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[Continued on next page]

(54) Title: TISSUE LIFTING

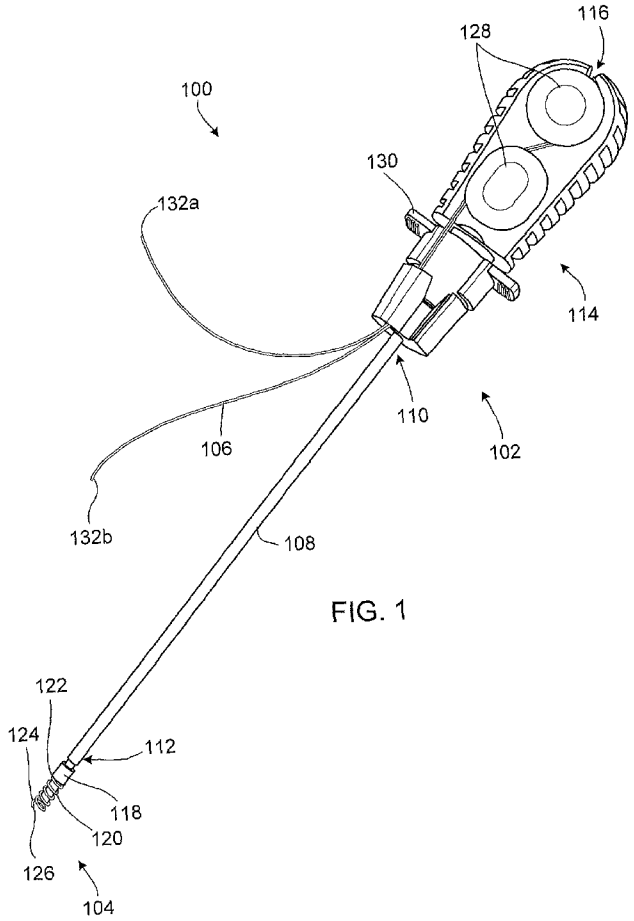

FIG. 1

(57) Abstract: A device (100) includes a shaft (108), a coil (120), and a suture (106). The coil has a sharp tip (126) and is releasably coupled to the shaft. The suture is coupled to the coil and extends through the shaft.

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Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

TISSUE LIFTING

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the full benefit of United States Provisional Application Serial Number 61/467,413, filed March 25, 2011, and titled "Device for Use In Hip Arthroscopy," the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] This application relates to surgical devices.

BACKGROUND

[0003] Generally, tissue distractors are used for expanding or separating tissues in order to create a space between the tissue to improve visualization and for increased working space during open surgery and minimally invasive surgery.

[0004] For example, during arthroscopic surgery, the joint areas of the body, such as the hip, knee, shoulder, and other joint areas, are approached via the use of an endoscope. Some joints are harder to access than others. For example, the hip joint differs from other joints in that a thick layer of soft tissue, known as the hip capsule, surrounds it. This thick layer makes changing the trajectory of instruments placed into the joint difficult and the importance of placing portals, or tissue passages, more critical than other joints.

[0005] During such surgeries, it is important to minimize the amount and size of incisions in order to reduce healing times. Conventional retractors are often bulky and awkward and require substantially large open incisions in a skin surface which may damage large amounts of healthy tissue.

[0006] Accordingly, there exists a need for a surgical device that may be modified to assist in cannula access to various treatment sites within a patient body for surgery.

SUMMARY

[0007] In a general aspect, a device includes a shaft, a coil, and a suture. The coil has a sharp tip and is releasably coupled to the shaft. The suture is coupled to the coil and extends through the shaft.

[0008] Implementations may include one or more of the following features. For example, the device may also include a handle coupled to the shaft which defines a passageway through the handle. The shaft may define a longitudinal passageway that cooperates with the passageway defined through the handle to receive the suture. The shaft may be rigid. The device may also include an interface that is releasably coupled to one of the coil and the shaft. The interface may define an opening that is receives a mating portion of the shaft. The interface and the shaft, when coupled, may permit the sharp tip of the coil to be driven into tissue upon rotation of the coupled interface and shaft. The interface may include an element for releasably securing the suture to the coil. The interface may be releasably coupled to the coil.

[0009] In another general aspect, a method of lifting tissue includes advancing a coil into the tissue, the coil having a suture attached thereto, and tensioning the suture to lift the tissue.

[0010] Implementations may include one of more of the following features. For example, tensioning the suture may include pulling on a proximal end of the suture with sufficient force to lift the tissue. Advancing the coil may include rotating a driver releasably coupled to the coil. The method may also include retracting the driver, leaving the coil in the tissue. The driver may be releasably coupled to the coil by engaging a distal end of the driver with a mating surface formed in an interface coupled to the coil. The tissue may comprise a hip capsule. The driver may have a rigid shaft.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a perspective view of a tissue lift assembly.

[0012] FIGS. 2-9 illustrate a method of using a tissue lift assembly.

[0013] FIG. 10 is a perspective view of a distal portion of a tissue lift assembly.

[0014] FIG. 11 is a side plan view of a distal portion of a tissue lift assembly.

[0015] It should be understood that the drawings are not necessarily to scale and that the disclosed implementations are sometimes illustrated diagrammatically and in partial views. In certain instances, details which are not necessary for an understanding of the disclosure or which render other details difficult to perceive may have been omitted. It should be understood, of course, that this disclosure is not limited to the particular implementations illustrated herein.

