

(19)



Europäisches Patentamt

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(11)

**EP 1 263 334 B1**

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:

**12.10.2005 Bulletin 2005/41**

(21) Application number: **01914737.0**

(22) Date of filing: **07.03.2001**

(51) Int Cl.<sup>7</sup>: **A61B 17/17**

(86) International application number:  
**PCT/US2001/007286**

(87) International publication number:  
**WO 2001/067971 (20.09.2001 Gazette 2001/38)**

### (54) INSTRUMENTS FOR LAPAROSCOPIC SPINAL SURGERY

WERKZEUGE ZUR LAPAROSKOPISCHEN CHIRURGIE DER WIRBELSÄULE

INSTRUMENTS DESTINES A LA CHIRURGIE LAPAROSCOPIQUE DU RACHIS

(84) Designated Contracting States:

**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE TR**

(30) Priority: **15.03.2000 US 525972**

(43) Date of publication of application:  
**11.12.2002 Bulletin 2002/50**

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## Description

### BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to instruments for performing spinal surgery. Specifically, the invention concerns laparoscopic instruments to perform spinal surgeries.

[0002] The use of surgical techniques to correct the causes of low back pain, such as spinal injuries and deformities, has steadily increased over the last several years. One common procedure for relieving pain from the above-described problems is a discectomy, or surgical removal of a portion or all of an intervertebral disc, followed by implantation of a device between the adjacent vertebrae, such as a vertebral implant or fusion device. Typically, implantation of such a device is intended to promote bony fusion between the adjacent vertebral bodies.

[0003] Various surgical methods have been devised for implantation of devices into a subject disc space. For example, PCT International Publication No. WO 97/30666 to Zdeblick et al. discloses laparoscopic surgical techniques and instruments for preparing a disc space for implantation of fusion devices or implants. The laparoscopic instrumentation provides a sealed working channel to the disc space through which the disc space is distracted, the vertebral endplates and surrounding discs are reamed, and the vertebral implant inserted, all through a laparoscopic port engaged to the end of the sleeve. In this technique, a single sleeve is alternately placed at bilateral locations on the disc space through a single incision in the skin for insertion of a pair of fusion devices or vertebral implants at each location. A switching sleeve extends through the outer sleeve of the laparoscope to protect the tissue at the surgical site as the outer sleeve of the laparoscope is moved between bilateral locations. In order to move the outer sleeve, the switching sleeve is inserted and then the distractor fingers of the outer sleeve are withdrawn from the disc space at the first bilateral location. The outer sleeve and the switching sleeve are then manipulated through the skin to the second bilateral location. The techniques and instruments of the '666 publication suffer from the disadvantage of requiring multiple manipulations of vessels and tissue adjacent the vertebral bodies to perform the procedure. Multiple manipulation of the vessels and tissues may increase the overall time of the procedure and increase the risk of damage to the vessels.

[0004] While the above described technique represents a significant advance over prior surgical procedures for spinal surgery, a need for improvement remains. In particular, procedures and instruments are required that minimize trauma to tissue surrounding the surgical site while allowing surgical procedures to be performed, such as spinal disc space preparations, implant insertion, and the like. There is also a need for instruments and techniques that maintain a sealed work-

ing channel during surgical procedures performed at multiple locations. The present invention is directed to these needs, among others.

[0005] WO-A-0003654 discloses a surgical method, and apparatus according to the preamble of claim 1, for implanting a spinal fusion implant into an intervertebral disc space.

[0006] WO-A-0024326 discloses surgical techniques and instruments for preparing a disc space for implantation of a vertebral fusion device or implant.

[0007] US-A-5571109 discloses a member with an eccentric access port, which can be inserted into a vertebral drilling sleeve in two positions offset by 180° in order to produce two adjacent holes.

### SUMMARY OF THE INVENTION

[0008] The present invention includes surgical instruments for performing procedures at adjacent disc space locations in a generally sealed environment through a cap member having an access port alignable with a corresponding one of the disc space locations.

[0009] In the present invention, there is provided an apparatus for performing surgical procedures in the disc space between adjacent vertebrae of a patient, comprising:

a sleeve having a distal end and proximal end, said sleeve defining a working channel therethrough, said working channel including:

a first portion and an adjacent second portion, said first and second portions each configured to receive surgical instruments therethrough; and

a cap member substantially sealing said working channel secured to said sleeve at said proximal end, said cap member having an access port alignable with a corresponding one of said first or second portions, said cap member movable with respect to said sleeve to align said access port with the other of said first and second portions.

[0010] Preferably, the disc space is prepared through the access port and first portion of the working channel. An implant may then be inserted through the access port and first portion with the working channel remaining substantially sealed. The access port is moved into alignment with the second portion of the working channel and the disc space is prepared for implant insertion through the access port and the second portion with the working channel remaining substantially sealed.

[0011] According to an embodiment of the invention, the sleeve preferably has a perimeter with a non-circular shape, said sleeve further including a flange ring secured to said proximal end having a perimeter with a substantially circular shape.

[0012] In another embodiment, the sleeve may have a longitudinal axis and the working channel extends between a distal end and a proximal end along said longi-

tudinal axis, said working channel including a first portion substantially aligned with said longitudinal axis for performing a first procedure therethrough at a first location and an adjacent second portion substantially aligned with said longitudinal axis for performing a second procedure therethrough at a second location; and

a housing secured to said proximal end of said sleeve, said housing including a sealable access port for accessing said working channel, said access port movable between said first and second portions of said working channel while said working channel remains sealed.

**[0013]** Other objects, advantages, embodiments, aspects and benefits can be discerned from the following written description, given by way of example only, and the accompanying figures.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0014]**

FIG. 1 is a perspective view of a surgical instrument assembly according to one embodiment of the present invention.

FIG. 1a is an elevational view of a spinal column segment.

FIG. 2 is a top plan view of the guide sleeve comprising a portion of the surgical instrument assembly of FIG. 1.

FIG. 3 is a partial section, partial elevational side view of the guide sleeve of FIG. 2.

FIG. 4 is a left-hand end view of the guide sleeve of FIG. 2.

FIG. 5 is a perspective view of the flange ring comprising a portion of the guide sleeve of FIG. 2.

FIG. 6 is an elevational view of the spring clip comprising a portion of the surgical instrument assembly of FIG. 1.

FIG. 7 is an elevational view of the lock pin comprising a portion of the surgical instrument assembly of FIG. 1.

FIG. 8 is a partial section, partial elevational view of the cap member comprising a portion of the surgical instrument assembly of FIG. 1.

FIG. 9 is a cross-sectional view taken through line 9-9 of FIG. 8.

FIG. 10 is a cross-sectional view taken through line 10-10 of FIG. 8.

FIG. 11 is a side elevational view of the housing comprising a portion of the cap member of FIG. 8.

FIG. 12 is a cross-sectional view taken through line 12-12 of FIG. 11.

FIG. 13 is a side elevational view of the insert member comprising a portion of the cap member of FIG. 10.

FIG. 14 is a cross-sectional view taken along line 14-14 of FIG. 13.

FIG. 15 is an enlarged detail view of a portion of

FIG. 13.

FIG. 16 is a partial section, partial elevational view of the valve member comprising a portion of the cap member of FIG. 8.

FIG. 17 is an enlarged side elevational view of the valve insert insertable into the valve member of FIG. 16.

FIG. 18 is a partial hidden line perspective view of the cap member of FIG. 8 with the valve member in a closed position.

FIG. 19 is a partial hidden line perspective view of the cap member of FIG. 8 with the valve member in an open position.

FIG. 20 is a side elevational view of a first distractor comprising a portion of the instrument of FIG. 1.

FIG. 21 is a top plan view of the distractor of FIG. 20.

FIG. 22 is a left hand end view of the distractor of FIG. 20.

FIG. 23 is a side elevational view of a second distractor comprising a portion of the surgical instrument assembly of FIG. 1.

FIG. 24 is a top plan view of the distractor of FIG. 23.

FIG. 25 is a left hand end view of the distractor of FIG. 23.

FIG. 26 is a side elevational view of a reaming sleeve usable with the surgical instrument assembly of FIG. 1.

FIG. 27 is a right hand end view of the sleeve of FIG. 26.

FIG. 28 is an elevational view of a reamer insertable through the sleeve of FIG. 26.

FIG. 29 is an enlarged detail view of the cutting end of the reamer of FIG. 28.

FIG. 30 is an elevational view of an implant inserter usable with the surgical instrument assembly of FIG. 1.

FIG. 31 is an elevational view of an implant inserter sleeve usable with the implant inserter of FIG. 30.

FIG. 32 is a perspective view of the surgical instrument assembly of FIG. 1 with an impactor cap placed on the cap member.

FIG. 33 is a cross-sectional view of the impactor cap of FIG. 32.

FIGs. 34 and 34a are a perspective view and an enlarged detail view, respectively, of a surgical instrument assembly according to the present invention with the first distractor connected to a distractor remover.

FIG. 35 is an elevational view of a distractor remover coupler comprising a portion of the distractor remover of FIG. 34.

FIGs. 36 and 36a are a perspective view and an enlarged detail view, respectively, of a surgical instrument assembly according to the present invention with the first distractor removed.

FIGs. 37 and 37a are a perspective view and an enlarged detail view, respectively, of a surgical instrument assembly according to the present inven-

tion with the first distractor removed and the reaming sleeve and reamer inserted through the guide sleeve.

FIG. 38 is a perspective view of a surgical instrument assembly according to the present invention with the first distractor and reaming sleeve removed and the cap member being rotated for alignment with the second distractor.

FIGs. 39 and 39a are a perspective view and an enlarged detail view, respectively, of a surgical instrument assembly according to the present invention with the cap member rotated, the second distractor removed, and the reaming sleeve and reamer inserted through the guide sleeve.

FIGs. 40 and 40a are a perspective view and an enlarged detail view, respectively, of a surgical instrument assembly according to the present invention with an implant being inserted through the guide sleeve at a first location.

FIGs. 41 and 41a are a perspective view and an enlarged detail view, respectively, of a surgical instrument assembly according to the present invention with the cap member rotated to its position of FIG. 34 and a second implant being inserted through the guide sleeve at a second location.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that the specific description is given by way of example only.

[0016] A surgical instrument assembly in accordance with the present invention is illustrated in FIG. 1 and designated generally at 45. Surgical instrument assembly 45 is particularly useful for accessing and preparing, as shown in Fig. 1a, a disc space S for insertion of vertebral implants or fusion devices between upper vertebral body V1 and lower vertebral body V2.

[0017] The surgical instrument assembly allows surgical procedures to be performed under a relatively sealed and protected passageway in an insufflated environment within the body cavity. This prevents leakage of abdominal distension fluids into the working channel and disc space and aids vision of the surgical site. The surgical procedure described herein is performed via an anterior approach to the spine. However, the surgical instruments of the present invention are not limited to such an approach, and may find application in lateral, antero-lateral, posterior, and postero-lateral approaches as well. Additionally, the surgical instruments of the present invention may find application at all vertebral segments of the spine, and in areas other than spinal surgery.

[0018] Assembly 45 includes a cap member 150 se-

cured to a guide sleeve 50. Guide sleeve 50 has a working channel 52 extending between proximal end 54 and distal end 56 with a distractor assembly 100 disposed in working channel 52. In the description that follows, proximally refers to the direction indicated by letter "P" and distally refers to the direction indicated by letter "D." Guide sleeve 50 is further depicted in FIGs. 2-4, and as described more fully below, receives various tools and surgical instruments therethrough in order to perform surgical procedures on the spine. Sleeve 50 has a length sufficient to extend from the spine through the skin of the patient in order to allow the surgeon access to the spine. A flange ring 70 is secured to proximal end 54, and opposite fingers 58a and 58b extend from distal end 56. Fingers 58a, 58b can be sized according to the desired height of the particular disc space and the depth of the disc space into which the outer sleeve 50 is to be inserted. Fingers 58a, 58b maintain the spacing between the adjacent vertebrae during surgical procedures, prevents surrounding tissue and vasculature from migrating into the disc space, and protects surrounding tissue and vasculature during surgical procedures. In addition, fingers 58a, 58b can be tapered along all or a portion of their length in order to conform to a normal angle between adjacent vertebrae at the instrumented level. In one alternative form, fingers 58a, 58b distract the disc space during insertion therein in lieu of distractor assembly 100.

[0019] As shown in FIG. 4, working channel 52 has a figure-eight shape, and sleeve 50 has a wall 51 forming a non-circular perimeter. In the illustrated embodiment, wall 51 has a racetrack shaped perimeter. Other shapes for the perimeter of wall 51 are also contemplated, including elliptical, racetrack shaped, rectangular, or other as would occur to those skilled in the art. Working channel 52 includes a first portion 52a and an adjacent second portion 52b. Each working channel portion 52a and 52b has a truncated circular shape, with the truncated part of the circles adjacent one another. In the illustrated embodiment, the channel 52 defines an overlap region B, indicated by the hatched area in FIG. 4, that is comprised of the area of the truncated portions of the circles forming first portion 52a and second portion 52b. This embodiment of guide sleeve 50 has a reduced profile that minimizes the width of channel 52 between fingers 58a, 58b while, as described further below, providing for bi-lateral implant insertion. Other shapes for working channel 52 are also contemplated, including circular first and second portions that are non-overlapping; elliptical, racetrack shaped, square, or rectangular working channels; working channels formed by adjacent circular guide sleeves; and other working channel shapes as would occur to those skilled in the art.

[0020] A distractor assembly 100 includes a first distractor 102 and a second distractor 112 disposed in working channel 52. Distractors 102 and 112 include distractor tips 103 and 113, respectively, positioned between first distraction finger 58a and second distraction

finger 58b extending from distal end 56. As shown further in FIG. 7, a lock pin 80 releasably secures distractor assembly 100 to guide sleeve 50. Lock pin 80 includes stem 82 that extends from head 86. Stem 82 includes a plurality of recesses 84a, 84b, 84c formed therealong and a shoulder 88 between recesses 84 and head 86. Recesses 84 receive grommets 85 therein. Recess 84c is illustrated without a grommet 85 for the purposes of clarity.

**[0021]** A cap member 150 is positioned on proximal end 54 of sleeve 50. Cap member 150 is secured to sleeve 50 via a spring clip 90 extending between cap member 150 and flange ring 70. As shown further in FIG. 5, flange ring 70 includes a sleeve member 72 defining a guide sleeve bore 73 extending through flange ring 70. Guide sleeve bore 73 is preferably sized and shaped to substantially correspond to the perimeter of wall 51 and receive guide sleeve 50 in a snug fitting relationship. Flange ring 70 can then be welded, bolted or otherwise secured to guide sleeve 50. A flange member 74 extends outwardly from sleeve member 72 and is positioned at a proximal end of sleeve member 72 so that flange member 74 is aligned with the proximal end opening of sleeve 50. Flange member 74 has a sidewall 75 that includes a groove 76 formed therein. Flange member 74 has a flange extension 78 extending therefrom towards the distal end of sleeve member 72. Flange extension 78 has a lock pin hole 79 extending therethrough and also through sleeve member 72 to communicate with guide sleeve opening 73. When flange ring 70 is properly positioned on proximal end 54 of sleeve 50, lock pin hole 79 is aligned with through-hole 60 of distractor assembly 100 (FIG. 3) and locking receptacles 106, 116 of distractors 102, 112 (FIGs. 21, 24) to engage and disengage distractor assembly 100 from guide sleeve 50.

**[0022]** As shown in FIG. 6, spring clip 90 is circular in shape and includes a resilient body 92 extending between first arm 94a and a second arm 94b. Spring clip 90 is made from spring steel or the like. Arms 94a and 94b extend distally outwardly from body 92 and cap member 150 a sufficient distance so that each can be accessed by the surgeon, as shown in FIG. 1. A gap is formed between arms 94a and 94b. Arms 94a and 94b can be positioned on either side of flange extension 78 when instrument 45 is assembled with sufficient space between flange extension 78 and arms 94a and 94b so spring clip 90 can assume a reduced size configuration by applying a force to arms 94a, 94b in the direction indicated by arrows C. In this configuration, body 92 is substantially positioned in groove 76 of flange ring 70, allowing cap member 150 to be removed or placed on flange ring 70. When arms 94a and 94b are released, clip 90 returns to its original shape shown in FIG. 6 and occupies a portion of an inner groove 178 (FIG. 15)

formed in cap member 150 and groove 76 of flange ring 70, securing cap member 150 to guide sleeve 50.

