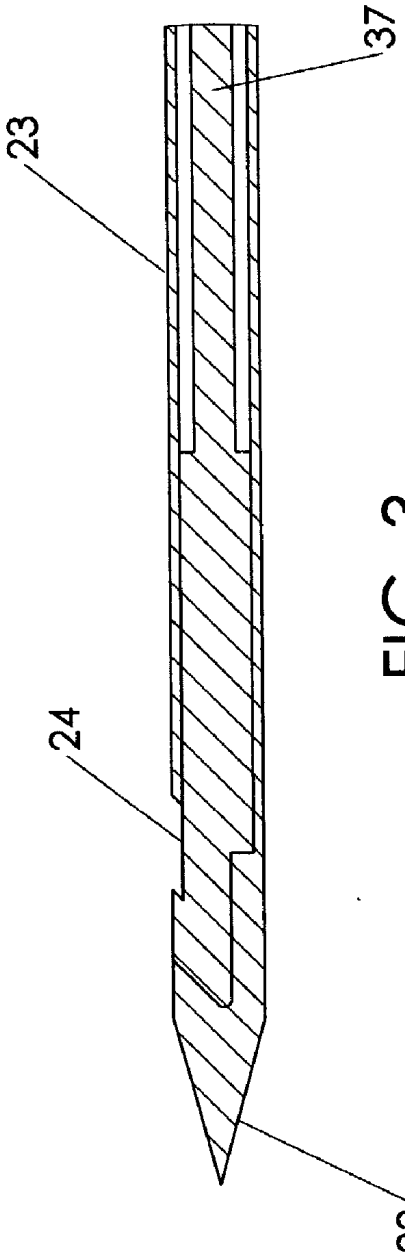


FIG. 3.

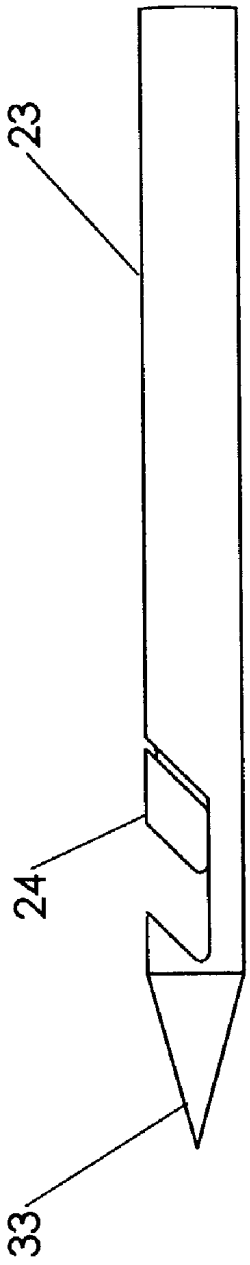


FIG. 4.

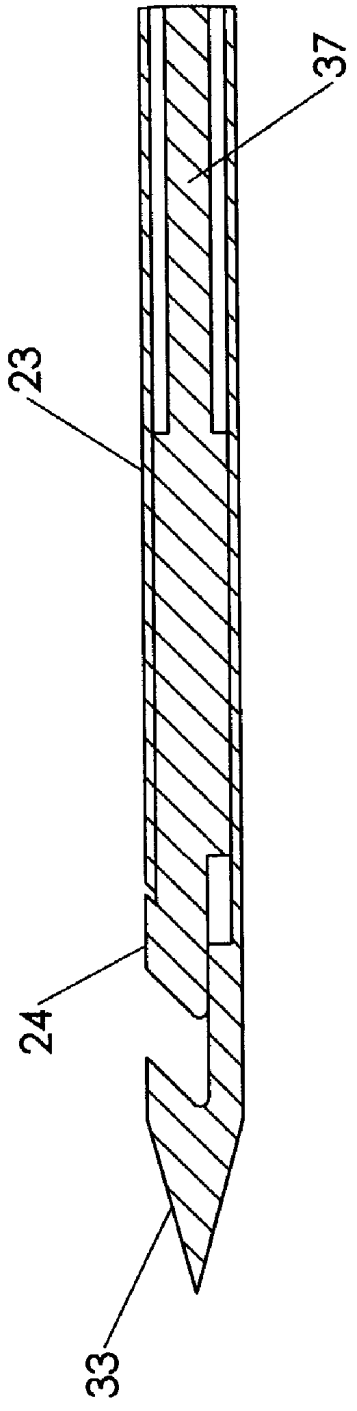


FIG. 5.

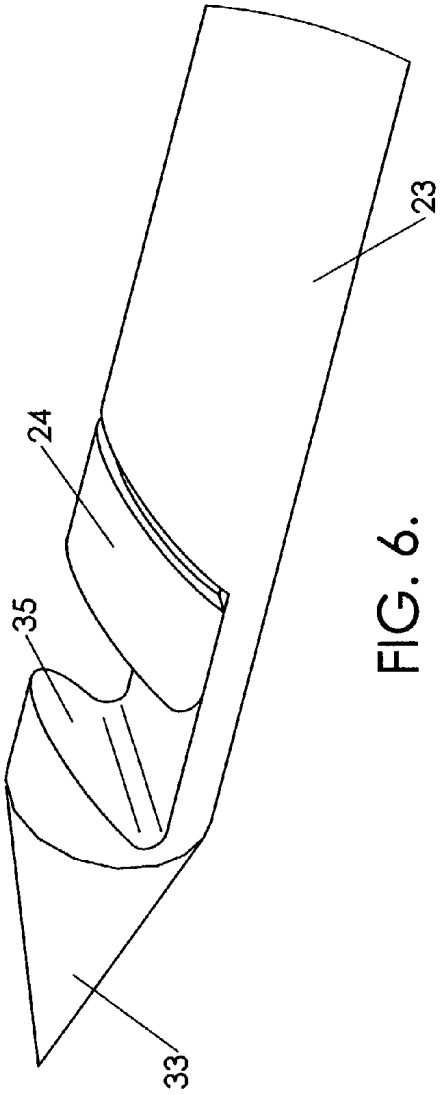


FIG. 6.

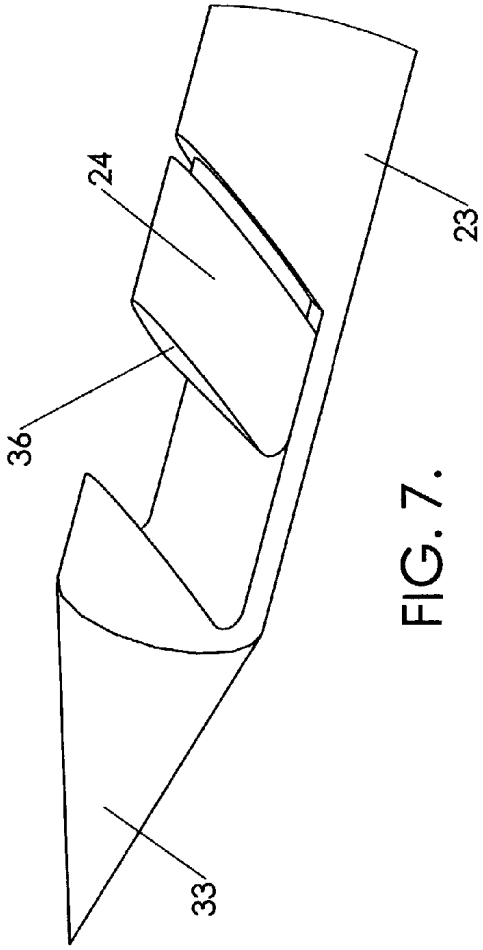


FIG. 7.

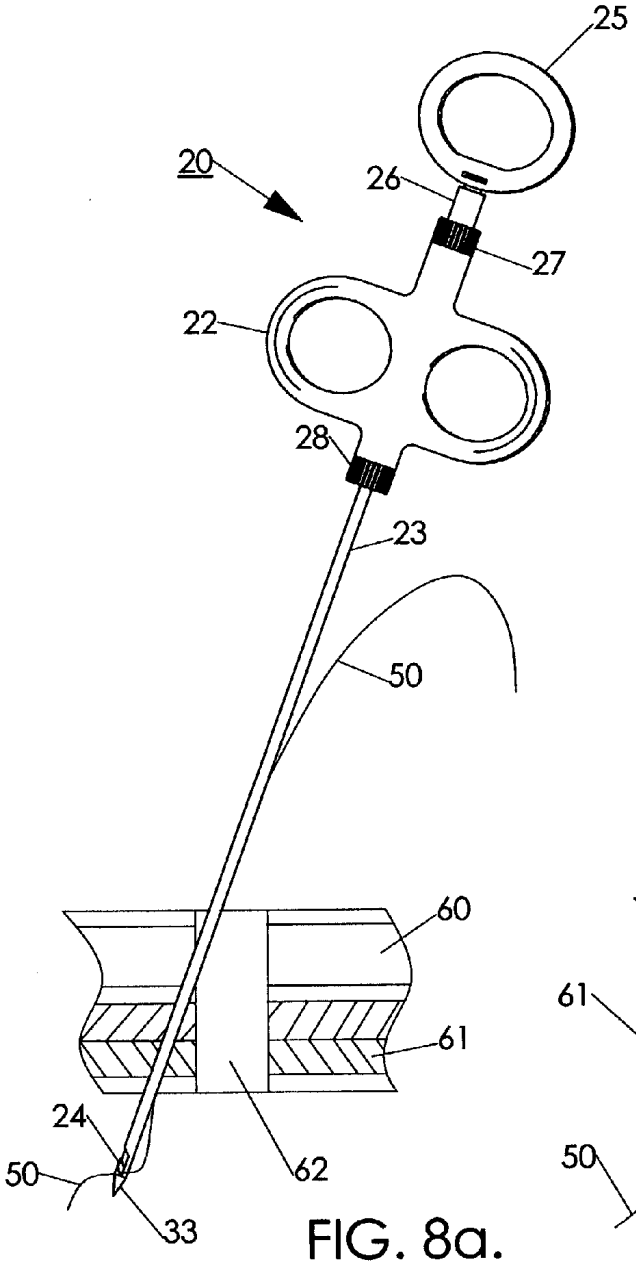
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FIG. 8a.