**[0023]** Referring now to FIGs. 8-10, cap member 150 will now be described further. Cap member 150 has a housing 152 and an access port 154 alignable with a corresponding one of the working channel portions 52a and 52b. Preferably, access port 154 is aligned by rotating cap member 150 about the proximal end of sleeve 50. However, other techniques are also contemplated herein, including sliding access port 154 between portions 52a and 52b. In the illustrated embodiment of FIG. 1, access port 154 is aligned with working channel portion 52a. Access port 154 provides the surgeon access to at least a portion of working channel 52 to perform surgical procedures. A valve member 156 is positioned substantially inside housing 152, except for, as discussed below, actuators 157a and 157b positioned outside housing 152 to control valve disc 188. An insert member 158 is positioned in housing 152.

**[0024]** Referring further to FIGs. 11-12, housing 152 includes an outer wall 160 and a proximal end wall 161 defining a hollow interior 163. A valve member opening 162 is formed through end wall 161. Housing 152 has a central axis 166 that is substantially aligned with central axis 55 of sleeve 50 when cap member 150 is placed thereon. Valve member opening 162 has a central axis 167 substantially aligned with a center line 53a of first portion 52a of working channel 52 when cap member 150 is secured to sleeve 50 as shown in FIG. 1. Outer wall 160 includes opposite flats 166a and 166b that allow positioning and pivoting operation of actuators 157a and 157b adjacent the outer surface of outer wall 160. As illustrated in FIGs. 9-10, housing 152 has an outer perimeter that is elliptically shaped, similar to the race-track shaped outer perimeter defined by wall 51 of guide sleeve 50, to minimize the profile of assembly 45. However, other shapes for housing 52, including shapes that are not similar to the shape of guide sleeve 50, are also contemplated. Opposing notches 164a and 164b are formed in the distal end of wall 160. Notches 164a and 164b selectively receive lock pin 80 to provide an indication of proper alignment of cap member 150 on guide sleeve 50.

**[0025]** Referring to FIGs. 13-15, insert member 158 includes an outer wall 170 and a proximal end wall 171 defining a hollow interior 173. A valve member opening 174 is formed through end wall 171. Insert member 158 has a central axis 176 that is substantially aligned with central axis 55 of sleeve 50 when cap member 150 is placed thereon. Valve member opening 174 has a central axis 177 substantially aligned with a center line 53a of first portion 52a of working channel 52 when cap member 150 is secured to sleeve 50 as shown in FIG. 1. A rim 172 extends from outer wall 170 inwardly towards hollow interior 173. A groove 178 is formed in wall 170 between the distal end of insert member 158 and rim 172. Groove 172 receives a portion of body 92 of spring clip 90 to secure cap member 150 to guide

sleeve. As best shown in FIG. 9, first fastener 179a and second fastener 179b extend through housing 152 and into rim 172 to secure insert member 158 to housing 152. Groove 178 and wall 170 have a circular shape that corresponds to the shape of flange member 74. Cap member 150 can be rotated about flange ring 70 to position access port 54 in alignment with second portion 52b without removing cap member 150 from guide sleeve 50, thus preserving the insufflated environment of the working space. Opposing notches 174a and 175b are formed in wall 170 opposite end wall 171 and are positioned adjacent notches 164a, 164b, respectively, when insert member 158 and housing 152 are assembled, receiving lock pin 80 and providing an indication of proper alignment of cap member 150 on guide sleeve 50.

**[0026]** Referring now to FIGS. 16-19, valve member 156 will be further described. Valve member 156 includes a proximal end portion 180 and a distal end portion 182 that extends distally from proximal end portion 180. Proximal end portion 180 has an outer dimension d1 that is greater than an outer dimension d2 of distal end portion 182. As shown in FIG. 10, proximal end portion 180 is secured to housing 152 via a first fastener 168a and an elongated second fastener 168b such that proximal end portion 180 is positioned in valve opening 162 of housing 152 and extends proximally from end wall 161. Distal end portion 182 is positioned in valve opening 174 of insert member 158 and extends into hollow interior 173 of insert member 158. Distal end portion 182 has inclined face 184 having a dovetail flange 185 extending therefrom. Inclined face 184 is formed at an angle A with respect to a central axis 186 of valve member 156. In the illustrated embodiment, angle A is about 40 degrees. Values for angle A ranging from 0 to 90 degrees are also contemplated.

**[0027]** As shown in FIG. 18, an O-ring 187 (FIG. 19) can be secured to dovetail 185 to provide a sealing interface with valve disc 188 when valve member 156 is closed. Disc 188 is coupled to valve stem 190 extending through housing 152 to opposite actuators 157a and 157b positioned alongside the outer surface of wall 160. Valve member 156 is in a closed condition with actuators 157a, 157b in a first position. In FIG. 19 actuators 157a, 157b have been rotated distally to a second position that rotates disc 188 distally away from inclined face 184. Preferably, disc 188 is rotated so that it is substantially parallel to central axis 55, clearing access port 154 and allowing insertion of surgical instruments there-through. Detent mechanisms, friction between actuators 157a, 157b and housing 152, or other mechanisms can be used to releasably maintain actuators 157a, 157b in the above-described first and second positions.

**[0028]** Referring now to FIG. 16, access port 154 extends through valve member 156, and valve member 156 has a central axis 186 that is substantially aligned with centerline 53a of first portion 52a of working channel 52 when cap member 150 is secured to sleeve 50

as shown in FIG. 1. Proximal end portion 182 has an enlarged proximal end opening 189 that extends to a ledge 198. As shown in an enlarged form in FIG. 17, a valve insert 192 is insertable into proximal end opening 189. Valve insert 192 has wall 193 defining a bore 197 extending between a distal face 194 and a proximal face 195. When assembled, distal face 194 abuts ledge 198 with proximal face 195 flush with proximal end wall 191 of upper end portion 180. An O-ring 196 is provided between end face 194 and ledge 198 extending into bore 197. O-ring 196 is sized to sealingly contact a surgical instrument extending through port 154. A grommet made of flexible material or other type of catch can be placed in recess 183 between proximal end portion 180 and valve insert 192 to hold valve insert 192 in position and provide a secure assembly. Sealing member 150 is adaptable to receive a second instrument of different size by removing insert member 192 and inserting a second insert member in end opening 189 having a bore and O-ring sized to sealingly receive the second instrument.

**[0029]** While illustrated as having various components assembled via fasteners, it is also contemplated that cap member 150 can be fabricated from a fewer number of components. For example, housing 152 and insert member 158 could be formed as a single unit. It is also contemplated that the components of cap member 150 are fabricated from surgical grade stainless steel; however, use of other material is not precluded. In one specific form, the valve disc, stem and actuators are fabricated from aluminum.

**[0030]** Referring now to FIGS. 20-22, first distractor 102 will now be further described. First distractor 102 includes distractor tip 103 at a distal end and a shaft 104 extending from tip 103 to a proximal end. Distractor 102 has a length along a central axis 107 such that the proximal end is positioned within assembly 45 when distractor 102 is secured to sleeve 50. As shown in FIG. 22, tip 103 and shaft 104 have a circular shape, and shaft 104 is sized to be slidably received in first portion 52a with central axis 107 substantially aligned with centerline 53a. Adjacent the proximal end is a slot 105 and a lock pin receptacle 106. As described further below, slot 105 is configured to couple distractor 102 to a distractor puller, such as distractor puller 220 of FIG. 35. Receptacle 106 receives a portion of lock pin 80 to secure distractor 102 to sleeve 50. Distractor tip 103 includes a rounded nose 103a to ease insertion of tip 103 through tissue and into the disc space. Also provided in the illustrated embodiment is a fin 108 extending from tip 103 towards the upper and the lower vertebral bodies. Fin 108 secures distractor 102 to the vertebral endplates and resists lateral migration of distractor 102 during the surgical procedure.

**[0031]** Referring now to FIGS. 23-25, second distractor 112 will now be further described. Second distractor 112 includes distractor tip 113 at a distal end and a shaft 114 extending from tip 113 to a proximal end. Distractor

112 has a length along a central axis 117 such that the proximal end is positioned within assembly 45 when distractor 112 is secured to sleeve 50. As shown in FIG. 22, tip 113 and shaft 114 have a substantially circular shape, and shaft 114 is sized to be slidably received in second portion 52b with central axis 117 substantially aligned with - centerline 53b. Adjacent the proximal end is a slot 115 and a lock pin receptacle 116. As described further below, slot 115 is configured to couple distractor 112 to a distractor puller, such as distractor puller 220 of FIG. 35. Receptacle 116 receives a portion of lock pin 80 to secure distractor 112 to sleeve 50. Distractor tip 113 includes a rounded nose 113a to ease insertion of tip 113 through tissue and into the disc space. Also provided in the illustrated embodiment is a fin 118 extending from tip 113 towards the upper and the lower vertebral bodies. Fin 118 secures distractor 112 to the vertebral endplates and resists lateral migration of distractor 112 during the surgical procedure.

[0032] In the illustrated embodiment of FIG. 25, distractor 112 has a recessed portion 119 extending along the length of tip 113 and shaft 114. Recessed portion is preferably in the form of a concavely curved surface that receives a portion of the circular distractor 102 when distractors 102, 112 are positioned in guide sleeve 50. This provides a reduced width profile for assembly 45, reducing trauma to and retraction of surrounding tissue and vasculature during the surgical procedure.

[0033] While the illustrated embodiment shows a particular type distractor assembly 100, it should be understood that the present invention contemplates various other types of distractor assemblies. For example, the distractor tips need not include fins. In one alternate form, the distal ends of the distractor shafts can be threaded to receive any one of a number of various-sized detachable distractor tips for insertion into the disc space. The appropriate-sized distractor tip is selected according to the vertebral level being instrumented. While not required, progressively larger distractor tips may be sequentially inserted in alternating fashion into the disc space until the adjacent vertebrae are adequately distracted. In another alternate form, the first and second distractors both have a completely circular cross-section and working channel 52 is configured to receive the circular distractors in side-by-side relation. In a further form, the first and second distractors include a nut or other device on the proximal end for connecting to a tool for rotating the distractor tip in the disc space. Other variations and forms of distractor assembly 100 are also contemplated as would occur to those skilled in the art.

[0034] Referring now to FIGs. 26-29, a reaming sleeve 130 and reamer 140 for preparing the disc space for implant insertion are illustrated. Reaming sleeve 130 includes a tubular member 131 having a bore 134 extending therethrough between a distal end and a proximal end. Sleeve 130 has a central axis 135 and a length between its distal and proximal ends sufficient to extend

from the vertebral bodies through sleeve 50 and cap member 150 with flange 133 adjacent to or abutting the proximal end wall 191 of valve member 156. A pair of opposite spikes 132a and 132b extend from the distal end of tubular member 131, and are provided to engage a corresponding one of the vertebral bodies V1 and V2 with sleeve 130 placed through working channel 52 of guide sleeve 50, holding sleeve 130 in place during reaming of the disc space. A driving force can be applied to flange 133 to drive spikes 132a, 132b into vertebral bodies V1, V2.

[0035] A reamer 140 has a shaft 141 extending between cutting head 142 at a distal end and a Hudson end connector 143 at a proximal end for connection to a T-handle or the like. Shaft 141 has depth markings 145 to monitor the reaming depth. Shaft 141 has a central axis 145 that is substantially aligned with central axis 135 of sleeve 130 when reamer 140 is placed through bore 134. Central axis 135 and central axis 145 are substantially aligned with center line 53a or 53b when placed through a corresponding one of first portion 52a or second portion 52b of guide sleeve 50.

[0036] Shaft 141 can be sized to contact the wall inner 134a of bore 134, allowing sleeve 130 to serve as a guide for reamer 140. As shown in further detail in FIG. 29, cutting head 142 includes a bore 144 and a number of helical blades 146. Bore 144 extends between distal end opening 144a and side opening 144b. A cutout 149 in bore 144 creates openings 148 in communication with bore 144. Reamed material from the disc space is deposited into bore 144 through openings 148 and evacuated through side opening 144b.

[0037] Referring now to FIGs. 30 and 31, an implant inserter 200 and inserter sleeve 210 are illustrated. Inserter 200 includes a shaft 201 having a central axis 205 extending between implant holder 202 at a distal end and Hudson connector 203 at a proximal end that can be connected to a T-handle or the like. External threads 204 are provided adjacent the proximal end. Implant holder 202 includes first extension 207a and opposite second extension 207b extending distally from a head 206 for gripping an implant therebetween. Head 206 further includes projection 206a insertable into an end receptacle of an implant (not shown.) Holder 202 includes an enlarged shaft portion 208 extending from shaft 201 to head 206. Enlarged shaft portion includes ramped portion 208a adjacent head 206 that increases in diameter from enlarged portion 208 to head 206. A slot 209 is formed through head 202 and enlarged portion 208 to allow deflection of extensions 207a, 207b towards one another, facilitating gripping of the implant therebetween.

[0038] Inserter sleeve 210 has a central axis 215 and includes a tubular member 211 defining a bore 217 extending between a proximal end and a distal end of sleeve 210. Depth markings 216 are provided adjacent the proximal end of sleeve 210. A first bushing 212 is inserted in bore 217 at the distal end of sleeve 210 and

second bushing 213 is inserted in bore 217 and extends from the proximal end of sleeve 210. Bore 217 extends through first bushing 212 and second bushing 213. First bushing 212 includes ramped portion 212a mating with ramped portion 208a of holder 202 when inserter 200 is placed through bore 217. Second bushing 213 includes internal threads 214 threadingly receiving threads 204 of inserter 200. As inserter 200 is threaded proximally into bore 217 of sleeve 210, first bushing 212 compresses holder 202 to secure the implant between first and second extensions 207a and 207b.

**[0039]** A surgical procedure using instrument assembly 45 will now be described. In FIG. 32 instrument assembly 45 is assembled prior to insertion to the disc space and impactor cap 240 placed on the proximal end of cap member 150. Stem 82 of lock pin 80 is inserted through lock pin hole 79 and into lock pin receptacles 106, 116 of dilators 102, 112. Shoulder 88 is positioned adjacent extension 78 and partially received in notches 164a, 175a, preventing rotation of cap member 150 and providing an indication of proper alignment of cap member 150 on guide sleeve 50. Valve member 156 is in a closed position as shown in FIG. 18. Impactor cap 240 transfers a driving force from a hand, mallet, slap hammer, or the like to instrument assembly 45 to drive distractor tips 103, 113 and fingers 58a, 58b into disc space D.

**[0040]** Impactor cap 240 includes recessed gripping elements 242 to facilitate handling of cap 240. As shown in FIG. 33, impactor cap 240 includes an outer wall 244 and end wall 246 defining a hollow interior 248. A bearing wall 249 is formed in hollow interior 248 that abuts proximal end wall 161 of housing 152. A well 250 is formed in bearing wall 249 to receive a part of proximal end portion 180 of valve member 156 extending proximally of end wall 161. When impactor cap 240 is placed on cap member 150, well 250 has a central axis 254 that is substantially aligned with central axis 186 of valve member 156, and impactor cap 240 has a central axis 252 that is substantially aligned with central axis 55 of sleeve 50.

**[0041]** In order for instrument assembly to be positioned adjacent the disc space, it is first necessary to retract the tissue between the skin level and the subject disc space using any one of a known number of techniques and/or instruments. Techniques for preparing the surgical site and the disc space for entry via an anterior approach, including discectomy procedures and midline marking procedures, are known to those skilled in the art. Examples of such techniques are disclosed in PCT Publication No. WO 97/30666.

**[0042]** It may be necessary for the surgeon to slightly twist or wrest instrument assembly 45 to advance it through the skin and tissue to disc space D. Instrument assembly 45 should be properly located with respect to the disc space, and insertion can be performed, monitored, and/or confirmed with radiographic imaging or direct visualization. When the proximal end of the assem-

bly is positioned adjacent the disc space and impactor cap 240 is mounted on cap member 150, a driving force from a hand, mallet, slap hammer, or the like is applied to impactor cap 240 to drive distractor tips 103, 113 and fingers 58a, 58b into disc space D.

**[0043]** The configuration of outer sleeve 50 allows surgical procedures to be performed within disc space D in order to, for example, prepare the disc space and insert vertebral implants at a left bilateral location  $I_L$  and a right bilateral location  $I_R$  (FIG. 1a.) It should be appreciated sleeve 50 allows the procedures to be performed in the disc space D at these bilateral locations through working channel 52 without requiring manipulation of the sleeve 50 between the bilateral locations, although procedures involving manipulation of sleeve 50 through the skin to alternate locations are not precluded by the present invention.

**[0044]** As shown in FIG. 34, once assembly 45 is in the desired position in disc space D, impactor cap 240 is removed. In order to release distractor assembly 100 from guide sleeve 50, lock pin 80 is pulled upward until stem 82 is no longer positioned in lock pin receptacles 106, 116, disengaging dilators 102, 112 from sleeve 50. Grommets 85 maintain the positioning of lock pin 80 with shoulder 88 positioned outside notches 164a, 175a, allowing rotation of cap member 150 about flange ring 70. Preferably, lock pin 80 remains positioned in hole 79 so that stem 82 serves as a guide for proper alignment of cap member 150. Actuators 157a, 157b are rotated proximally to rotate disc 188 and open valve member 156, as shown in FIG. 19.

**[0045]** Once valve member 156 is opened, distractor remover 220 is inserted through port 154 and engaged to notch 105 of distractor 102, as shown in FIG. 34a. As shown in FIG. 35, distractor puller 220 has a shaft 222 extending between a Hudson connector 226 at a proximal end and a stem 226 at a distal end. Stem 226 has a trough 227 that receives a catch 224 therein. Catch 224 has a raised portion 225 and is pivotally engaged in trough 227 via a pin 228. A spring 230 biases catch 224 upwardly. Catch 224 is pushed into trough 227 as stem 226 is inserted a sufficient amount into the proximal end of shaft 104 until raised portion 225 is pushed by spring 230 into notch 105, coupling puller 220 to distractor 102. A remover tool, such as remover 260, is coupled to connector 226 of puller 220. Remover 260 has a shaft 262 extending between connector 264 and a stop member 266. A slide 268 is slidably disposed on shaft 262, and is moved proximally and distally on shaft 262 to impact stop member 266 and remove distractor 102 from the disc space D. Catch 226 is depressed into trough 227 to remove puller 220 from notch 105. Once distractor 102 is removed, valve member 156 can be moved to the closed position to maintain the sealed environment.

**[0046]** Referring now to FIGs. 36 and 36a, distractor 102 is removed, valve member 156 is moved to its open position, and reamer sleeve 130 is inserted into first por-



tion 52a of working channel 52. A mallet or other device can be used to apply a driving force against flange 133 and drive spikes 132a and 132b in vertebral bodies V1 and V2, respectively. Once sleeve 130 is securely positioned, reamer 140 is inserted into bore 134 as shown in FIGs. 37 and 37a. A T-handle 270 is coupled to Hudson connector 143, allowing the surgeon to rotate head 142 to ream material from disc space D at a first bilateral location. The depth of reaming in disc space D can be determined and monitored via radiographic imaging and/or monitored via depth markings 145, direct visualization, radiographic imaging or the like. When reaming is complete, sleeve 130 and reamer 140 are removed from working channel 52 and valve member 156 can be moved to its closed position to maintain the sealed environment.

[0047] Referring now to FIG. 38, cap member 150 is being rotated as indicated by arrow "R" to align port 154 with second portion 52b of working channel 52. During rotation, valve member 156 is closed and the distal end of housing 152 is adjacent to or abuts stem 82 of lock pin 80. This helps maintain proper positioning and alignment of cap member 150 during rotation thereof. If necessary, spring clip 90 can be compressed via arms 94a and 94b to facilitate rotation of cap member 150. Once port 154 is aligned with second portion 152b, second distractor 112 may be removed in a manner similar to that described above with respect to first distractor 102. Distraction of disc space D is maintained evenly by fingers 58a and 58b. Of course, cap member 150 may also be rotated in the direction opposite arrow R to reposition access port 154.

[0048] Referring now to FIGs. 39 and 39a, reaming sleeve 130 and reamer 140 are inserted through second portion 52b of working channel 52. In a manner similar to that described above with respect to FIGs. 37 and 37a, disc space D is reamed at a second bilateral location adjacent the first bilateral location to prepare it for insertion of an implant therein. Once the disc space is reamed, reaming sleeve 130 and reamer 140 are withdrawn from sleeve 50 and valve member 156 closed.

[0049] Referring now to FIGs. 40 and 40a, an implant 280 is secured to implant inserter 200 and inserter sleeve 210. Valve member 156 is opened and implant 280 is inserted through second portion 52b along with implant inserter 200 and inserter sleeve 210. T-handle 270 is secured to Hudson connector 203, and implant 280 is threaded to the desired depth in disc space D in the second bilateral location. The depth of insertion in disc space D can be determined and monitored via depth markings 216, direct visualization, radiographic imaging or the like. Inserter 200 and sleeve 210 are uncoupled to release extensions 207a and 207b from implant 280 and withdrawn from sleeve 50. Valve member 156 is then closed. In one form, implant 280 can be provided with a recessed portion similarly shaped as the recessed portion 119 described above with respect to tip 113 of second distractor 112. The recessed portion

of implant 280 faces the reamed disc space at the first bilateral location, and the recessed portion receives a portion of second implant 290, reducing the overall width of the disc space occupied by implants 280, 290.

[0050] Referring now to FIGs. 41 and 41a, a second implant 290 is secured to implant inserter 200 and inserter sleeve 210. Valve member 156 is opened and implant 290 is inserted through first portion 52a of working channel 52 along with implant inserter 200 and inserter sleeve 210. T-handle 270 is secured to Hudson connector 203, and implant 290 is threaded to the desired depth in disc space D. The depth of insertion in disc space D can be determined and monitored via depth markings 216, direct visualization, radiographic imaging or the like. Inserter 200 and sleeve 210 are uncoupled to release extensions 207a and 207b from implant 290 and withdrawn from sleeve 50. Sleeve 50 may then be withdrawn from disc space D and the entry wound closed using standard surgical techniques.

[0051] Variations in the above described surgical technique are also contemplated. For example, all the procedures can be completed through first working channel portion 52a, including implant insertion, prior to positioning access port 154 with second portion 154b. While certain instruments have been described for use with assembly 45, it should be understood that the use of any such instruments with assembly 45 as would occur to those skilled in the art is also contemplated.

[0052] It should be appreciated that disc space D can be prepared for bilateral implant insertion without movement or manipulation of guide sleeve 50 after the fingers 58a and 58b are positioned within disc space D since the surgeon has access to each of the bilateral locations through working channel 52. It should also be appreciated that disc space D may be tapped to facilitate insertion of threaded implants. It should be further appreciated that the implants can be provided with osteogenic or bone growth material to promote fusion, or that such material can be placed directly into disc space D. In a further form, it is contemplated that the implants are not threaded, but rather are configured for pushing or driving into the prepared disc space.

## Claims

1. An apparatus for performing surgical procedures in the disc space between adjacent vertebrae of a patient, comprising:

a sleeve (50) having a distal end (56) and proximal end (54), said sleeve defining a working channel therethrough, said working channel including:

a first portion (52a) and an adjacent second portion (52b), said first and second portions each configured to receive surgical

instruments therethrough;

**characterised in**

a cap member (150) substantially sealing said working channel secured to said sleeve at said proximal end, said cap member having an access port (154) alignable with a corresponding one of said first or second portions, said cap member movable with respect to said sleeve to align said access port with the other of said first and second portions; and

wherein said working channel (52) remains sealed during movement of said cap member (150) to align said access port (154).

2. The apparatus of claim 1, wherein said cap member (150) includes an O-ring extending into said access port (154), said O-ring sealingly receiving surgical instruments extending through said access port to maintain said substantially sealed working channel.
3. The apparatus of claim 1 or 2, wherein each of said first and second portions has a truncated circular shape, wherein said truncated portions of the circle are positioned adjacent one another.
4. The apparatus of claim 1, wherein said sleeve (50) has a perimeter with a non-circular shape.
5. The apparatus of any preceding claim, wherein said sleeve includes a flange ring (70) at said proximal end and said cap member is secured to said flange ring.
6. The apparatus of claim 5, wherein said sleeve (50) has a racetrack shaped perimeter and said flange ring (70) has a circular shaped perimeter.
7. The apparatus of claim 6, wherein said flange ring (70) includes a sleeve member (72) having a race-track shaped inner bore positioned about said race-track shaped perimeter of said sleeve.
8. The apparatus of claim 6 or 7, wherein said access port (154) is aligned with said first or second portion by rotating said cap member about said flange ring (70).
9. The apparatus of claims 6, 7 or 8, wherein said cap member (150) is secured to said flange ring (70) at said proximal end sealing said working channel.

10. The apparatus of any of claims 1 to 9, wherein:

said cap member (150) has an inner circular insert member that includes an inner groove ad-

jacent a distal end thereof;

said flange ring (70) includes a sidewall (75) forming said outer perimeter, said sidewall having a groove formed therein; and

said cap member being secured to said flange ring by a spring clip (90) extending between said sidewall groove and said inner groove.

11. The apparatus of any of claims 1 to 10, wherein said cap member includes a valve member (156) having a valve disc (188) coupled to at least one actuator (157a, 157b) for opening and closing said access port (154).

12. The apparatus of claim 11, wherein said valve member includes:

a stem (190) extending through and mounted to said cap member;  
said actuator coupled to said stem outside said cap member; and  
said disc (188) coupled to said stem, wherein said actuator is pivotable from a closed position whereby said disc substantially closes said access port to an open position whereby said disc does not substantially close said access port.

13. The apparatus of any of claims 1 to 8, 10 or 11, wherein said first portion of said working channel is for performing a surgical procedure at a first disc space location and said second portion of said working channel is for performing a surgical procedure at a second disc space location.

14. The apparatus of claim 13, wherein said working channel has a figure eight shape formed by said first and second portions.

15. The apparatus of any preceding claim, wherein said sleeve includes a pair of opposite fingers (58a, 58b) extending from said distal end for insertion into the disc space.

16. The apparatus of claim 15, wherein said sleeve has a racetrack shaped perimeter.

17. The apparatus of claim 1 wherein said sleeve has a longitudinal axis and said working channel extends between said distal end and said proximal end along said longitudinal axis, wherein said first portion is substantially aligned with said longitudinal axis for performing a first procedure therethrough at a first location and said adjacent second portion substantially aligned with said longitudinal axis for performing a second procedure therethrough at a second location; and wherein said cap member has a housing (152) secured to said proximal end of said sleeve, said housing including said sealable access

port (154) for accessing said working channel, said access port movable between said first and second portions of said working channel while said working channel remains sealed.

18. The apparatus of claim 17, wherein said sleeve includes a flange ring (70) at said proximal end and said housing is secured to said flange ring.
19. The apparatus of claim 18, wherein said sleeve has a racetrack shaped perimeter and said flange ring has a circular shaped perimeter.
20. The apparatus of claim 19, wherein said flange ring includes a sleeve member having a racetrack shaped inner bore positioned about said racetrack shaped perimeter of said sleeve.
21. The apparatus of claim 18, 19 or 20, wherein said access port is aligned with said first or second portion by rotating said housing about said flange ring.
22. The apparatus of any of claims 18 to 21, wherein said housing includes a valve member having a valve disc coupled to at least one actuator for opening and closing said access port.

#### Patentansprüche

1. Vorrichtung zum Ausführen chirurgischer Prozeduren im Bandscheibenraum zwischen benachbarten Wirbeln eines Patienten, mit:

einer Hülse (50) mit einem distalen Ende (56) und einem proximalen Ende (54), wobei die Hülse einen durch sie verlaufenden Arbeitskanal definiert, der folgendes aufweist:

einen ersten Abschnitt (52a) und einen benachbarten zweiten Abschnitt (52b), wobei der erste und der zweite Abschnitt jeweils konfiguriert sind, um chirurgische Instrumente durch sie hindurch aufzunehmen,

#### gekennzeichnet durch:

ein Kappenelement (150), das den an der Hülse befestigten Arbeitskanal an dem proximalen Ende im wesentlichen abdichtet, wobei das Kappenelement einen Zugangsanschluss (154) aufweist, der mit einem entsprechenden von dem ersten oder dem zweiten Abschnitt ausrichtbar ist, und das Kappenelement in Bezug auf die Hülse bewegbar ist, um den Zugangsanschluss mit dem anderen von dem ersten und dem zweiten Abschnitt auszurichten,

wobei der Arbeitskanal (52) während der Bewegung des Kappenelements (150) zum Ausrichten des Zugangsanschlusses (154) abgedichtet bleibt.

2. Vorrichtung nach Anspruch 1, wobei das Kappenelement (150) einen O-Ring aufweist, der sich in den Zugangsanschluss (154) erstreckt, wobei der O-Ring abdichtend chirurgische Instrumente aufnimmt, die sich durch den Zugangsanschluss erstrecken, um den im wesentlichen abgedichteten Arbeitskanal aufrechtzuerhalten.
3. Vorrichtung nach Anspruch 1 oder 2, wobei der erste und der zweite Abschnitt jeweils eine abgeschnittene kreisförmige Gestalt aufweisen, wobei die abgeschnittenen Abschnitte des Kreises aneinander angrenzend positioniert sind.
4. Vorrichtung nach Anspruch 1, wobei die Hülse (50) einen Umfangsrand mit einer nicht-kreisförmigen Form aufweist.
5. Vorrichtung nach einem der voranstehenden Ansprüche, wobei die Hülse an dem proximalen Ende einen Flanschring (70) aufweist und das Kappenelement an dem Flanschring befestigt ist.
6. Vorrichtung nach Anspruch 5, wobei die Hülse (50) einen rennbahnförmigen Umfangsrand aufweist und der Flanschring (70) einen kreisförmigen Umfangsrand aufweist.
7. Vorrichtung nach Anspruch 6, wobei der Flanschring (70) ein Hülselement (72) mit einer rennbahnförmigen Innenbohrung aufweist, die um den rennbahnförmigen Umfangsrand der Hülse angeordnet ist.
8. Vorrichtung nach Anspruch 6 oder 7, wobei der Zugangsanschluss (154) durch Drehen des Kappenelements um den Flanschring (70) mit dem ersten oder dem zweiten Abschnitt ausgerichtet wird.
9. Vorrichtung nach Anspruch 6, 7 oder 8, wobei das Kappenelement (150) an dem proximalen Ende, das den Arbeitskanal abdichtet, an dem Flanschring (70) befestigt ist.
10. Vorrichtung nach einem der Ansprüche 1 bis 9, wobei:
 

das Kappenelement (150) ein inneres kreisförmiges Einselement aufweist, das angrenzend an ein distales Ende davon eine innere Nut aufweist,

der Flanschring (70) eine Seitenwand (75) aufweist, die den Außenrand bildet, wobei in der

Seitenwand eine Nut ausgebildet ist, und

das Kappenelement durch eine Federklammer (90), die zwischen der Seitenwandnut und der inneren Nut verläuft, an dem Flanschring befestigt ist.

11. Vorrichtung nach einem der Ansprüche 1 bis 10, wobei das Kappenelement ein Ventilelement (156) mit einer Ventilscheibe (188) aufweist, die mit mindestens einem Betätigungselement (157a, 157b) zum Öffnen und Schließen des Zugangsanschlusses (154) gekoppelt ist.