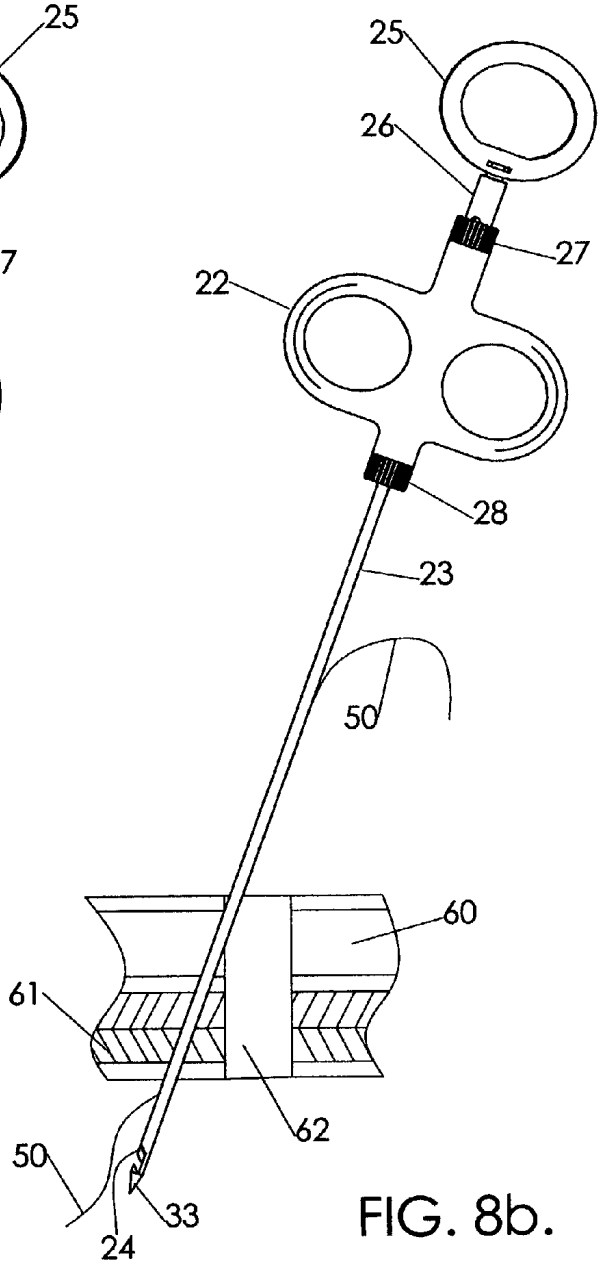
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FIG. 8b.

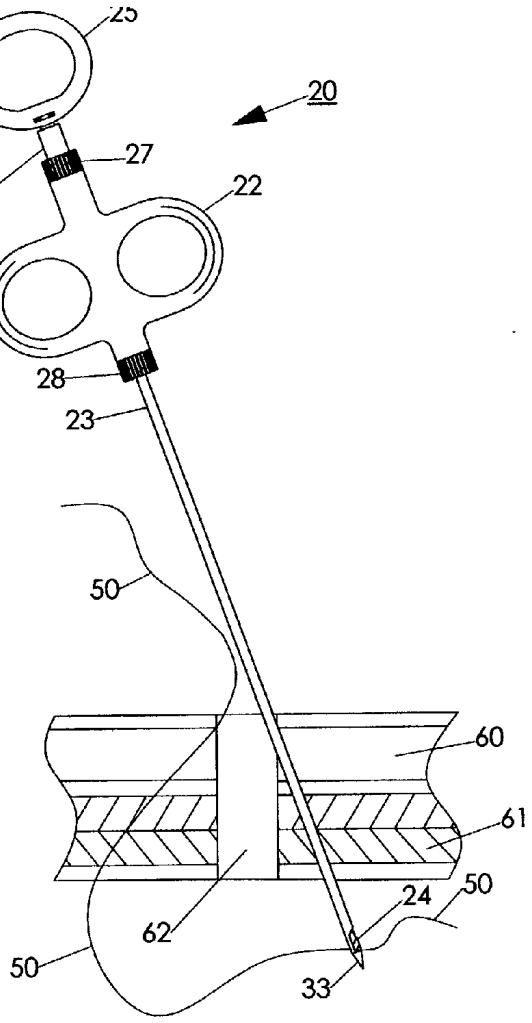



FIG. 8c.

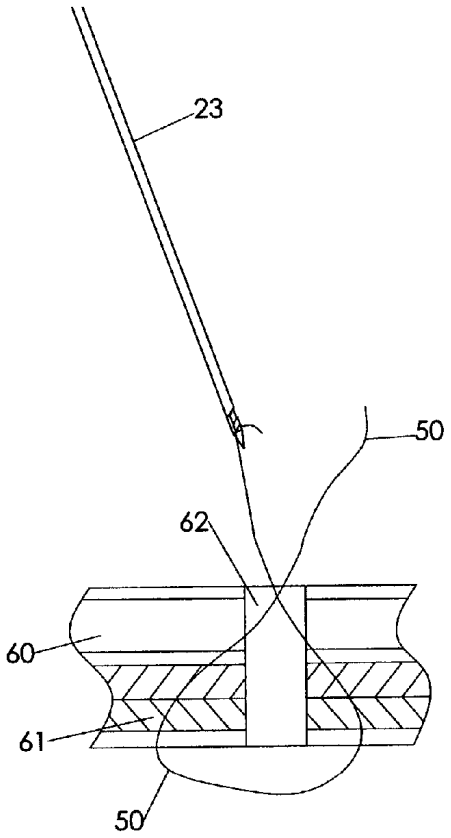



FIG. 8d.

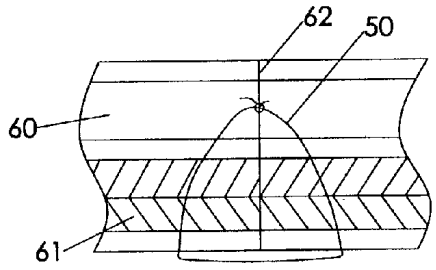
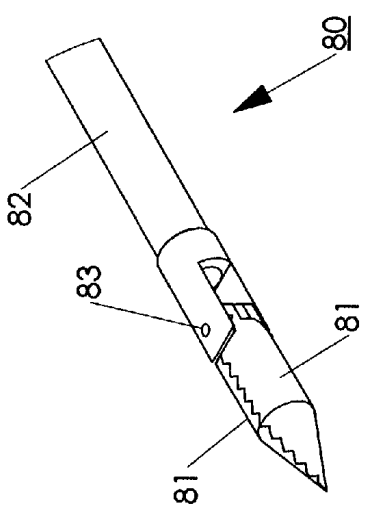



FIG. 8e.



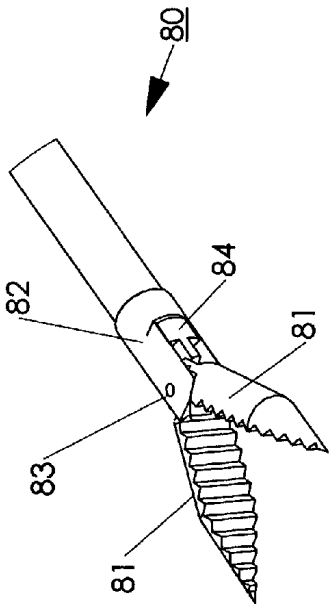




FIG. 9b.

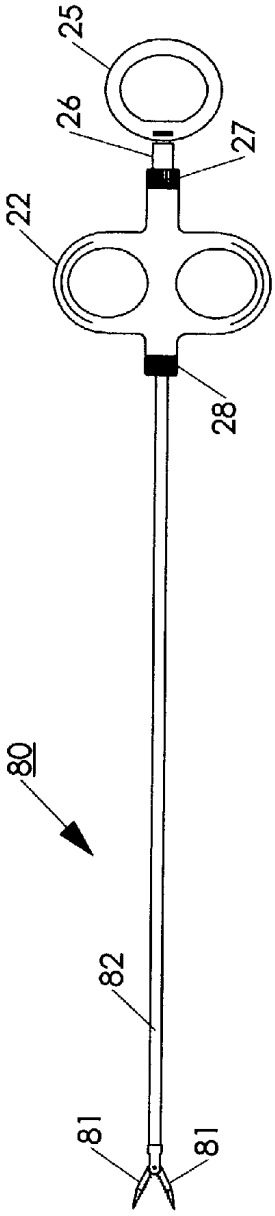



FIG. 9a.

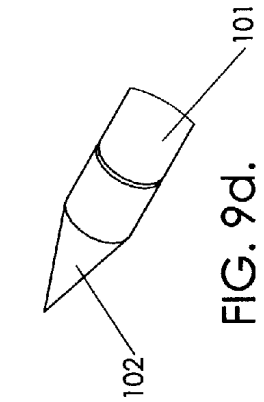



FIG. 9d.

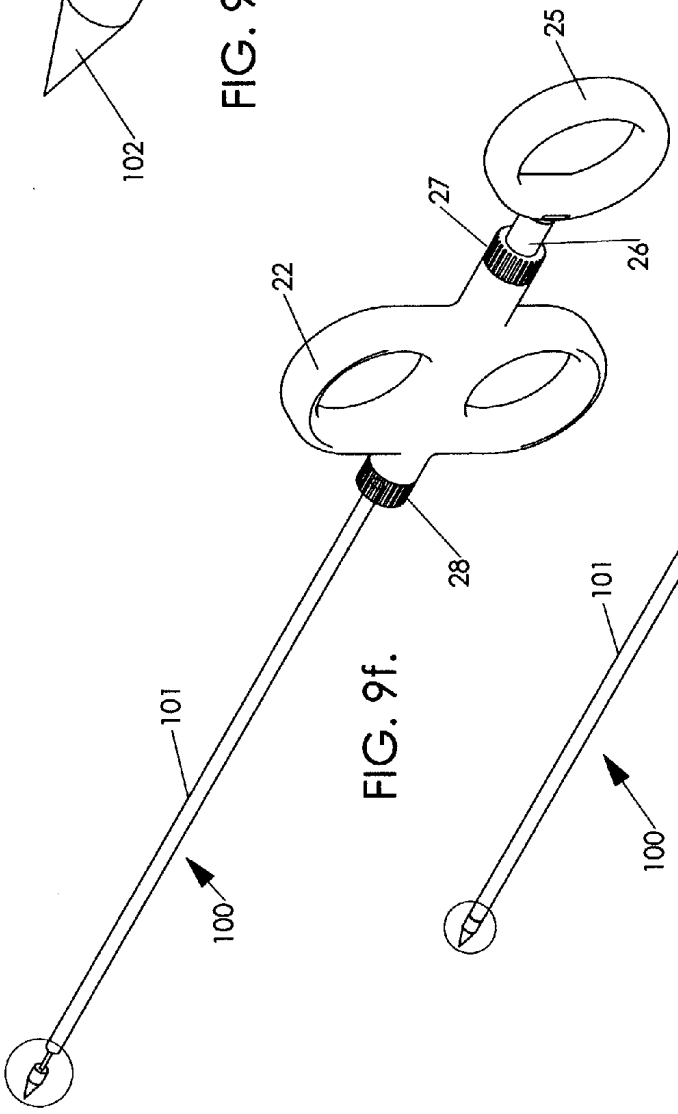



FIG. 9f.

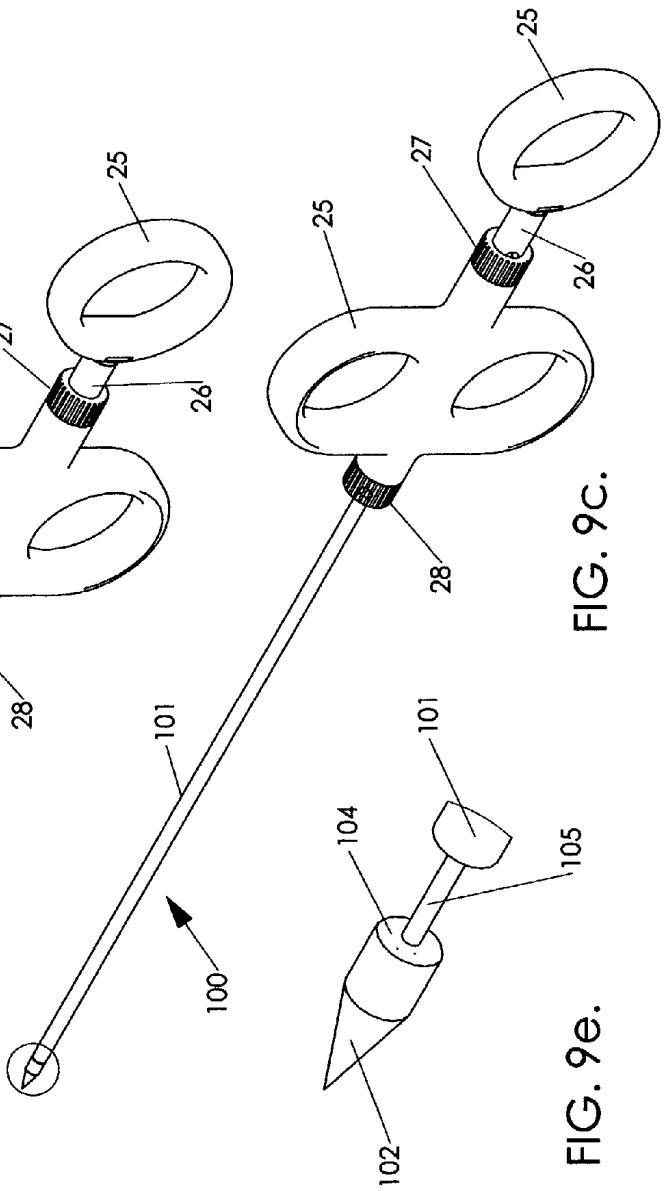



FIG. 9c.




FIG. 9e.

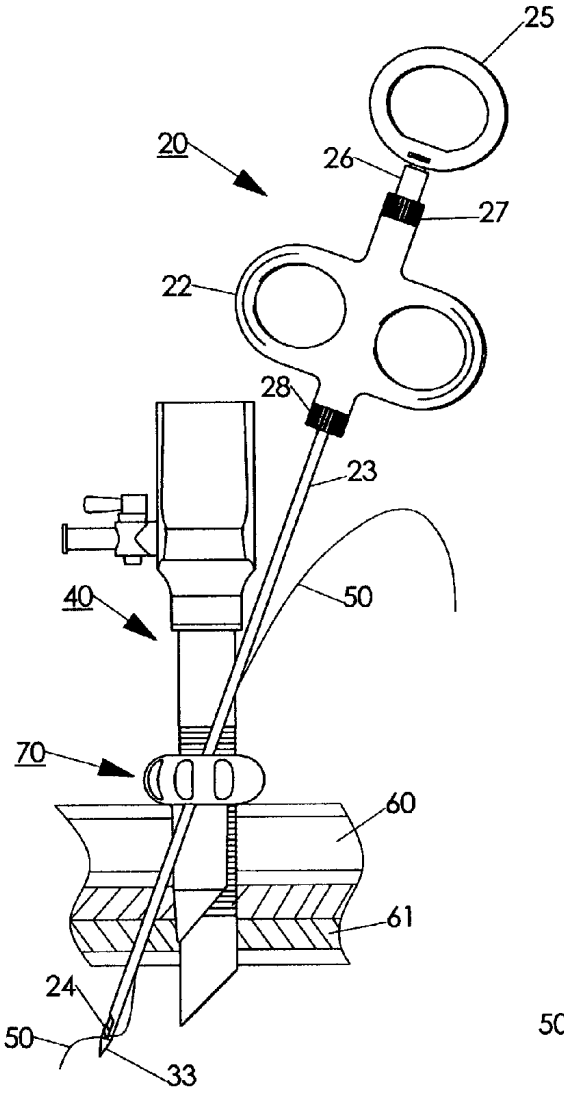



FIG. 10a.

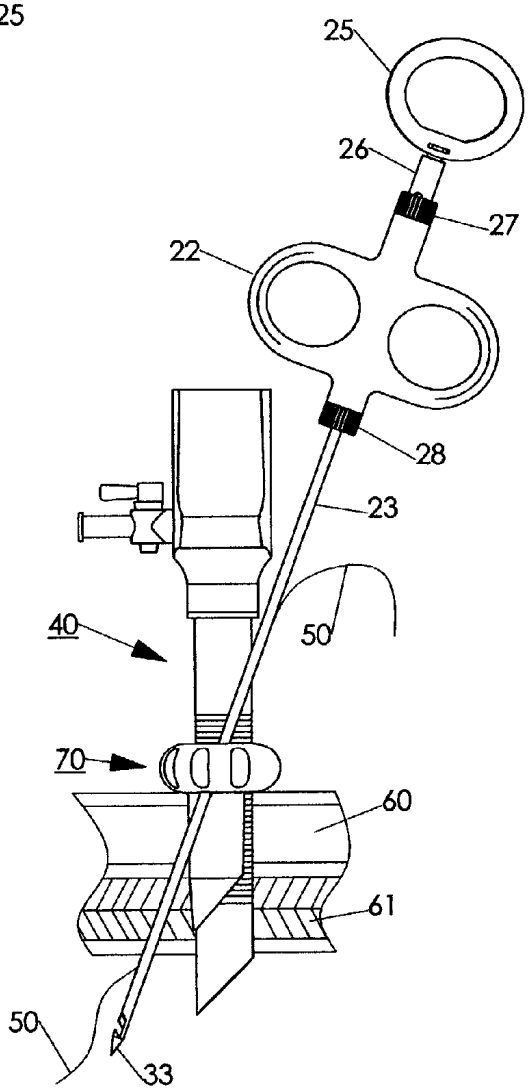



FIG. 10b.

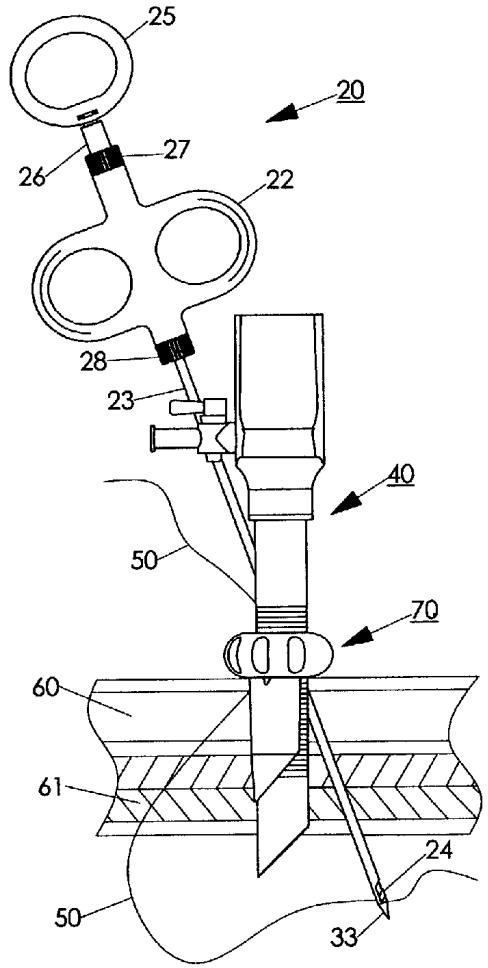



FIG. 10c.