12. Vorrichtung nach Anspruch 11, wobei das Ventilelement folgendes aufweist:

einen Stamm bzw. Schaft (190), der sich durch das Kappenelement erstreckt und daran angebracht ist,

wobei das Betätigungselement außerhalb des Kappenelements mit dem Stamm bzw. Schaft gekoppelt ist, und

die Scheibe (188) mit dem Stamm gekoppelt ist, wobei das Betätigungselement aus einer geschlossenen Position, in der die Scheibe den Zugangsanschluss im wesentlichen schließt, in eine offene Position, in der die Scheibe den Zugangsanschluss nicht im wesentlichen schließt, schwenkbar ist.

13. Vorrichtung nach einem der Ansprüche 1 bis 8, 10 oder 11, wobei der erste Abschnitt des Arbeitskanals dazu dient, eine chirurgische Prozedur an einem ersten Ort des Bandscheibenraums auszuführen, und der zweite Abschnitt des Arbeitskanals dazu dient, eine chirurgische Prozedur an einem zweiten Ort des Bandscheibenraums auszuführen.

14. Vorrichtung nach Anspruch 13, wobei der Arbeitskanal die Form einer Acht aufweist, die durch den ersten und den zweiten Abschnitt gebildet ist.

15. Vorrichtung nach einem der voranstehenden Ansprüche, wobei die Hülse ein Paar entgegengesetzter Finger (58a, 58b) zum Einführen in den Bandscheibenraum aufweist, die von dem distalen Ende ausgehen.

16. Vorrichtung nach Anspruch 15, wobei die Hülse einen rennbahnförmigen Umfangsrand aufweist.

17. Vorrichtung nach Anspruch 1, wobei die Hülse eine Längsachse aufweist und sich der Arbeitskanal zwischen dem distalen Ende und dem proximalen Ende entlang der Längsachse erstreckt, wobei der erste

ste Abschnitt im wesentlichen mit der Längsachse ausgerichtet ist, um dadurch eine erste Prozedur an einem ersten Ort auszuführen, und wobei der benachbarte zweite Abschnitt im wesentlichen mit der Längsachse ausgerichtet ist, um dadurch eine zweite Prozedur an einem zweiten Ort auszuführen, und wobei das Kappenelement ein Gehäuse (152) aufweist, das an dem proximalen Ende der Hülse befestigt ist, wobei das Gehäuse den abdichtbaren Zugangsanschluss (154) für einen Zugang zu dem Arbeitskanal aufweist, wobei der Zugangsanschluss zwischen dem ersten und dem zweiten Abschnitt des Arbeitskanals beweglich ist, während der Arbeitskanal abgedichtet bleibt.

18. Vorrichtung nach Anspruch 17, wobei die Hülse an dem proximalen Ende einen Flanschring (70) aufweist und das Gehäuse an dem Flanschring befestigt ist.

19. Vorrichtung nach Anspruch 18, wobei die Hülse einen rennbahnförmigen Umfangsrand aufweist und der Flanschring einen kreisförmigen Umfangsrand aufweist.

20. Vorrichtung nach Anspruch 19, wobei der Flanschring ein Hülselement mit einer rennbahnförmigen Innenbohrung aufweist, die um den rennbahnförmigen Umfangsrand der Hülse positioniert ist.

21. Vorrichtung nach Anspruch 18, 19 oder 20, wobei der Zugangsanschluss durch Drehen des Gehäuses um den Flanschring mit dem ersten oder dem zweiten Abschnitt ausgerichtet wird.

22. Vorrichtung nach einem der Ansprüche 18 bis 21, wobei das Gehäuse ein Ventilelement mit einer Ventilscheibe aufweist, die mit mindestens einem Betätigungselement zum Öffnen und Schließen des Zugangsanschlusses gekoppelt ist.

## Revendications

1. Appareil pour exécuter des procédures chirurgicales dans l'espace discal entre des vertèbres adjacentes d'un patient, comprenant :

un manchon (50) ayant une extrémité distale (56) et une extrémité proximale (54), ledit manchon définissant un canal de travail à travers lui-même, ledit canal de travail incluant :  
une première portion (52a) et une seconde portion (52b) adjacentes, ladite première et ladite seconde portion étant configurées chacune pour recevoir des instruments chirurgicaux à travers elle-même ;

**caractérisé par :**

- un élément formant capuchon (150) qui étanche sensiblement ledit canal de travail et qui est fixé audit manchon à ladite extrémité proximale, ledit élément formant capuchon ayant un orifice d'accès (154) susceptible d'être aligné avec une portion correspondante parmi ladite première ou ladite seconde portion, ledit élément formant capuchon étant mobile par rapport audit manchon pour aligner ledit orifice d'accès avec l'autre portion parmi ladite première ou ladite seconde portion ; et
- dans lequel ledit canal de travail (52) reste étanche pendant le mouvement dudit élément formant capuchon (150) pour aligner ledit orifice d'accès (154).
2. Appareil selon la revendication 1, dans lequel ledit élément formant capuchon (150) inclut un joint torique s'étendant dans ledit orifice d'accès (154), ledit joint torique recevant avec étanchement des instruments chirurgicaux qui s'étendent à travers ledit orifice d'accès pour maintenir ledit canal de travail sensiblement étanché.
  3. Appareil selon la revendication 1 ou 2, dans lequel chacune de ladite première et de ladite seconde portion a une forme circulaire tronquée, et dans lequel lesdites portions tronquées de cercle sont positionnées adjacentes l'une à l'autre.
  4. Appareil selon la revendication 1, dans lequel ledit manchon (50) a un périmètre avec une forme non circulaire.
  5. Appareil selon l'une quelconque des revendications précédentes, dans lequel ledit manchon inclut une bague à bride (70) à ladite extrémité proximale, et ledit élément formant capuchon est fixé à ladite bague à bride.
  6. Appareil selon la revendication 5, dans lequel ledit manchon (50) présente un périmètre en forme de piste, et ladite bague à bride (70) présente un périmètre de forme circulaire.
  7. Appareil selon la revendication 6, dans lequel ladite bague à bride (70) inclut un élément en forme de manchon (72) ayant un perçage intérieur en forme de piste positionné autour dudit périmètre en forme de piste dudit manchon.
  8. Appareil selon la revendication 6 ou 7, dans lequel ledit orifice d'accès (154) est aligné avec ladite première portion ou avec ladite seconde portion par rotation dudit élément formant capuchon autour de ladite bague à bride (70).
  9. Appareil selon les revendications 6, 7 ou 8, dans lequel ledit élément formant capuchon (150) est fixé à ladite bague à bride (70) à ladite extrémité proximale en étanchant ledit canal de travail.
  10. Appareil selon l'une quelconque des revendications 1 à 9, dans lequel :
 

ledit élément formant capuchon (150) comprend un élément d'insert circulaire intérieur qui inclut une gorge intérieure adjacente à son extrémité distale ;

ladite bague à bride (70) inclut une paroi latérale (75) formant ledit périmètre extérieur, ladite paroi latérale ayant une gorge formée en elle-même ; et

ledit élément formant capuchon est fixé à ladite bague à bride par un jonc élastique (90) qui s'étend entre ladite gorge de la paroi latérale et ladite gorge intérieure.
  11. Appareil selon l'une quelconque des revendications 1 à 10, dans lequel ledit élément formant capuchon inclut un élément de valve (156) ayant un disque de valve (188) couplé à au moins un actionneur (157a, 157b) pour ouvrir et pour fermer ledit orifice d'accès (154).
  12. Appareil selon la revendication 11, dans lequel ledit élément de valve inclut :
 

une tige (190) qui s'étend à travers ledit élément formant capuchon et qui est montée sur celui-ci ;

ledit actionneur est couplé à ladite tige à l'extérieur dudit élément formant capuchon ; et

ledit disque (188) est couplé à ladite tige, ledit actionneur étant susceptible de pivoter depuis une position fermée dans laquelle ledit disque ferme sensiblement ledit orifice d'accès jusqu'à une position ouverte dans laquelle ledit disque ne ferme pas sensiblement ledit orifice d'accès.
  13. Appareil selon l'une quelconque des revendications 1 à 8, 10 ou 11, dans lequel ladite première portion dudit canal de travail est destinée à exécuter une procédure chirurgicale au niveau de l'emplacement d'un premier espace discal, et ladite seconde portion dudit canal de travail est destinée à exécuter une procédure chirurgicale au niveau de l'emplacement d'un second espace discal.
  14. Appareil selon la revendication 13, dans lequel ledit canal de travail à la forme du chiffre 8 formé par ladite première portion et ladite seconde portion.
  15. Appareil selon l'une quelconque des revendications

précédentes, dans lequel ledit manchon inclut une paire de doigts opposés (58a, 58b) qui s'étendent depuis ladite extrémité distale en vue d'être introduits dans l'espace discal.

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16. Appareil selon la revendication 15, dans lequel ledit manchon présente un périmètre en forme de piste.

17. Appareil selon la revendication 1, dans lequel ledit manchon a un axe longitudinal et ledit canal de travail s'étend entre ladite extrémité distale et ladite extrémité proximale le long dudit axe longitudinal, dans lequel ladite première portion est sensiblement alignée avec ledit axe longitudinal pour exécuter une première procédure à travers celle-ci à un premier emplacement et ladite seconde portion adjacente est sensiblement alignée avec ledit axe longitudinal pour exécuter une seconde procédure à travers celle-ci à un second emplacement ; et dans lequel ledit élément formant capuchon comprend un boîtier (152) fixé à ladite extrémité proximale dudit manchon, ledit boîtier incluant ledit orifice d'accès (154) susceptible d'être étanché pour accéder audit canal de travail, ledit orifice d'accès étant mobile entre ladite première portion et ladite seconde portion dudit canal de travail cependant que ledit canal de travail reste étanché.

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18. Appareil selon la revendication 17, dans lequel ledit manchon inclut une bague à bride (70) à ladite extrémité proximale, et ledit boîtier est fixé à ladite bague à bride.

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19. Appareil selon la revendication 18, dans lequel ledit manchon présente un périmètre en forme de piste, et ladite bague à bride présente un périmètre de forme circulaire.

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20. Appareil selon la revendication 19, dans lequel ladite bague à bride inclut un élément en forme de manchon ayant un perçage intérieur en forme de piste positionné autour dudit périmètre en forme de piste dudit manchon.

40

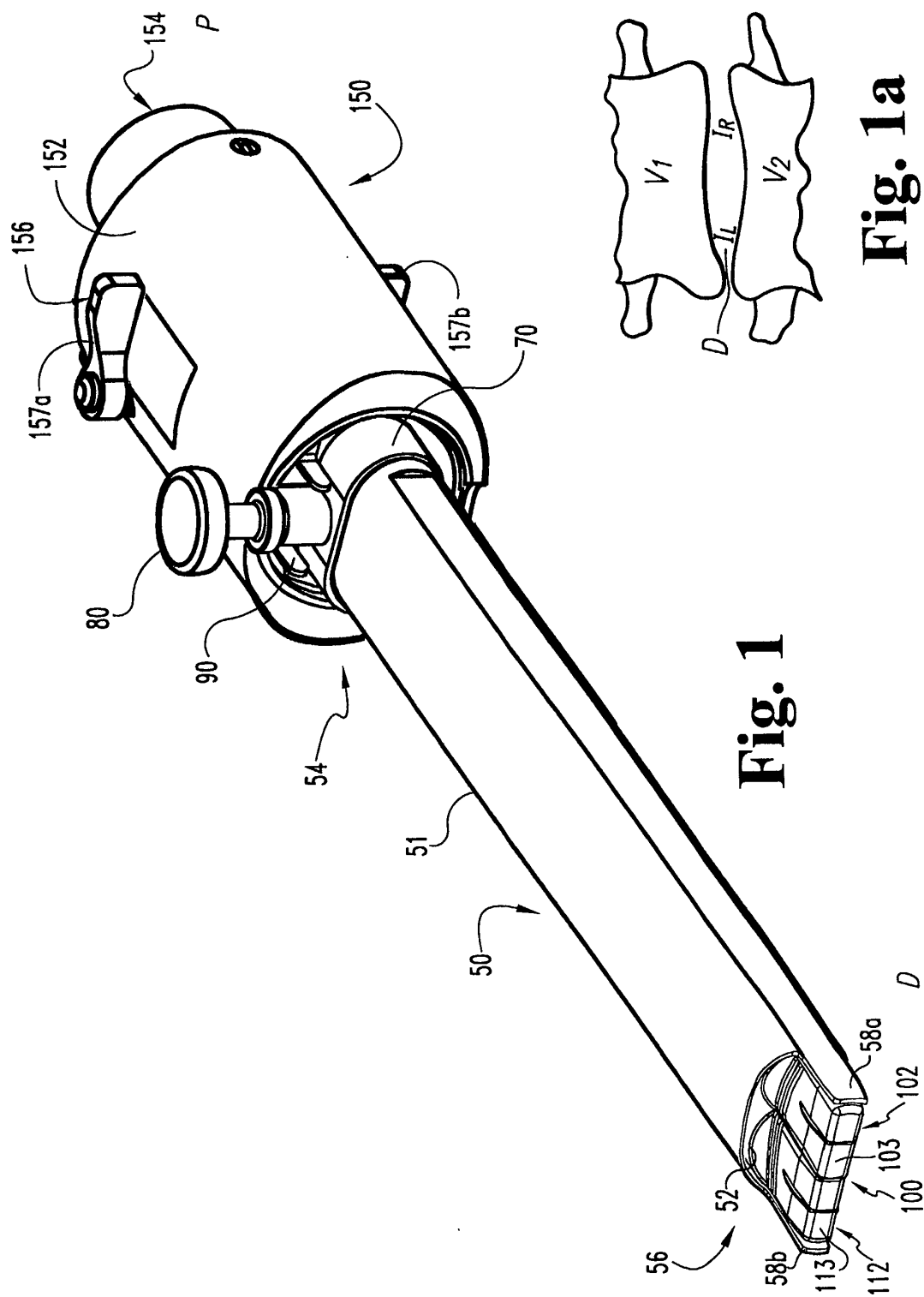
21. Appareil selon la revendication 18, 19 ou 20, dans lequel ledit orifice d'accès est aligné avec ladite première portion ou avec ladite seconde portion par rotation dudit boîtier autour de ladite bague à bride.

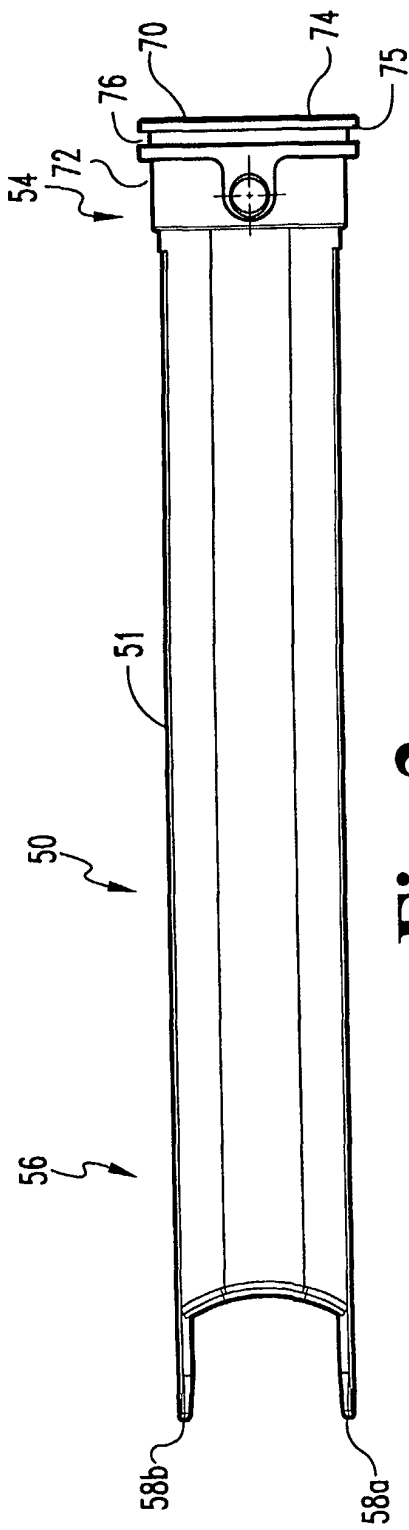
45

22. Appareil selon l'une quelconque des revendications 18 à 21, dans lequel ledit boîtier inclut un élément de valve ayant un disque de valve couplé à au moins un actionneur pour ouvrir et pour fermer ledit orifice d'accès.