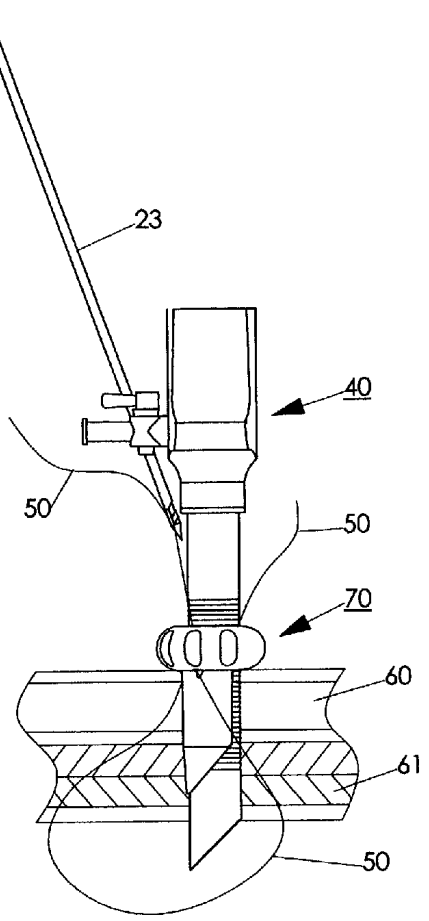



FIG. 10d.

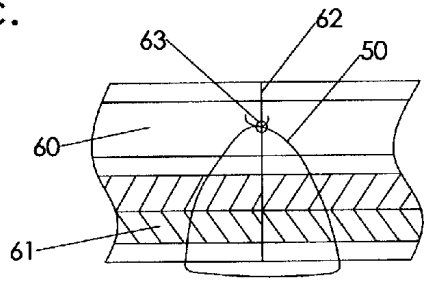



FIG. 10f.

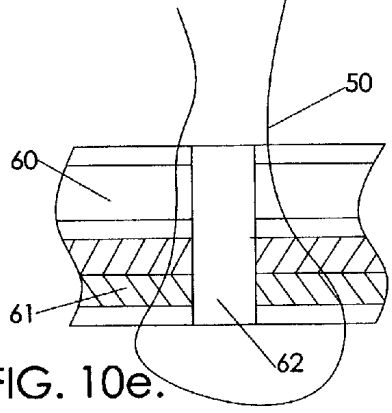



FIG. 10e.

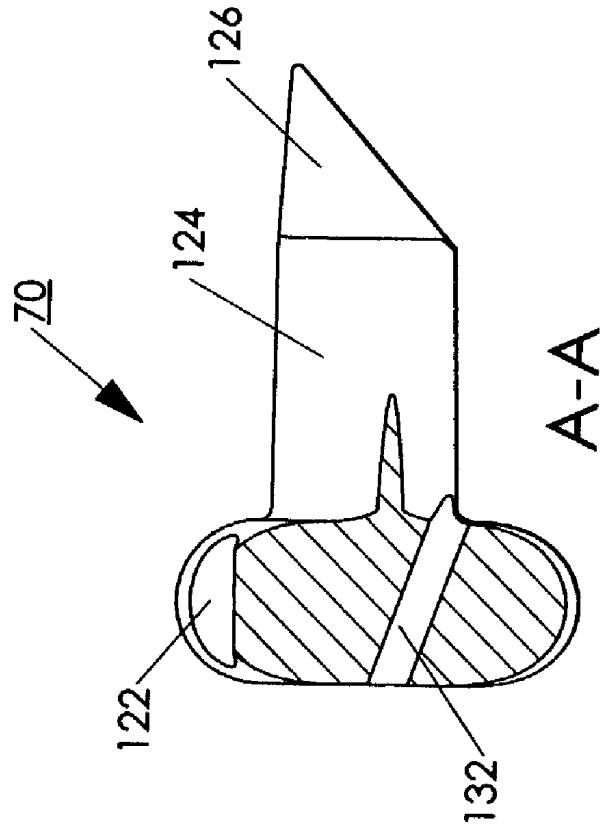



FIG. 12.

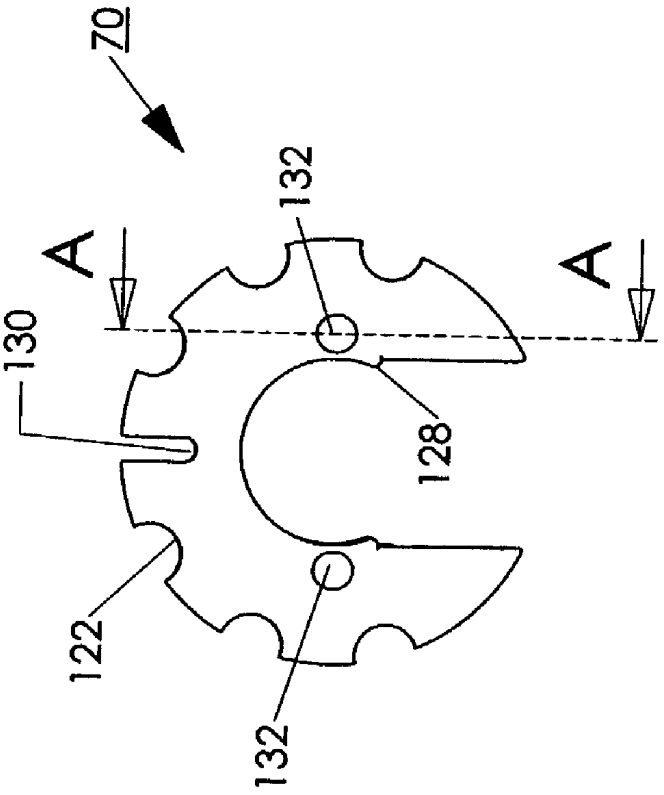



FIG. 11.

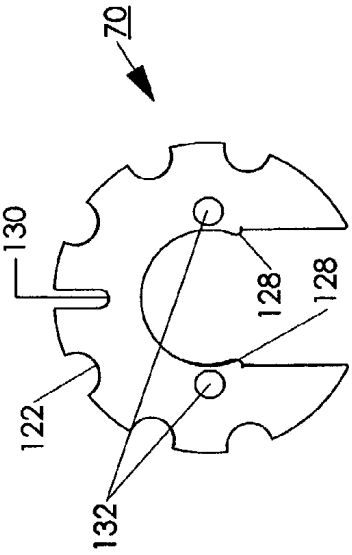



FIG. 13.

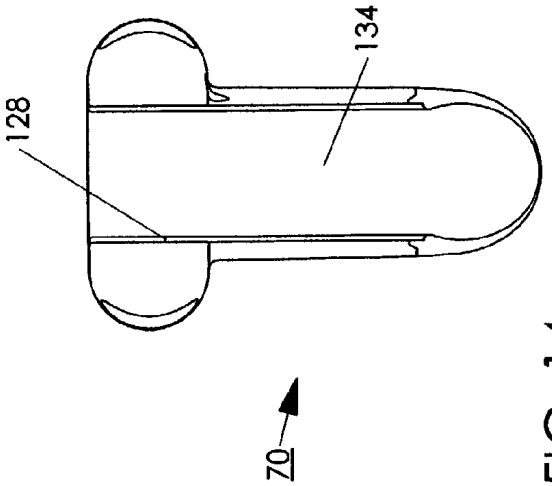



FIG. 14.

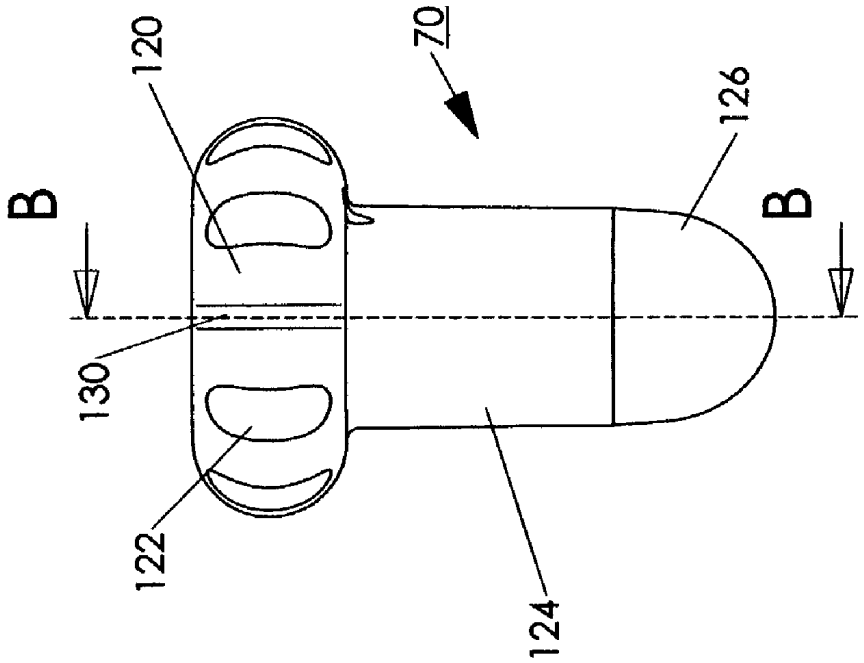
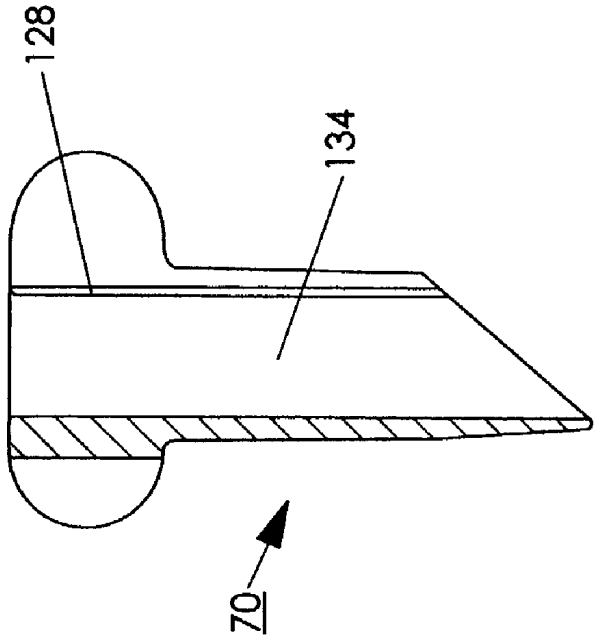