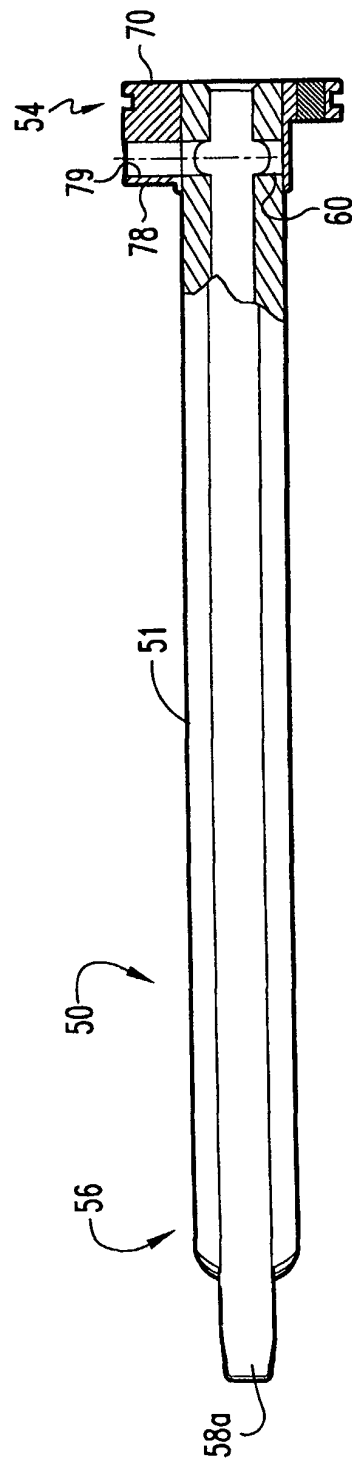
50

55



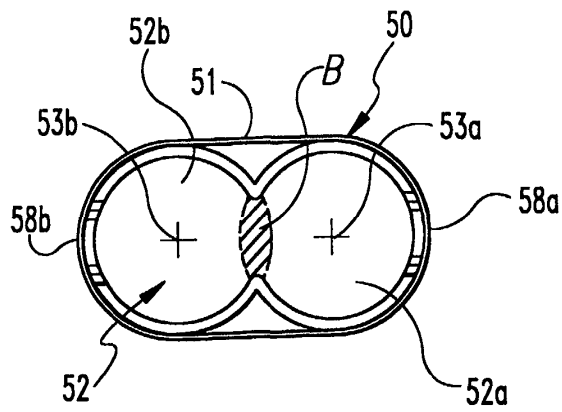


**Fig. 2**

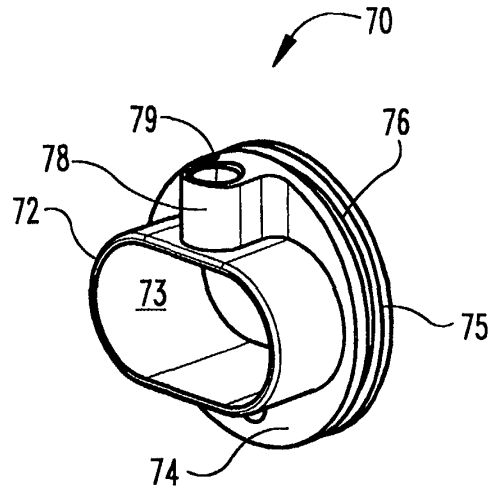


**Fig. 3**

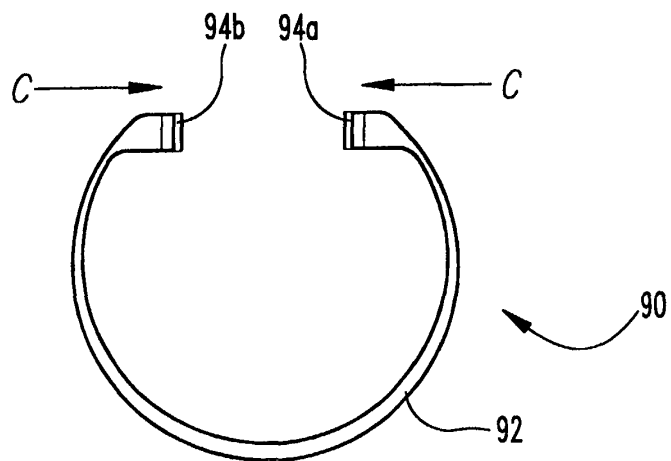




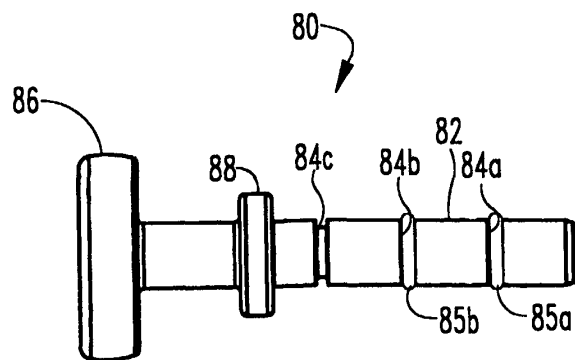
**Fig. 4**



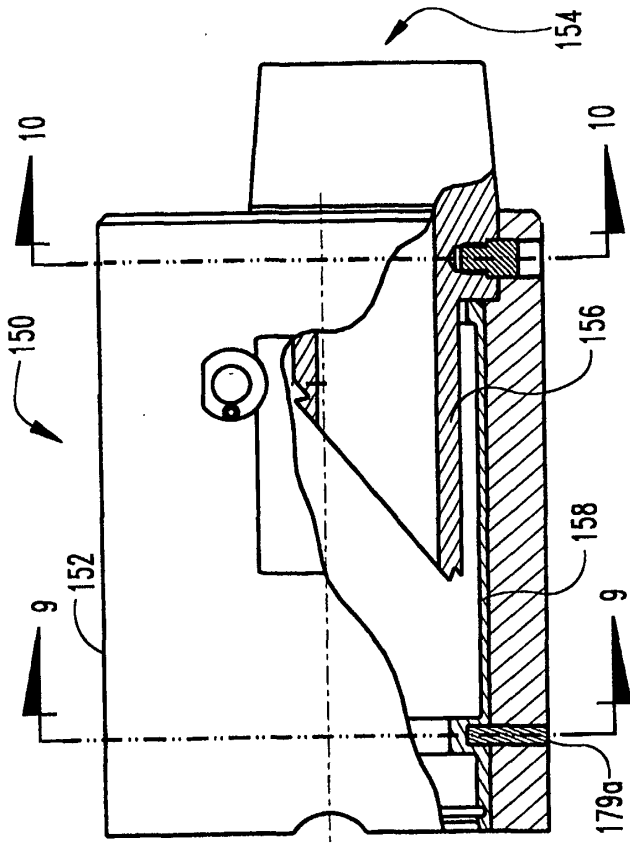
**Fig. 5**



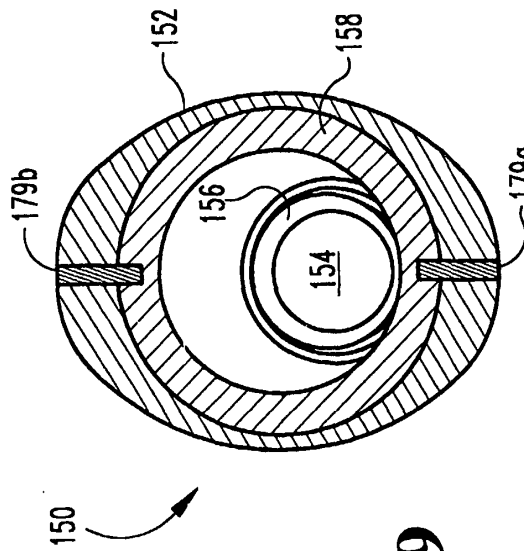
**Fig. 6**



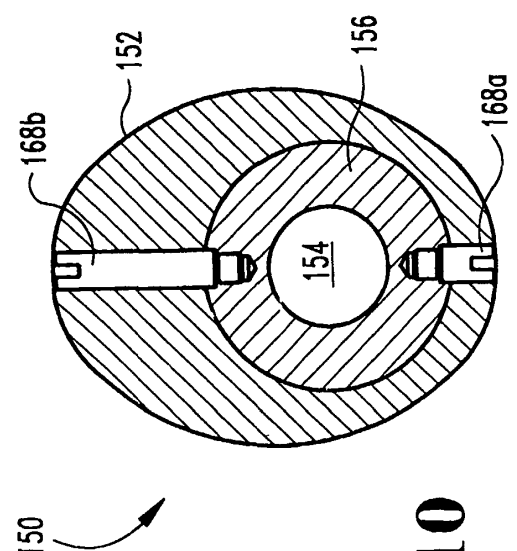
**Fig. 7**



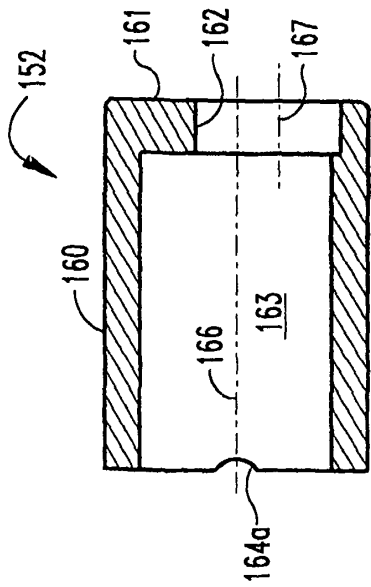
**Fig. 8**



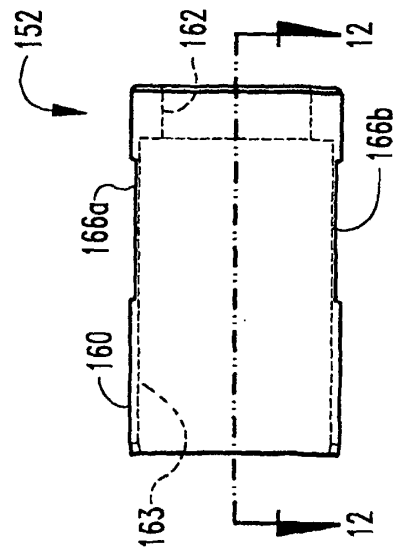
**Fig. 9**



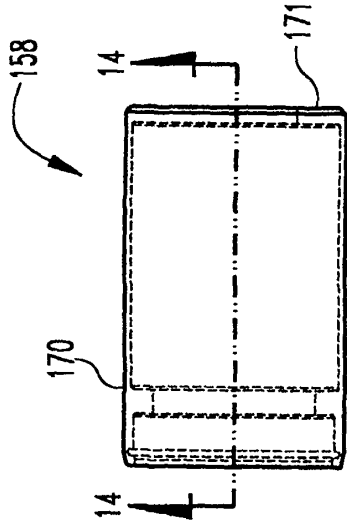
**Fig. 10**



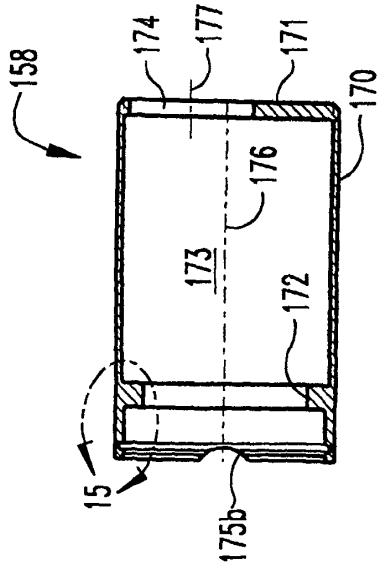
**Fig. 12**



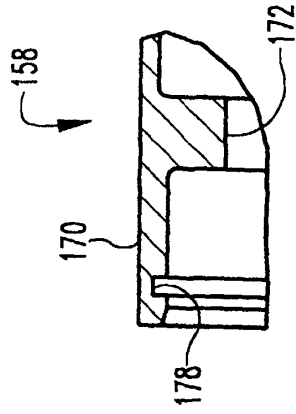