FIG. 16.




B-B

FIG. 15.

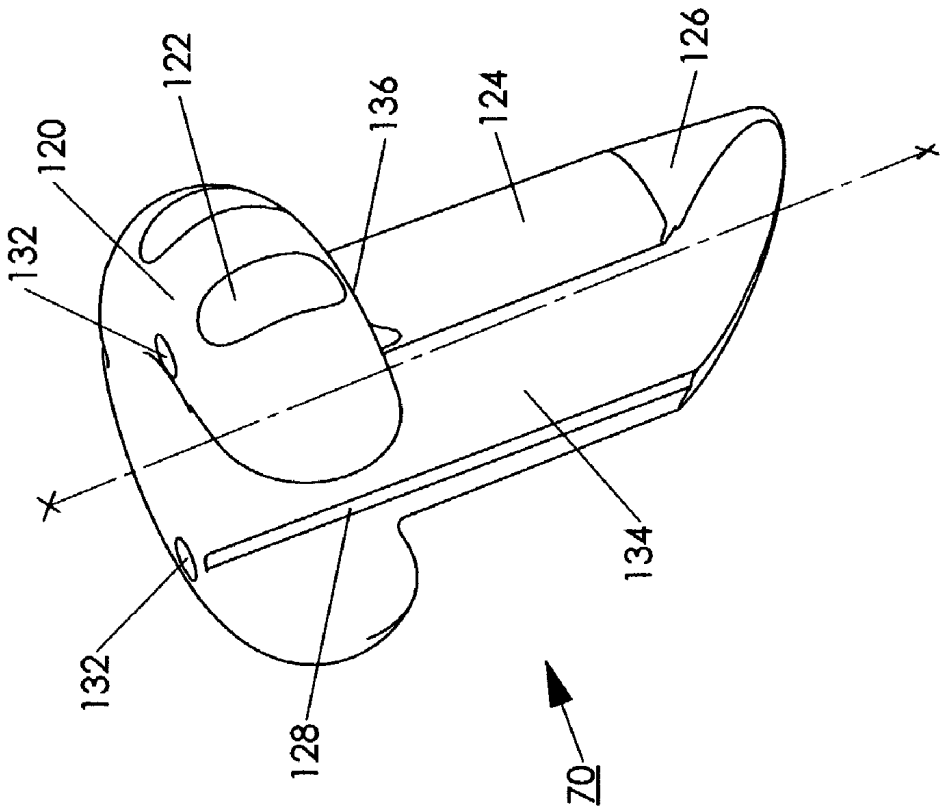



FIG. 17.

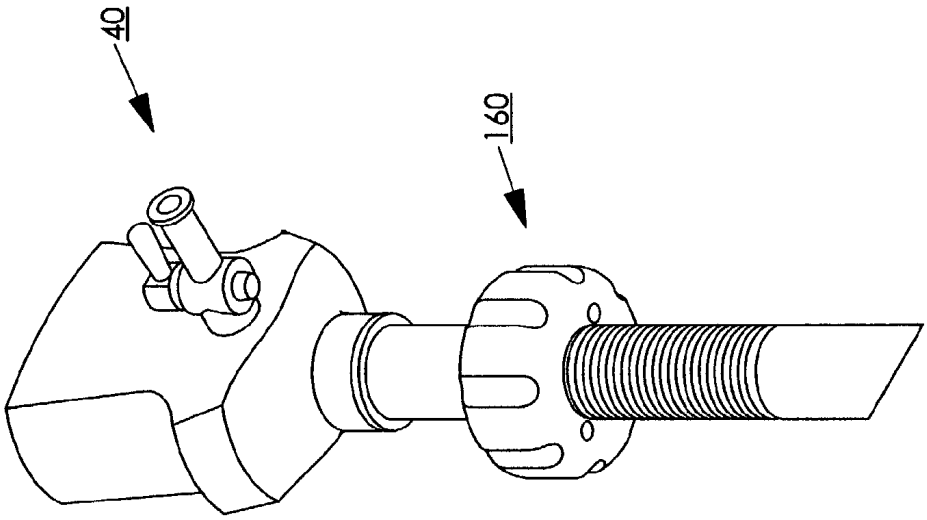



FIG. 19.

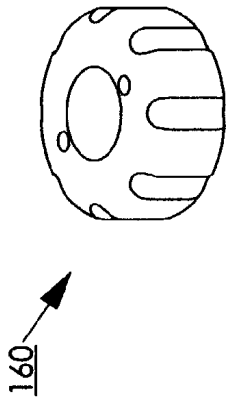



FIG. 18.

# SURGICAL FASCIA CLOSURE INSTRUMENT, GUIDE AND METHOD

## CROSS REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable

## STATMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable

## DESCRIPTION OF ATTACHED APPENDIX

[0003] Not Applicable

## BACKGROUND OF THE INVENTION

[0004] This invention relates generally to the field of laparascopic surgery and more specifically to a surgical fascia closure instrument, guide and method.

[0005] 1. Field of the Invention

[0006] The present invention relates to improvements in the procedure for suturing tissue during laparoscopic surgery. More particularly, the invention relates to a method of suturing which utilizes a modified laparoscopic grasper and a guide. An alternative embodiment of the laparoscopic grasper has an interchangeable shaft configuration.

[0007] 2. Description of the Related Art

[0008] An endoscopic/laparoscopy procedure involves making small surgical incisions in a patient's body for the insertion of trocar tubes thereby creating access ports into the patient's body. Thereafter, various types of endoscopic/laparoscopic instruments are inserted through these access ports and the appropriate surgical procedures are carried out.

[0009] After the surgical procedure is performed, the trocar tubes are usually removed and the incisions sutured closed by using both a needle and grasper for penetrating the tissue and handling the suture. This procedure for closure is frequently a time-consuming procedure requiring the identification of the fascia and closure of each fascial site with suture from an external point.

[0010] The necessity for closing these port sites in laparoscopic surgery is critical since suturing the incisions improperly can lead to bowel herniation through the port sites as well as the possibility of omental trapping if the fascial sites are not properly closed. Incisional hernias have occurred in both laparoscopic-assisted vaginal hysterectomies and laparoscopic cholecystectomies as well as other advanced laparoscopic procedures.

[0011] Thus there is a need for an endoscopic/laparoscopic instrument, a guide and method which will significantly reduce the operating time and is better able to give the surgeon direct visualization of the fascial and peritoneal closing. Additionally, there is a need for a surgical instrument which allows the surgeon to control bleeding sites by rapidly putting sutures around blood vessels of the abdominal wall without the need to remove trocar tubes already in the wound.

[0012] U.S. Pat. No. 6,183,485 issued to Rodger D. Thomason on Feb. 6, 2001

[0013] This patent is directed to a suturing means and method using a laparoscopic surgical instrument and a guide. The laparoscopic surgical instrument comprises a modified laparoscopic grasper wherein forceps jaws at the tip are manipulated by means of handles extending from a tubular housing with an enclosed reciprocating actuating rod connected with the handlers. The laparoscopic surgical instrument of this patent has the tip of the forceps jaws modified to have either a knife-, chisel-, or cone-shaped tip when the jaws are in the closed position. The guide is used for directing the surgical instrument to accurately pierce the tissue and carry the suture to the predetermined area of the body. To place the guide within the body opening, the removal of the operating trocar tubes are necessary.

[0014] With the present invention, the suture guide is applied to the shaft of a trocar at the beginning of the surgery and slides down to the level of the subcutaneous tissue. Within the needle guide, there are two guide ports which orient the needle at selected angles to allow the needle to pass through the abdominal wall. Suturing can start immediately without frustration The surgeon simply passes the suture through the tissue, then picks up the suture for tying or passing through the tissue to create another stitch for wound closure. The present invention allows introduction of suture through large, 10 mm or greater operative ports or trocars.

[0015] Additionally, the technique for using the present invention is easily learned; and the several embodiments set forth herein generally reduce the time and frustration associated with intra-abdominal suturing. These advantages are enhanced by use of the guide disclosed herein.

## BRIEF SUMMARY OF THE INVENTION

[0016] It is an object of the present invention to provide a surgical instrument, a guide and a method for the closure of a surgical incision under direct camera vision of the surgeon.