**Fig. 11**



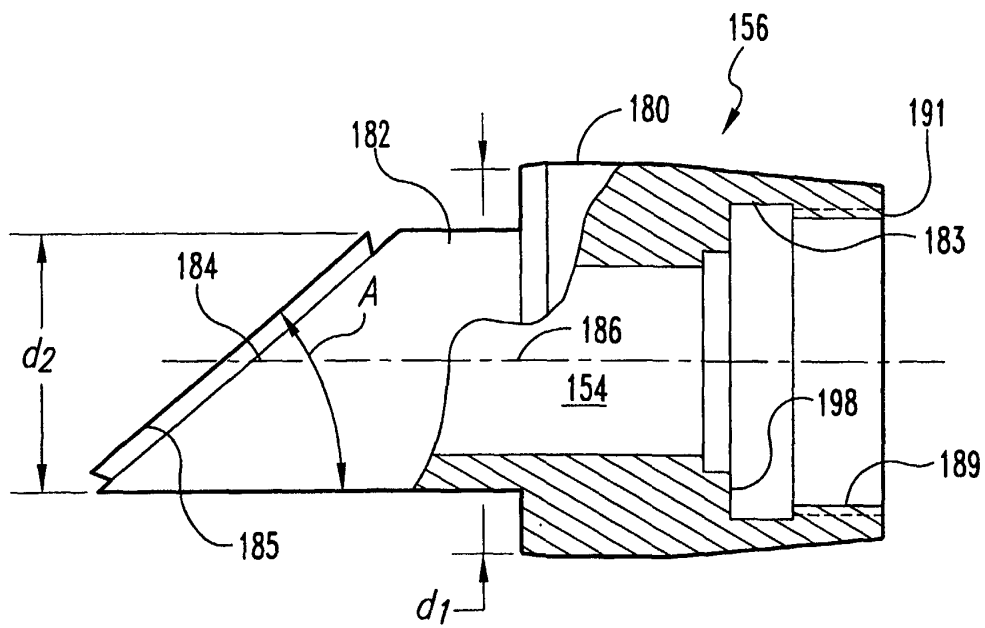
**Fig. 13**



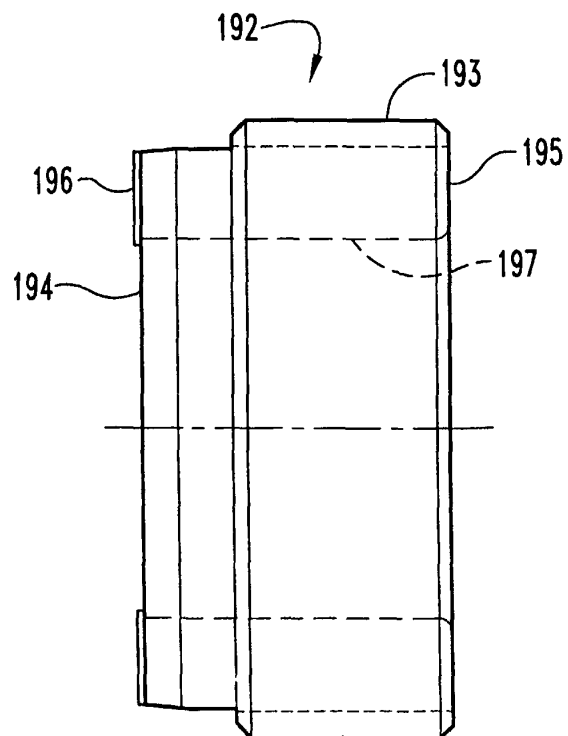
**Fig. 14**



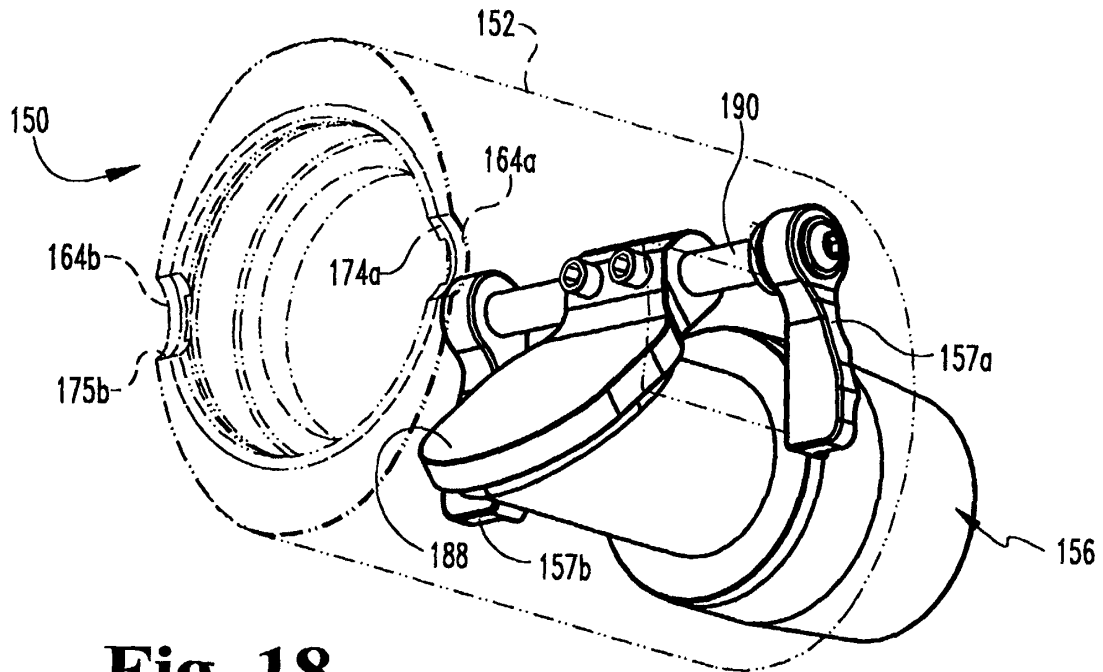
**Fig. 15**



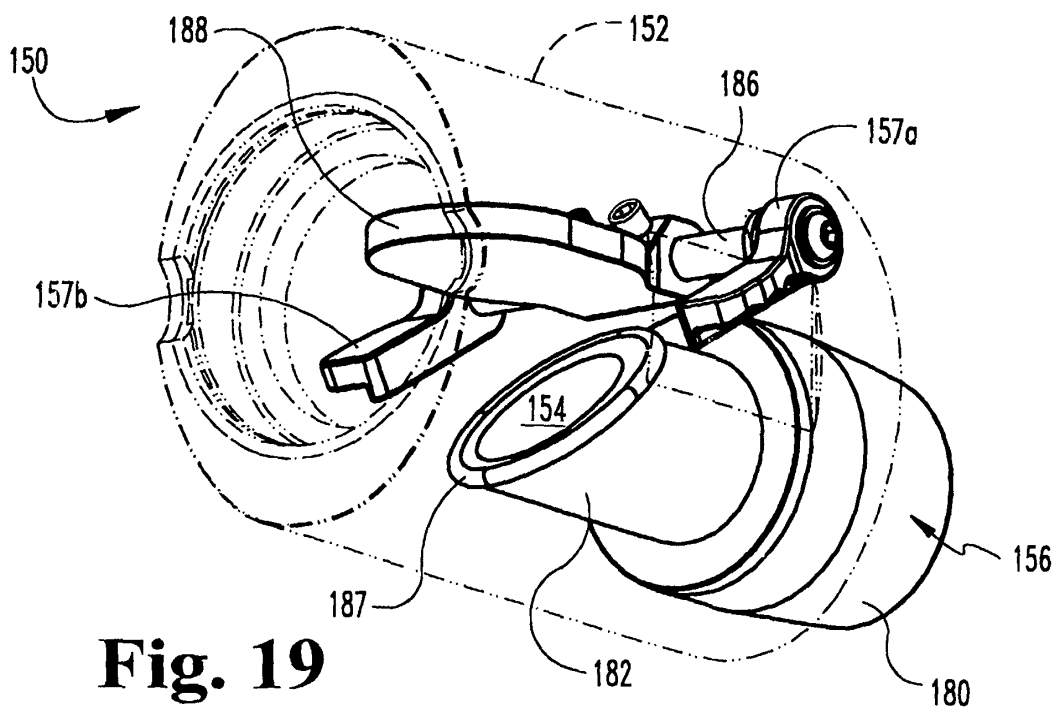
**Fig. 16**



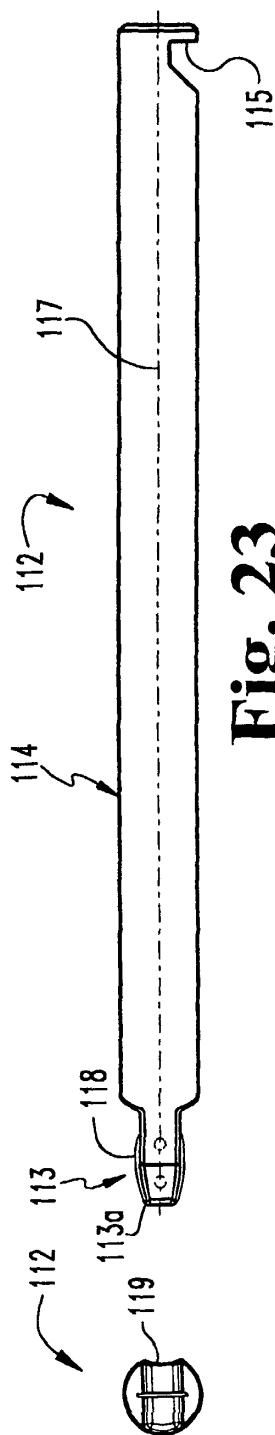
**Fig. 17**



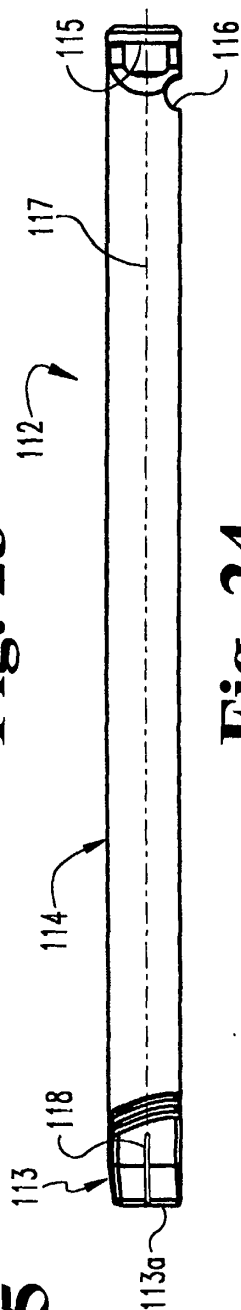
**Fig. 18**



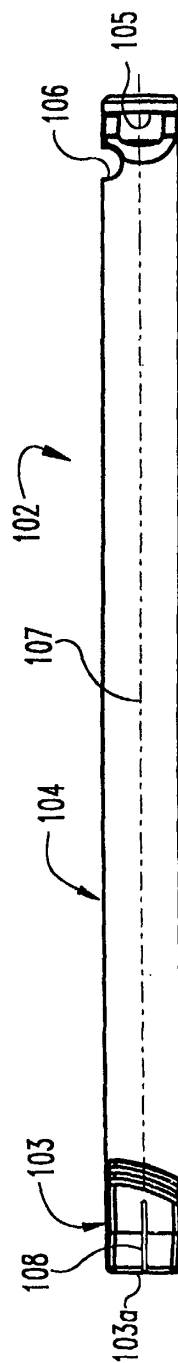
**Fig. 19**



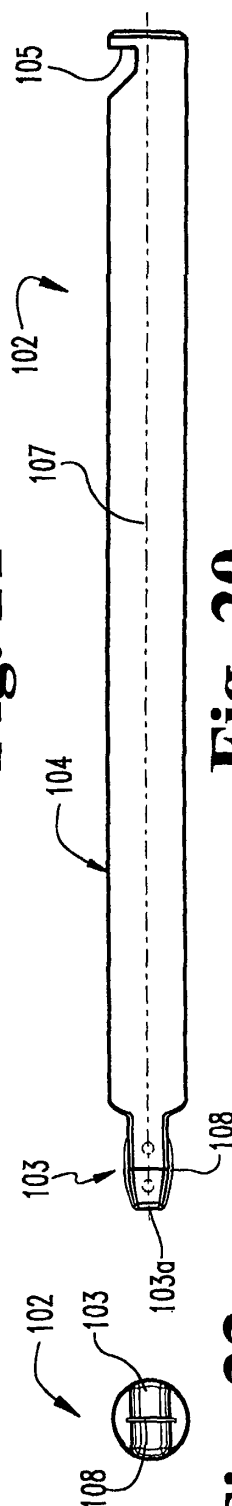
**Fig. 23**



**Fig. 24**

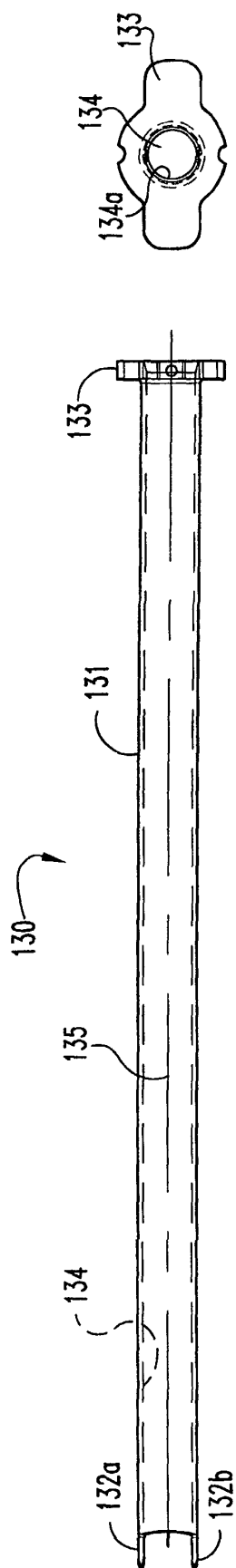


**Fig. 21**

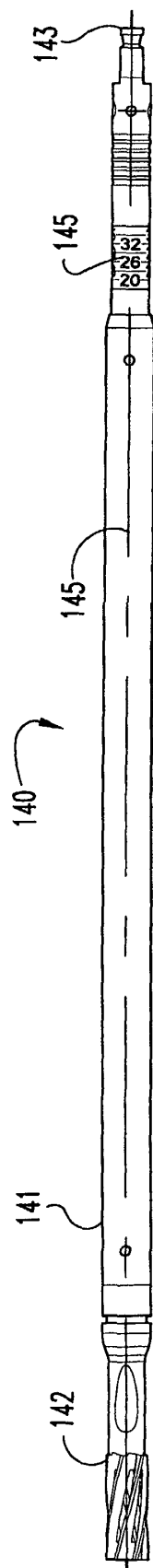


**Fig. 20**

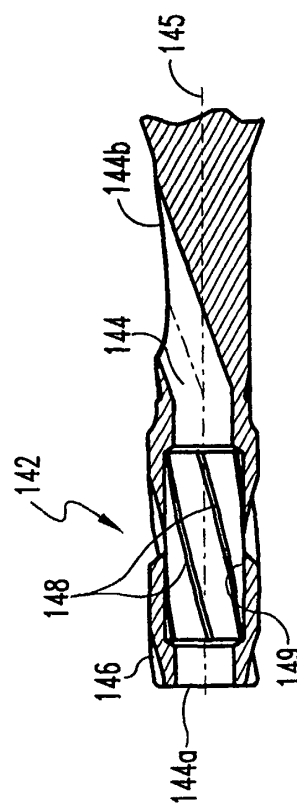
**Fig. 22**



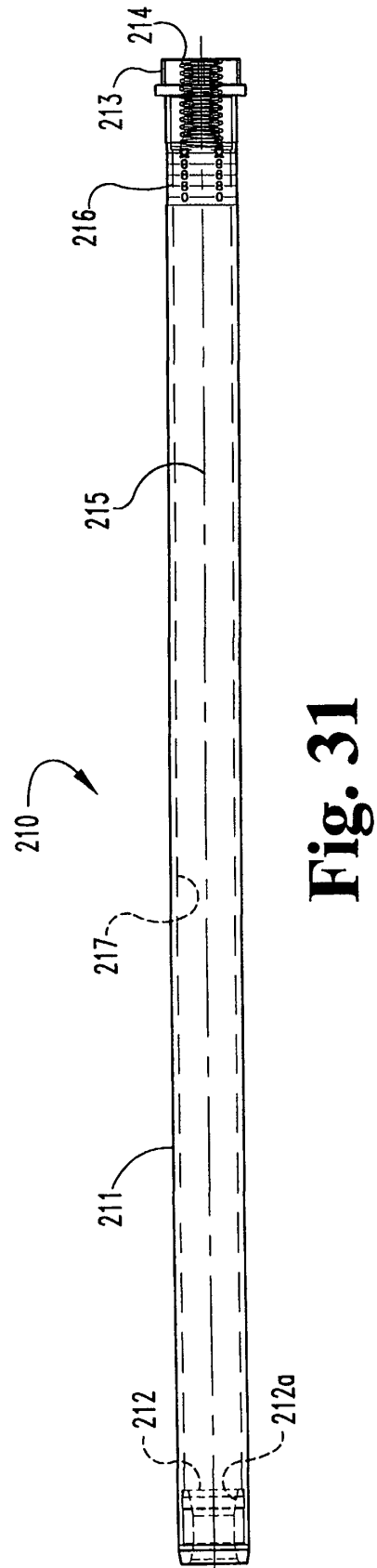
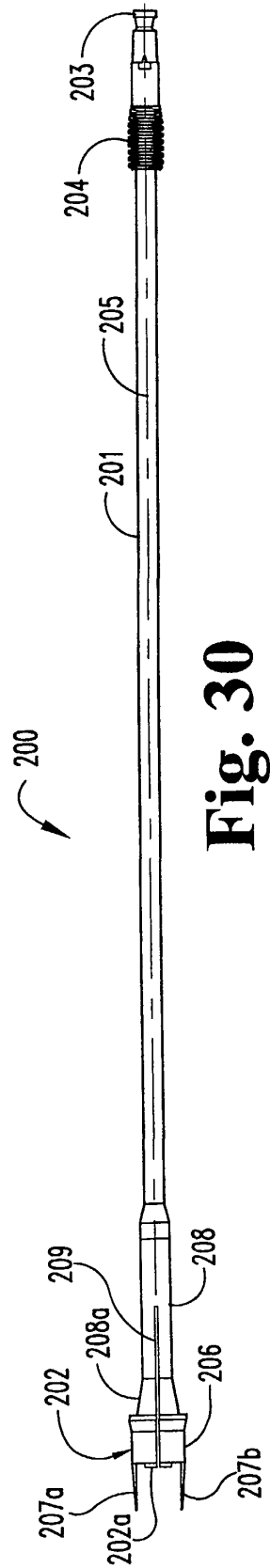
**Fig. 26**



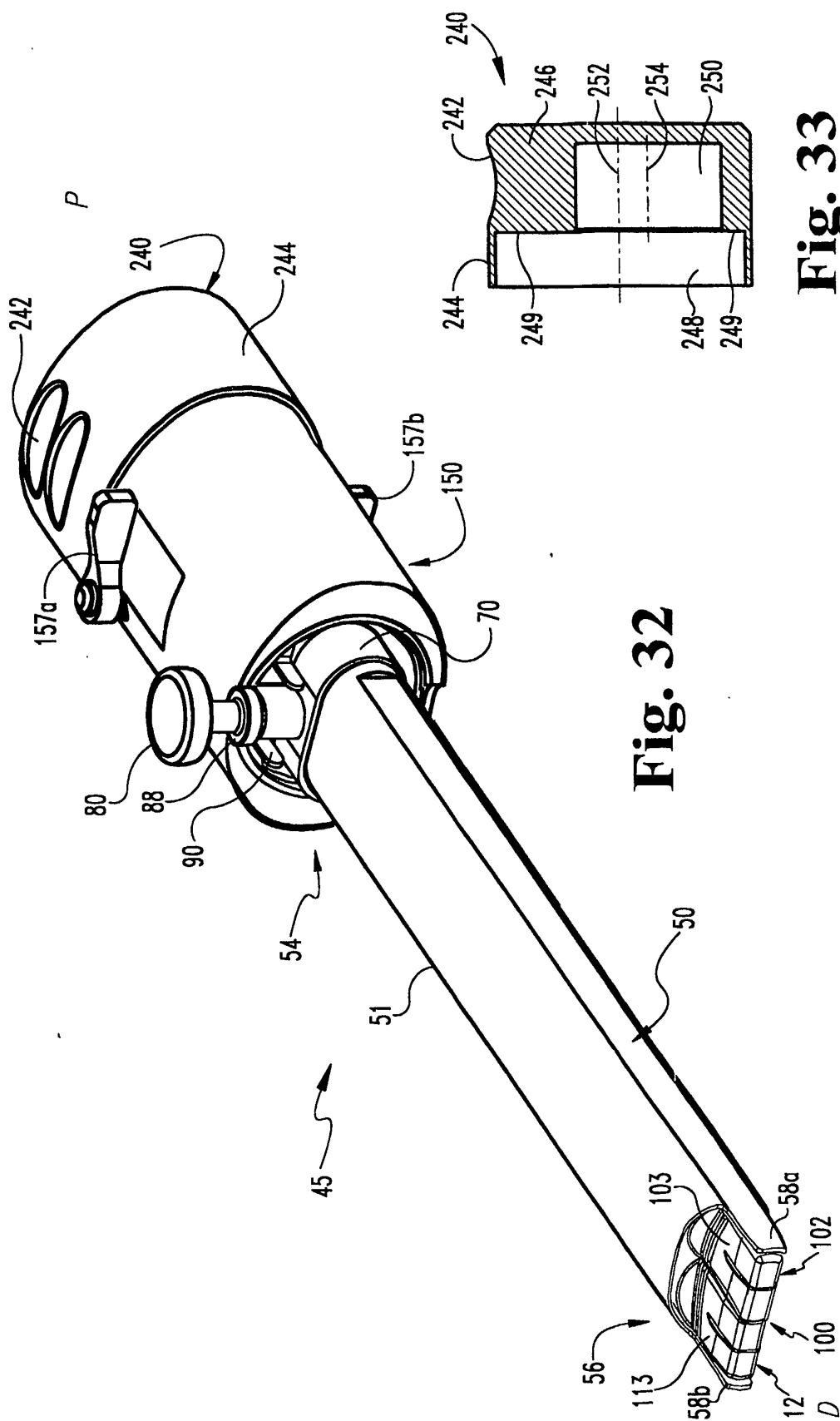
**Fig. 27**



**Fig. 28**

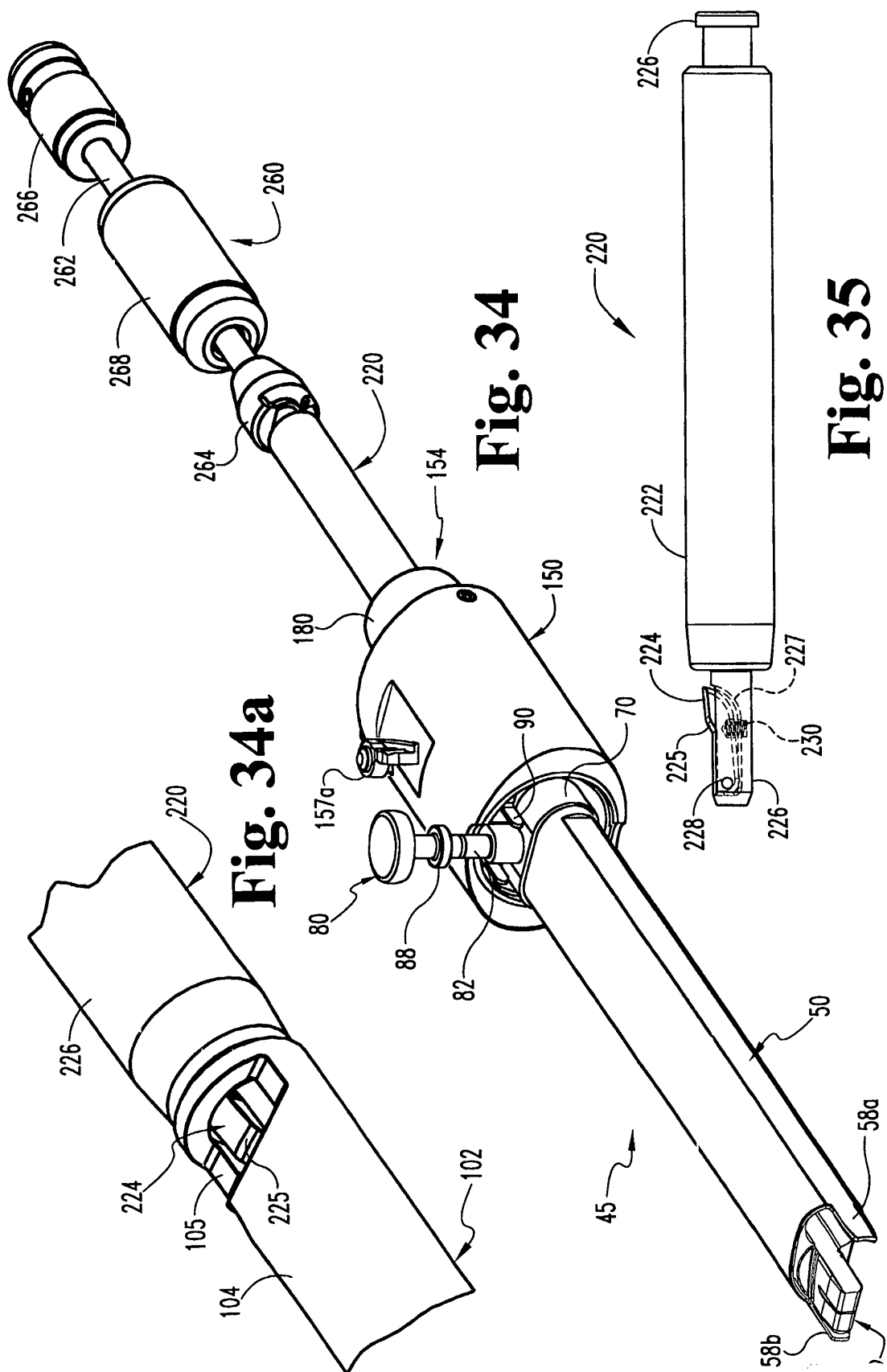


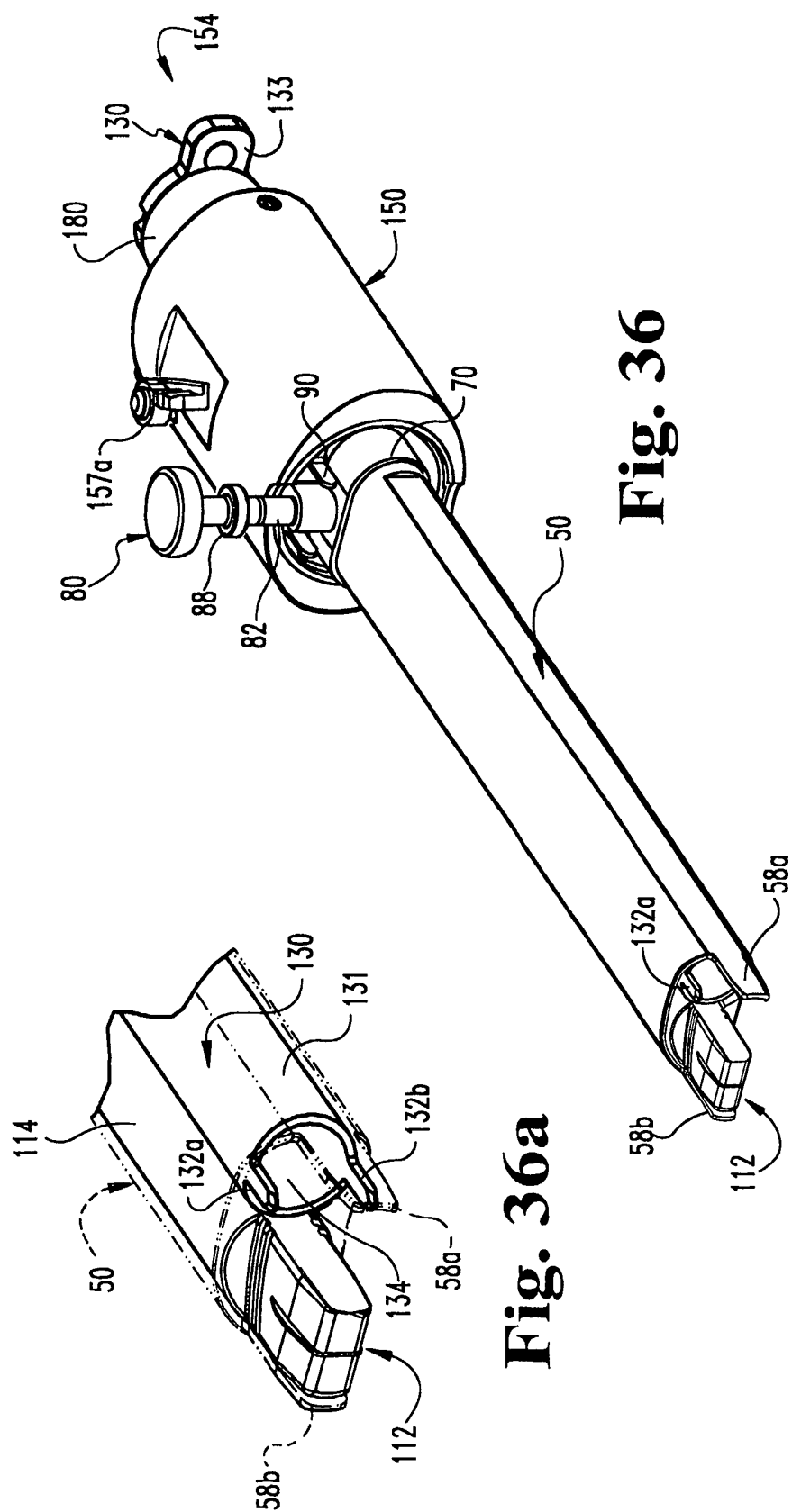




**Fig. 33**

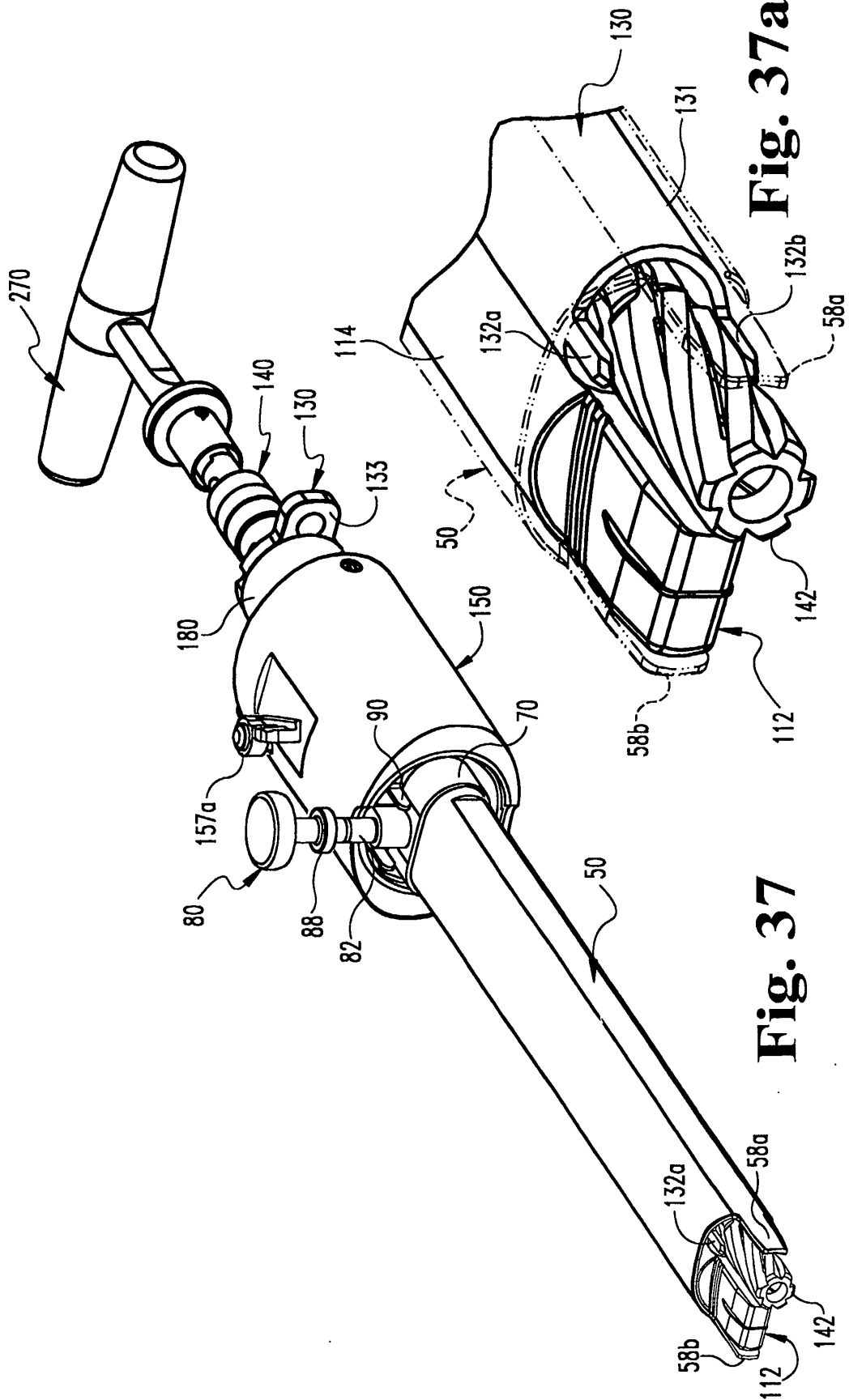
**Fig. 32**





**Fig. 36a**

**Fig. 36**



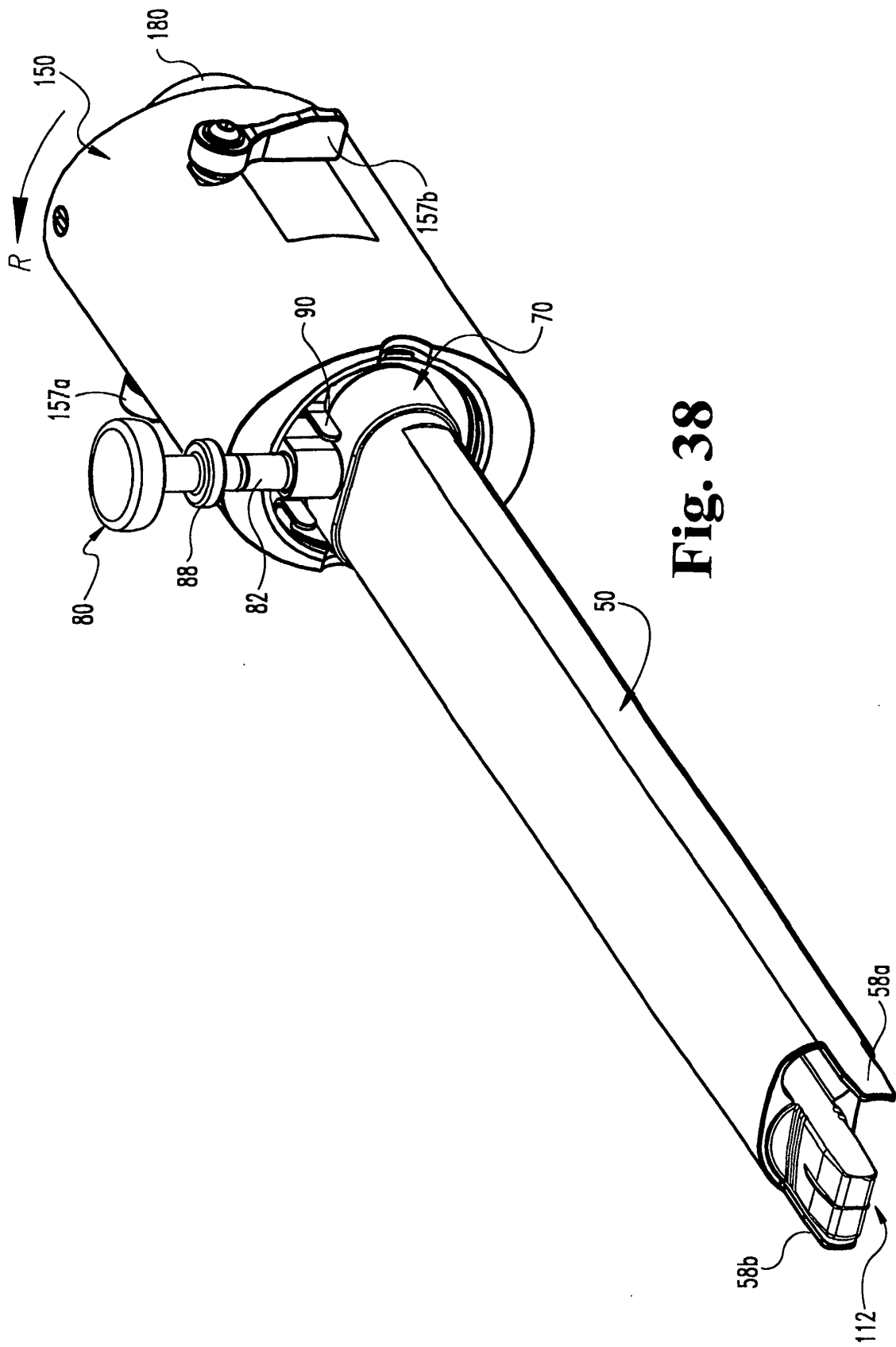
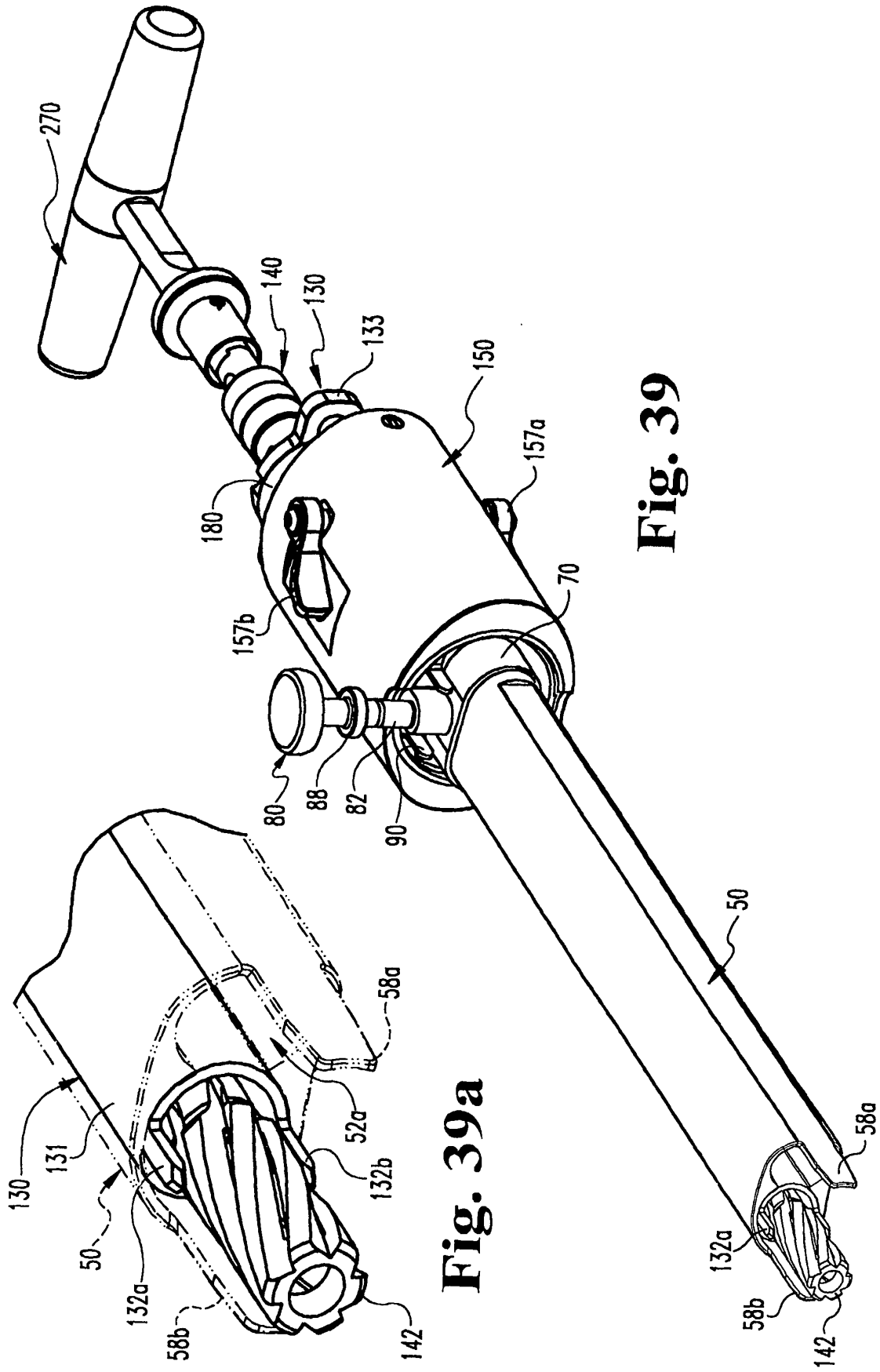
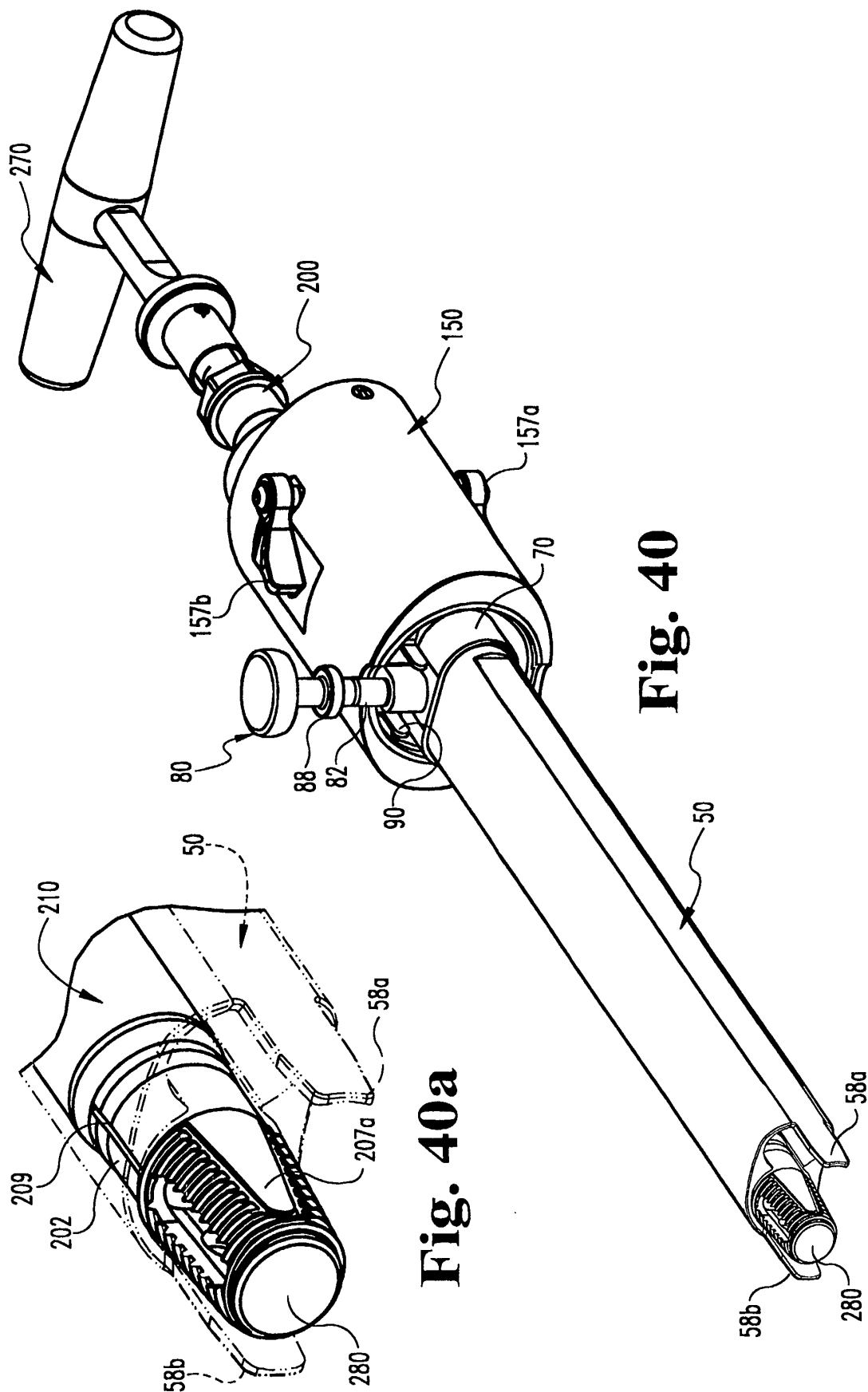


Fig. 38





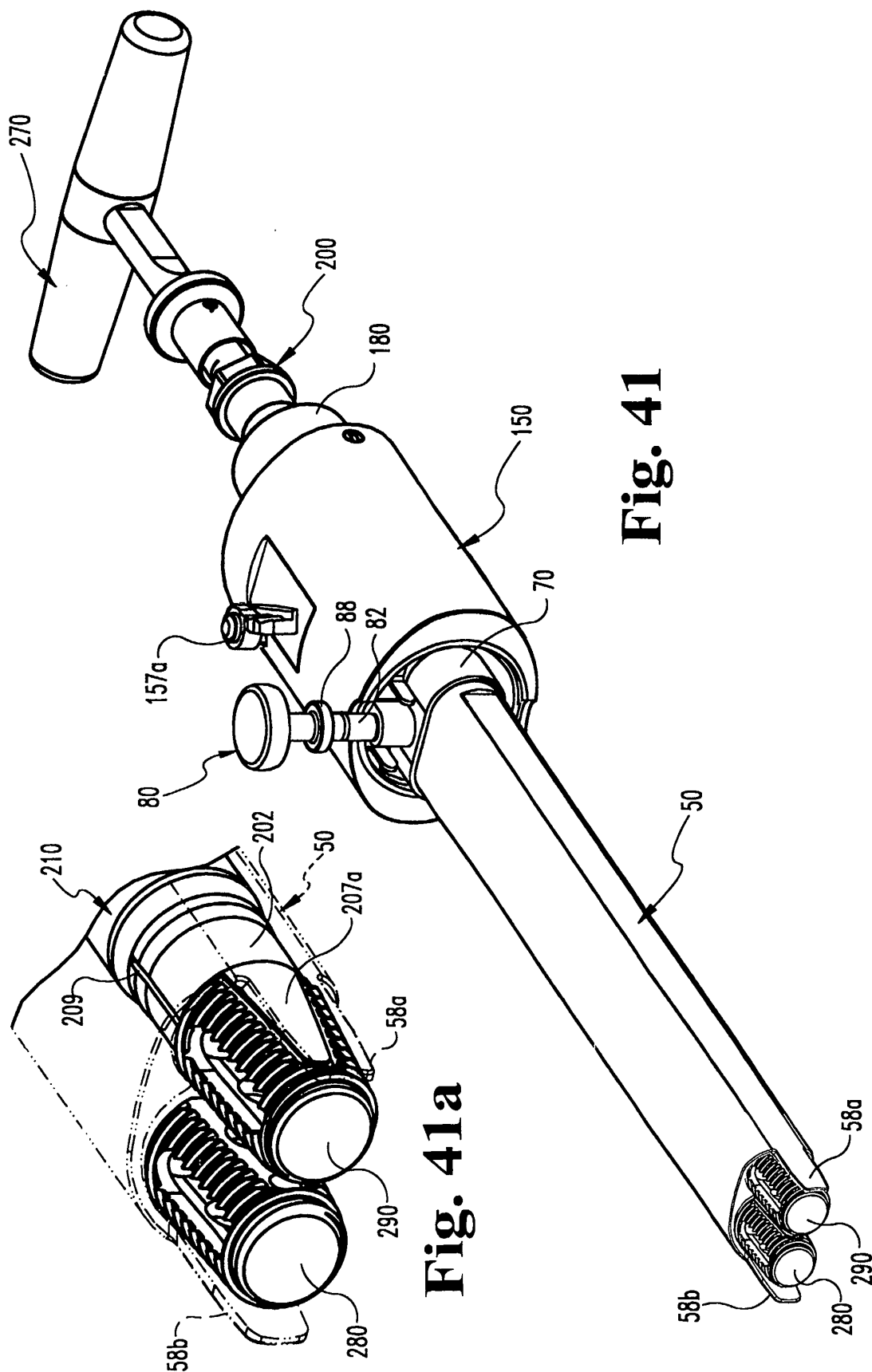


Fig. 41a

Fig. 41



专利名称(译)	腹腔镜脊柱手术器械		
公开(公告)号	<a href="#">EP1263334B1</a>	公开(公告)日	2005-10-12
申请号	EP2001914737	申请日	2001-03-07
[标]申请(专利权)人(译)	SDGI控股股份有限公司		
申请(专利权)人(译)	SDGI HOLDINGS , INC.		
当前申请(专利权)人(译)	SDGI HOLDINGS , INC.		