[0017] A further object of the invention is to provide a laparoscopic instrument, a guide and a method that allows for the rapid control of bleeding vessels in the outer or the abdominal wall that may occur with the placement of laparoscopy trocars.

[0018] Still another object of the invention to provide a guide that will attach onto the trocar tube and eliminates trocar removal from the incision, therefore causes less trauma and allows the surgeon to start the facia closure procedure immidately.

[0019] Another object of the invention is to provide a laparoscopic instrument that easily disassembles by hands only for providing easy access to all the components for cleaning and sterilization prior to surgery.

[0020] It is another object of the invention to provide an improved guide to accurately and consistently restrain the position and angle of insertion of a laparoscopic instrument to provide for proper placement and retrieval of suture material at a predetermined location within the body.

[0021] Accordingly, it is an objective of the present invention to provide a method associated with an improved surgical instrument and an improved guide that better suits the needs of a surgeon when suturing closed a surgical incision.

[0022] These and other objects of and advantages of the present invention will be apparent from a review of the following specification and accompanying drawings.

[0023] Other objects and advantages of the present invention will become apparent from the following descriptions, taken in connection with the accompanying drawings, wherein, by way of illustration and example, an embodiment of the present invention is disclosed.

[0024] The present invention is directed to a suturing means and method using an improved probe guide and an improved laparoscopic surgical instrument which permits a surgeon to pass suture without trauma through tissue while retaining the function of grasping the suture.

[0025] The laparoscopic surgical instrument comprises a modified laparoscopic grasper wherein grasping surfaces close to the tip are manipulated by means of handles extending from a tubular housing with an enclosed reciprocating actuating rod connected with the handles.

[0026] The invention includes a snap on suture probe guide delivering guided access to appropriate tissue layers for suturing. In a preferred embodiment, the probe guide is attached on to the operating trocar which remains in the wound during a laparoscopic tissue closure procedure.

[0027] The drawings constitute a part of this specification and include exemplary embodiments to the invention, which may be embodied in various forms. It is to be understood that in some instances various aspects of the invention may be shown exaggerated or enlarged to facilitate an understanding of the invention.

## BRIEF DESCRIPTION OF DRAWINGS

[0028] The above, as well as other, advantages of the present invention will become readily apparent to those skilled in the art from the following detailed description of the preferred embodiments when considered in light of the accompanying drawings in which:

[0029] **FIG. 1***a*. is a side elevational view of a laparoscopic instrument of the present invention

[0030] **FIG. 1***b*. is an exploded side elevational view of the laparoscopic instrument of **FIG. 1***a*.

[0031] **FIG. 2**. is a side elevational partial view of the tip of the laparoscopic instrument showing in closed condition

[0032] **FIG. 3**. is a side elevational sectional view of the tip of the laparoscopic instrument showing in closed condition

[0033] **FIG. 4**. is a side elevational partial view of the tip of the laparoscopic instrument showing in open condition

[0034] **FIG. 5**. is a side elevational broken view of the tip of the laparoscopic instrument showing in open condition

[0035] **FIG. 6**. is an isometric view of the tip of the laparoscopic instrument showing in open condition

[0036] **FIG. 7**. is a dimetric view of the tip of the laparoscopic instrument showing in open condition

[0037] **FIG. 8***a*. is a diagrammatic sketch, partly broken away, of the surgical instrument in the closed position passing suture through tissue.

[0038] **FIG. 8***b*. is a diagrammatic sketch, partly broken away, of the surgical instrument in the open position for dropping the suture.

[0039] **FIG. 8***c*. is a diagrammatic sketch, partly broken away, of the surgical instrument in the closed position passing suture through tissue at the other side of the incision and picking up suture.

[0040] **FIG. 8***d*. is a diagrammatic sketch, partly broken away, of the surgical instrument pulling suture through muscle fascia and peritoneum.

[0041] **FIG. 8***e*. is a diagrammatic sketch, partly broken away, of the suture tied below the skin to complete closure.

[0042] **FIG. 9***a*. is a side elevational view of an alternative embodiment to the laparoscopic instrument of the present invention.

[0043] **FIG. 9***b*. is a perspective view of the forceps jaws in open and in closed position according to one embodiment of the invention.

[0044] **FIG. 9***c*. is an isometric view of another alternative embodiment to the laparoscopic instrument of the present invention showing in closed position.

[0045] **FIG. 9***d*. is a perspective detail view, of the forceps tip in closed position according to one embodiment of the invention.

[0046] **FIG. 9***e*. is a perspective detail view, of the forceps tip in open position according to one embodiment of the invention.

[0047] **FIG. 9***f*. is an isometric view of another alternative embodiment to the laparoscopic instrument of the present invention showing in open position.

[0048] **FIG. 10***a*. is a diagrammatic sketch showing the guide of the present invention attached on the operating trocar within the wound to be closed receiving the tip of the surgical instrument received within a passageway carrying suture material.

[0049] **FIG. 10***b*. is a diagrammatic sketch showing the guide with the surgical instrument releasing the suture material.

[0050] **FIG. 10***c*. is a diagrammatic sketch showing the guide with the surgical instrument being received in an opposite and adjacent passageway of the guide retrieving the suture material.

[0051] **FIG. 10***d*. is a diagrammatic sketch showing the guide with the surgical instrument pulling suture through muscle fascia and peritoneum.

[0052] **FIG. 10***e*. is a diagrammatic sketch showing the operating trocar with the guide and the surgical instrument has been removed from the body and the loop of suture is ready for wound closure.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0053] Detailed descriptions of the preferred embodiment are provided herein. It is to be understood, however, that the present invention may be embodied in various forms. Therefore, specific details disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the present invention in virtually any appropriately detailed system, structure or manner.

[0054] Referring now to the drawings wherein like reference numerals refer to like and corresponding parts throughout, the laparoscopic instrument is generally indicated by numeral **20**.

[0055] Referring now to **FIGS. 1***a* and **1***b* , where grasping surface **35** is fixed and grasping surface **36** is moving back and forth when actuating rod **37** is reciprocated by a surgeon manipulating the instrument handle **22** and **23** providing a driving for driving grasping surface **36** to be in closed contact with fixed grasping surface **36** for carrying suture. Detachable means **21** comprise an elongated tube **23** concentrically sharing an axis with the actuating rod **37** having having grasping surfaces **35** and **36** engaged at a distal third of the outer shaft **23**.

[0056] As shown in **FIG. 1***b* , the laparoscopic instrument **20** can be easily disassembled for sterilization prior to surgery by separating handle **22** from detachable means **21** by loosening the knurled screws **28** on fixed handle housing **22**,and other knurled screw **27** at thumbring **25** and unlatching connecting ball **32** from rotating piece **26** which thereby frees actuating rod **37** and tube **23** from handle housing **22**. By loosening thumb screw **27**, thumbring **25** can be disassembled from fixed handle housing **22** that allows for cleaning of the inside of the handle-housing area. When disassembled, the parts may be flushed, washed, and dried according to hospital procedures for stainless steel surgical instruments.

[0057] With the above-described arrangement, it will be seen that the surgeon is able to selectively operate the handle **22** and thumbring **23** to independently open and close the movable grasping surface **36** in relationship to fixed grasping surface **35** for grasping, carrying, or releasing suture during a laparoscopic operation. To open grasping surface **36**, the surgeon moves movable thumbring **25** connected to rotating piece **26** forward toward the distal end of tube **23**. As shown in **FIGS. 2, 3, 4** and **5** the grasping surfaces **35** and **36** are separate from needle tip **33**. The tip **33** operates as a sharp needle point that pierce through soft tissue while grasping surface **35** and **36** simultaneously grips and passes the suture. **FIG. 4**. shows the surgical instrument **20** in the open position. **FIG. 5**. shows a sectional side elevational view of the instrument and it also explains how the inner part **24** with the grasping surface **36** at the end moves inside the outer tube **23**, **FIGS. 2**. and **3**. shows the same instrument in a closed position.

[0058] **FIGS. 8***a*. through **8***e*. are diagrammatic representations of one example of using the method and laparoscopic instrument **20** of the present invention grasping and passing suture through soft tissue for closure of an incision **62**. In **FIG. 8***a*. the surgeon grasps the suture material **50** with grasping surfaces **35** and **36** and inserts instrument **20** carrying suture material **50** through the muscle fascia **60** and peritoneum **61** until the tip **33** and grasping surface **35** and **36** is seen through the peritoneum by direct camera vision. Subsequently, the surgeon releases the suture **50** by opening the moving grasping surface **36** located on the end of the moving inner part **24** and withdrawing the instrument **20** out of incision **62** as shown in FIG. **8***b*. In **FIG. 8***c*. the surgeon then takes instrument **20** and inserts the tip **33** through the muscle fascia **60** and peritoneum **61** opposite the first point of insertion, grasping the suture **50** with gripping surface **35** and **36** and pulling the suture **50** carried and held by grasping surface **35** and **36** outside incision **62** as shown by **FIG. 8***d*. whereupon suture **50** is tied below the skin to complete closure of incision **62** as shown by **FIG. 8***e*.

[0059] As shown in **FIGS. 9***a*. through **9***f*., additional alternative embodiments of the present invention provide additional advantages for both specific and general applications.

[0060] **FIG. 9***b*. shows an interchangeable grasping forcep shaft **80** with serrated jaws **81** forming a sharp, cone shaped needle tip in a fully closed position. The shaft **80** is connected to the handle **22** and thumbring **25** by tightening knurled screw **27** and **28**. The interchangeable grasper shaft **80** has two identical jaws **81** at the tip. Both jaws **81** are are retractable by an inner actuating rod **84** allowing to pierce tissue and carry suture in the same time. A pin **83** serves as a pivot point for the moving jaws **81**. The exceedingly sharp needle tip formed by the jaws **81** provides easy penetration of tissue layers. The option to be able to retract both jaws, allows the surgeon to manipulate the suture easier.

[0061] As shown on **FIG. 9***c*, the novel configuration of the shaft **100** provides an alternative embodiment to that shown in **FIGS. 1***a*. and **1***b*. The shaft **101** is fix and engaged to handle **22**. An actuating rod **105** with a needle tip **102** at its end connected to handle **22** and thumbring **25**, moves inside the outer tube defining a suture gripping area **106** (shown in **FIG. 9***d*.) between grasping surface **104** and the paralell end of the outer tube **101**. The advantage of this alternative is, there is no need to rotate the instrument for suture pick up because the gripping surface is concentrically located on the instrument shaft allowing suture grasping in 360 degrees.

[0062] **FIG. 9***c*. shows the above alternative embodiment in a closed position and the detail view of the closed tip in **FIG. 9***d*.

[0063] **FIG. 9***f*. shows the above alternative embodiment in an open position and the detail view of the open tip in **FIG. 9***e*.

[0064] Materials used to construct the devices set forth herein include surgical stainless steel and other alloys.

[0065] The present invention has been found to facilitate many camera-viewed laparoscopic procedures. By varying the diameter, length and curvature of the shaft, many procedures may be improved compared to previously-existing methods. Laparoscopic port closure and the identification and retraction of ureters during lympadenectomy also advantageously implement the present invention. The same is likewise true for retraction of kidneys and other structures during laparoscopic nephrectomy.

[0066] Intra-abdominal suturing, whether by closing of peritoneum or intra-abdominal knot-tying, has benefited from use of the present invention as has laparoscopic port closure (as for the urological uses listed above). In general surgery, the present invention has been found to be advantageously used with respect to laparoscopic port closures and temporary fixations of hernia mesh.

[0067] It is contemplated that many other surgical procedures will advantageously use the present inventive methods, guide and instruments as described herein.

[0068] These features and their advantages in use will be more particularly appreciated when reviewing the following method of the present invention used to pass suture through soft tissues during endoscopic/laparoscopic surgery for which the instrument **20** of this invention is provided. In application the surgical instrument **20** is to be grasped by a skilled laparoscopic surgeon and placed for closure of punctured vessels in the muscular surface or for closure of the fascia.

[0069] As shown in FIGS. **11-17**, a specially adapted guide **70** can be used in the suturing procedure discussed above, and its application is demonstrated in **FIGS. 10***a*-**10***f*. The guide **70** provides the surgeon a device and methodology for accurately and precisely positioning and removing the suture material **50** in or from the patient's body where desired.

[0070] The guide **70** has a longitudinal axis x shown in **FIG. 17** and is generally symmetrical about its x axis. Its extended lip also serves as a gripping area for the surgeon with a radially disposed surface **120** which further assists the surgeon in gripping and holding the guide **70**. The gripping surface **120** may be smooth or roughened for easy finger contact.

[0071] The surface at the proximal end exposes the two passageways **132** through the guide **70**. The passageways **132** are parallel to each other, and each forms an angle alpha of approximately 20 .degree. with the longitudinal axis x. The two passageways **132** starts at the same surface and runs in an opposite direction from each other. The diameter of the passageways **132** are sized to receive the surgical instrument to be used.

[0072] The guide **70** has an opening running parallel to the longitudinal axis x. The open side allows the surgeon to attach the guide **70** onto the trocar **40**. In use, the guide **70** snaps onto the shaft of the trocar **40** still in the wound, and its extending lip **136** is adjacent to the wound to be sutured. The shaft of the trocar **40** is concentric with the center opening of the guide **70**, and it clips into the center opening of the guide by two extruded locking surface **128** parallel to the longitudinal axis x. The cutout **130** in the guide **70** serves as a stress relief and makes the guide more flexible while attaching onto the trocar **40**, allowing the operator to complete the snap-on attachment of the guide **70** and the trocar **40** with ease. The two extruded locking surface than keeps the guide **70** in place in order to complete skin closure. The lip **136** prevents the guide **70** from sliding further down on the trocar **40** shaft into the wound and, therefore, should be sized to be of a greater diameter than that of the open wound to be sutured.

[0073] A distal portion **126** of the guide **70** is slightly tapered . Tapering allows for greater ease of insertion while the guide **70** slides into the wound between the trocar **40** and surrounding tissue until it stops at the subcutaneous tissue by the lip portion **136**.

[0074] The entire guide **70** can be integrally formed out of high-density polyethylene or other comparable material which is durable and medically inert and can serve as a disposable or a reusable product.

[0075] As can be seen in **FIGS. 10***a*-**10***f*, the guide **70** greatly assists in the procedure described above for **FIGS. 8***a*-**8***e*. More particularly, the guide **70** is attached on the trocar which is already going through the skin incision, muscle, fascia, and peritoneum so that the trocar **40** appears in the view of the laparoscope. The guide **70** is oriented so that the passageways **132** in the guide **70** are in the required position to complete skin closure.

[0076] The fascia closure instrument **20** (or **80** or **100**) is inserted with suture in its grasp through the correctly positioned passageway in the guide **70** and observed to exit through the peritoneum by laparoscopic view.

[0077] The suture is then released and the instrument **20** (or **80** or **100**) withdrawn from the guide **70**. The instrument **20** is placed in the first passageway **132** of the guide and watched by laparoscopic view to exit through the peritoneum.

[0078] The suture is withdrawn through the hole made by the instrument **20**. The trocar **40** with the guide **70** on its shaft is then withdrawn from the incision **62** completely. The suture is then tied by standard techniques, thus ensuring the fascia and peritoneum in a mass closure under the skin.

[0079] As can be seen by inspection of the Figures, particularly **FIGS. 9***a*-**9***f* some surgical instruments that do maintain a linear configuration could use the guide **70** with its straight passages.

[0080] Alternative embodiment to the suture guide shown in FIGS. **18-19**.

[0081] The overall length of the guide shaft **124** may vary, but it does not depend upon the patient's anatomy. The guide clips onto the trocar **40** shaft which is placed in the wound at the beginning of the laparoscopic surgery. Therefore the guide shaft **124** can be eliminated completely leaving the extended lip portion **136** as an alternative guide **160** to the original suture guide **70** of the present invention as shown on **FIG.18**.

[0082] As shown on **FIG. 19**., the alternative embodiment **160** of the suture guide **70** can be placed on the shaft of the operating trocar **40** before the first surgical incision is performed assuring that when the laparoscopic surgery is complete, the suture guide will be available immediately to begin tissue closure.

[0083] Additionally, the alternative suture guide **160** can be sterilized and packaged together with the operating trocars by healthcare manufacturers, offering great economical and surgical advantages.

[0084] There has been described and illustrated herein an improved laparoscopic instrument, a guide, and a surgical method. While particular embodiments of the invention have been described, it is not intended that the invention be

limited exactly thereto, as it is intended that the invention be as broad in scope as the art will permit. The foregoing description and drawings will suggest other embodiments and variations within the scope of the claims to those skilled in the art, all of which are intended to be included in the spirit of the invention as herein set forth.

[0085] While the invention has been described in connection with a preferred embodiment, it is not intended to limit the scope of the invention to the particular form set forth, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

What is claimed is: Suture passing surgical instrument, guide and methodology for using same comprising:

1. A suture passing and grasping surgical instrument carrying suture material to an area within the body for closing an open wound, comprising:

a hollow tube having a first end and a second end;

a needle tip end and a base section, said base section fixedly engaging said first end of said hollow tube, said tip end tapering downwardly to said base section;

driving means engaging said second end of inner rod for imparting reciprocal motion to said inner rod relative to said tube for motion of said second grasping surface, wherein said second grasping surface engages said first grasping surface defining an area for grasping, carrying and passing the suture through a patient's skin for suturing an open wound and said tube, inner rod, first and second grasping surfaces and said actuating means detachable for cleaning.

2. A laparoscopic instrument for passing through a patient's peritoneum and fascia, and closing an open wound with suture material comprising:

(a) detachable piercing, carrying and grasping means having a sharp tip for insertion below skin level and grasping and carrying the suture material;

(b) driving means for driving said detachable means through the patient's peritoneum and fascia at a first point and actuating said detachable means for gripping the suture material, said detachable piercing and grasping means comprises first and second grasping surface concentricly engaged to each other, said first grasping surface fixedly engaging a hollow tube and said second grasping surface at the first end of the reciprocally moving inner part narrows down to a thin wire rod concentrically located within said hollow tube;

(c) said first and second forcep grasping surfaces having an angle, said interior grasping surfaces are paralell to each other; and

(d) said interior grasping surfaces capable for gripping various size suture while allowing the grasping surfaces to close, whereby the suture material is carried by said detachable means and recovered by driving said detachable means through the patient's peritoneum and fascia at a second point and actuating said detachable means for gripping and pulling the suture material outside the wound providing for rapid closure of the open wound.

3. A laparoscopic instrument according to claim 2, wherein said detachable piercing means comprises a sharp cone shaped tip at a distal end.

4. A laparoscopic instrument according to claim 2, wherein said detachable grasping means comprises a laparoscopic grasper defined by one fixed and one moving grasping surface.

5. A laparoscopic instrument according to claim 2, wherein said driving means comprises a housing means and a handscrew engaging to said housing means, wherein said handscrew means detachable from said housing means for cleaning prior to surgery.