[标]发明人	ZDEBLICK THOMAS A MCGAHAN THOMAS V DERIDDER STEVEN D		
发明人	ZDEBLICK, THOMAS, A. MCGAHAN, THOMAS, V. DERIDDER, STEVEN, D.		
IPC分类号	A61B17/56 A61B17/02 A61B17/16 A61B17/17 A61B17/34		
CPC分类号	A61B17/1757 A61B17/3462 A61B2017/0256 A61B2017/3445		
优先权	09/525972 2000-03-15 US		
其他公开文献	EP1263334A2		
外部链接	<a href="#">Espacenet</a>		

#### 摘要(译)

提供外科手术技术和器械，用于在椎间盘空间中进行外科手术。器械（45）包括套管（50），套管（50）具有远端（56）和相对的近端（54）以及在它们之间延伸的工作通道（52）。工作通道（52）包括第一部分（52a）和相邻的第二部分（52b），第二部分（52b）构造成接收穿过其中的手术器械。帽构件（150）在近端（54）处固定到套管（50）。盖构件（150）具有可密封的进入端口（154），其基本上与第一或第二部分（52a，52b）中的相应一个对齐。帽构件（150）可相对于套筒（50）移动，以使入口（154）与第一和第二部分（52a，52b）中的另一个基本对齐，同时工作通道（52）保持密封。还公开了在腹腔镜手术中使用各种手术器械的各种技术。