6. A laparoscopic instrument for grasping, carrying and passing suture through a patient's skin for suturing an open wound comprising:

a hollow tube having a first end and a second end;

a needle tip end and a base section, said base section fixedly engaging said first end of said hollow tube, said tip end tapering downwardly to said base section;

driving means engaging said second end of inner rod for imparting reciprocal motion to said inner rod relative to said tube for motion of said second grasping surface, wherein said second grasping surface engages said first grasping surface defining an area for grasping, carrying and passing the suture through a patient's skin for suturing an open wound and said tube, inner rod, first and second grasping surfaces and said actuating means detachable for cleaning.

7. An instrument for grasping, carrying, and passing suture through a patient's tissue comprising

(a) a handle/actuator means for holding and activating the instrument from a closed to an open position back and forth; and

(b) a forcep means which opens and closes for grasping the suture and having the grasping surfaces paralell to each other in both open and closed positions, and wherein said forcep means holds the suture in a fully closed position while carrying the suture; and

(c) a sharp, cone shaped tip to be insertable through the patient's tissue to the place of suturing.

8. A device for guiding and positioning a surgical instrument carrying suture material to an area within the body for closing an open wound, comprising:

a guide means having a longitudinal axis and distal and proximal ends, and further having a first passage including a lip near said proximal end of said guide means being generally perpendicular to said longitudinal axis and a circular finger gripping surface being generally parallel to said longitudinal axis, and

said guide means defining first and second linear passageways therethrough at first and second angles generally 20 degree from said longitudinal axis, said first and second passageways terminating through said lip, said second passageway positioned oppositely adjacent said first passageway, said first and second passageways starting at a common surface; and

said guide attaches onto the shaft of the operating trocar and than it slides down on the shaft until said lip portion stops at the subcutaneous tissue above the wound to be closed, said guide positioning the surgical instrument

carrying suture material for passing through said first and second passageways at said angles to the predetermined area within the body to assist in closing the open wound and the suture material can be left at a predetermined point within the body and the surgical tool may be inserted through said second passageway through said lip to retrieve the suture material from the area within the body.

**9**. The device of claim 8, further comprising:

an opening at the side of the said guide which is perpendicular to said longitudinal axis and said opening is used to attach said guide onto the shaft of the said trocar which remains inside the wound after a surgical procedure, therefore the said guide uses the same operating port of said trocar for optimal wound closure.

**10**. A method of suturing an open wound comprising the steps of:

(a)providing a surgical instrument, comprising: a sharp tip for insertion below skin level and grasping and carrying the suture material; driving means for driving said detachable means through the patient's peritoneum and fascia at a first point and actuating said detachable means for gripping the suture material, said detachable piercing and grasping means comprises first and second grasping surface concentricly engaged to each other, said first grasping surface fixedly engaging a hollow tube and said second grasping surface at the first end of the reciprocally moving inner part narrows down to a thin wire rod concentrically located within said hollow tube; said first and second forcep grasping surfaces having an angle, said interior grasping surfaces are paralell to each other; and said interior grasping surfaces capable for gripping various size suture while allowing the grasping surfaces to close completely, whereby the suture material is carried by said detachable means and recovered by driving said detachable means through the patient's peritoneum and fascia at a second point and actuating said detachable means for gripping and pulling the suture material outside the wound providing for rapid closure of the open wound;

(b) providing a guide, comprising: a longitudinal axis, and further having an opening at the side which is perpendicular to said longitudinal axis and said opening is used to attach said guide onto the shaft of the said trocar which remains inside the wound after a surgical procedure, therefore the said guide uses the same operating port of said trocar for the fascia closing procedure, and further having a first passage including a lip near said proximal end of said guide means being generally perpendicular to said longitudinal axis and a circular finger gripping surface being generally parallel to said longitudinal axis, said guide means defining therein a first generally linear passageway therethrough at a first angle less than 20 degree from said longitudinal axis, and providing for two exit holes through said lip portion above the wound to be closed, said guide positioning the surgical instrument carrying suture material for passing through said passageway at said angle to the predetermined area within the body to assist in closing the open wound;

(c) grasping the suture material between said grasping surfaces and inserting a said cone shaped tip means for passing suture material through said first passageway in said guide until reaching tissue and until said tip means is seen through the peritoneum by way of a surgical camera;

(d) releasing said suture material, withdrawing said tip of surgical instrument means from said guide, and leaving the suture material in place;

(e) inserting said tip of surgical instrument means in a second passageway defined within said guide and appositely adjacent said first passageway, said second passageway directing said tip means to a point where the suture material may first leave the body to provide wound closure, said second passageway through said guide means forming a second angle less than 20 degree from said longitudinal axis, and positioned appositely adjacent said first passageway, said first and second passageways sharing a common entrance, and further having a second exit hole through said lip, wherein the suture material can be left at the predetermined point within the body and the surgical tool may be inserted into and through said second passageway through said common entrance to retrieve the suture material from the area within the body;

(f) grasping said suture material with said grasping surfaces;

(g) retrieving said suture material with said grasping surfaces means through said guide outside the wound; and

(h) removing said surgical instrument, said guide and said trocar means from the wound and tying ends of said suture material together to provide closure of the wound.

**11**. The method of claim 8, further comprising: a second wing oppositely opposed to said first wing, said first and second wings defining a gap therebetween which contains a through circular opening sized as the diameter of the operating trocar in use and aligned with said first and second passageways, whereby nonlinear surgical tools may be used in conjunction with said guide.

**12**. A device for accurately guiding and positioning a surgical instrument carrying suture material to a predetermined area within the body for closing an open wound, comprising: a guide means having a longitudinal axis and distal and proximal ends, and further having a depth-limiting extending lip near said proximal end of said guide means and being generally perpendicular to said longitudinal axis, wherein said distal end is for insertion into the wound to a depth limited and determined by said extending lip, said guide means defining therein at least one hole providing a generally linear passageway therethrough at a first diverging angle at 20.degree. from said longitudinal axis, said passageway terminating through said lip, wherein said distal end of said guide is tapered and positionable within said trocar with the lip portion above the wound to be closed, said guide positioning the surgical instrument carrying suture material for passing through said passageway at said angle to the predetermined area within the body to assist in closing the open wound.

**13**. The device of claim 8 further comprising a second passageway through said guide means forming a second angle less than 20.degree. from said longitudinal axis, and positioned appositely adjacent said first passageway, said first and second passageways sharing a common surface for entering, and further said second passageway terminating through said lip, wherein the suture material can be left at the predetermined point within the body and the surgical tool may be inserted into and through said second passageway through said common entrance to retrieve the suture material from the area within the body.

**14**. The device of claim 9 wherein said guide means available is a plurality of sizes having different radial diameters depending on the size of the oparating trocar used for the particular surgery.

**15**. The device of claim 8 wherein said guide means is integrally formed of thermoplastics, approved by the medical industry.

**16**. A method of suturing an open wound comprising the steps of:

(a) providing a guide, comprising: a guide means having a longitudinal axis and distal and proximal ends, and further having a first passage including a lip near said proximal end of said guide means being generally perpendicular to said longitudinal axis and a circular finger gripping surface being generally parallel to said longitudinal axis, and said guide means defining first and second linear passageways therethrough at first and second angles generally 20 degree from said longitudinal axis, said first and second passageways terminating through said lip, said second passageway positioned oppositely adjacent said first passageway, said first and second passageways starting at a common surface; and said guide attaches onto the shaft of the operating trocar and than it slides down on the shaft until said lip portion stops the said guide at the subcutaneous tissue above the wound to be closed, said guide positioning the surgical instrument carrying suture material for passing through said first and second passageways at said angles to the predetermined area within the body to assist in closing the open wound and the suture material can be left at a predetermined point within the body and the surgical tool may be inserted through said second passageway through said lip to retrieve the suture material from the area within the body;

(b) providing a guide, comprising: a longitudinal axis, and further having an opening on its side which is perpendicular to said longitudinal axis and said opening is used to attach said guide onto the shaft of the said trocar which remains inside the wound after a surgical procedure, therefore the said guide uses the same operating port of said trocar for the fascia closing procedure, and further having a first passage including a lip near said proximal end of said guide means being generally perpendicular to said longitudinal axis and a circular finger gripping surface being generally parallel to said longitudinal axis, said guide means defining therein a first generally linear passageway therethrough at a first angle less than 20 degree from said longitudinal axis, and providing for two exit holes through said lip portion above the wound to be closed, said guide positioning the surgical instrument carrying suture material for passing through said passageway at said angle to the predetermined area within the body to assist in closing the open wound;

(c) grasping and inserting a tip means for passing suture material through said first passageway in said guide until reaching tissue and until said tip means is seen through the peritoneum by way of an endoscopic camera;

(d) releasing said suture material, withdrawing said tip means from said guide, and leaving the suture material in place;

(e) inserting said tip means in a second passageway defined by said hole within said guide and appositely adjacent said first passageway, said second passageway directing said tip means to a point where the suture material may first leave the body to provide wound closure;

(f) grasping said suture material with said grasping surfaces means;

(g) retrieving said suture material with said grasping surfaces means through said guide outside the wound; and

(h) removing said guide and said trocar means from the wound and tying ends of said suture material together to provide closure of the wound.

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摘要(译)

一种外科器械，一种卡扣式导向器和能够用于闭合筋膜的方法和其他使用大型手术端口或套管针的腹腔镜手术，旨在帮助预防术后疝气缺陷，并用于阻止急性出血腹壁。带有针尖的器械轴连接到手柄上，允许操作者控制可伸缩的抓握表面。导针器直接施加在套管针的轴上，并向下滑动到皮下组织的高度，帮助操作者放置针头。一旦缝合线穿过腹壁，它就被释放，然后针通过相对的“引导端口”重新插入。缝合线在腹部外侧形成腹腔内缝合线。缝合线末端将被绑住，允许关闭腹壁内的筋膜缺损。