DETAILED DESCRIPTION

[0016] FIG. 1 shows a tissue lift assembly 100. The tissue lift assembly 100 includes a driver 102, an inserter 104, a coil 120, and a flexible member, such as a suture 106. The driver 102 includes a shaft 108 with a proximal end 110 and a distal end 112. A handle 114 is coupled to the proximal end 110 of the shaft, and the distal end 112 of the shaft 108 includes a mating portion 402 (FIG. 4). The shaft 108 may define a channel or lumen 602 (FIG. 6) extending from the proximal end 110 and the distal end 112. The handle 114 may include suture retention features such as protuberances 128 and switch 130. The switch 130 may be spring loaded. The handle 114 defines a longitudinal passageway 116 extending through the handle 114 that may align with the channel or lumen 602 of the shaft 108 when, for example, the shaft 108 is coupled to the handle 114.

[0017] The inserter 104 includes an interface portion 118 that may be releasably coupled to the coil 120 and that defines an opening or recess 404 (FIG. 4). The opening 404 in the interface portion 118 is shaped and configured to receive the corresponding mating portion 402 of the shaft 108.

[0018] The coil 120 is coupled to the interface portion 118 at its proximal end 122. The distal end 124 of the coil 120 forms a sharp tip 126. A distal end portion (not shown) of the suture 106 is releasably or permanently coupled to the coil 120 or interface portion 118 and extends through the lumen 602 (FIG. 6) of the shaft 108 and through the passageway 116 of the handle 114.

Proximal end portions 132a and 132b of the suture 106 extend from the passage way 116 of the handle 114 and may be engaged with the suture retention features 128 and 130. In particular, the end portions 132a and 132b may be threaded through and around retention features 128 on a side of the handle 114 and through a retention notch (not shown) formed in the switch 130.

[0019] To assemble the tissue lift assembly 100, the inserter 104 is brought into contact with the distal end 112 of the shaft 108 by tensioning the suture 106. Tension may be maintained on the suture 106 with the use of suture retention features 128 and 130 or manually.

[0020] Referring to FIGS. 2-9, in use, access portals (not shown) are created in, for example, tissue surrounding the hip. These portals allow surgeons to access the desired surgery location with minimal damage to surrounding tissue. Often it is necessary to lift tissue away from a bone, joint, or wound in order to access the desired surgery location. FIGS. 2-9 illustrate the use of the tissue lift assembly 100 to lift a hip capsule 202 away from the hip joint. The tissue lift assembly 100 is assembled as shown in FIG. 1 by bringing the inserter 104 into contact with the distal end 112 of the shaft 108 by pulling on the end portions 132a and 132b of suture 106. In the implementation shown, the coil 120 and the interface 118, which are releasably coupled to the distal end 112 of the shaft 108, are then inserted through a portal (not shown) in the patient's skin and other tissue. The driver 102 is used to bring the sharp tip 126 of the coil 120 into contact with tissue, such as the hip capsule 202. The shaft 108 is then rotated in a counterclockwise direction as indicated by arrow A (FIG. 3), by rotating the handle 114. This rotation causes the sharp tip 126 to pierce the tissue 202 and drives the coil 120 into tissue 202. Referring to FIG. 4, once the coil 120 is inserted in the tissue 202 at the desired depth, the mating portion 402 of the shaft 108 may be released from the opening 404 of the interface 118 by, for example, releasing the suture 106 from the suture retention features 128 and 130 (FIG. 1) and pulling the driver 102 away from the inserter 104. The shaft 108 can then be removed completely from the portal (not shown) leaving the coil 120, the interface 118, and a portion of the suture 106 within the surgical site. Removing the shaft 108 from the portal conserves space in the portal by leaving only the thin suture 106, allowing for insertion of another device through the same portal while the inserter 104 is being used. To lift the tissue 202, tension is applied to the suture 106 as

illustrated by arrow B (FIG. 5), with sufficient force to lift the tissue to a desired distance from the bone, joint, or wound area.

[0021] To remove the coil 120 from the tissue 202, while holding the end portions of the suture 106, the shaft 108 of the driver 102 is slid proximally along the suture 106until the mating tip 402 on the distal end 112 of the shaft 108 contacts with the opening 404 of the interface 118 (FIG. 8). The surgeon may then engage the suture 106 with the suture retention features 128 and 130 to maintain the contact between the shaft 108 and the coil 120, and more specifically, the interface 118 with the mating tip 402 of the shaft 108. The shaft 108 may then be rotated in a clockwise direction as indicated by arrow C (FIG. 8), by rotating the handle 114 in a clockwise direction. This rotation causes the coil 120 to be drawn from the tissue 202. Once the sharp tip 126 of the coil 120 is free of the tissue 202, the entire tissue lift assembly 100 may be removed from the portal (not shown).

[0022] FIGS. 10 and 11 show an exploded view of the distal end of the tissue lift assembly 100. The distal end 112 of the shaft 108 includes a mating portion 402 that is shaped as a square driver. The interface 118 may be coupled to the coil 120 and defines an opening 404, which is shaped to receive the mating portion 402 of the shaft. A suture 106 extends from the shaft 108 and into interface 118. Interface 118 includes slots or other retention features 1002 to releasably couple the suture 106 to the interface 118 and the coil 120.

[0023] While only certain implementations have been set forth, alternatives and modifications will be apparent from the above description to those skilled in the art. For example, the suture 106 may be coupled to the interface 118 or may be releasably and directly coupled to the coil 120. In addition, the present implementations also are not limited to sutures, but may include other flexible members. The shaft 108 may be rigid or flexible.

[0024] In addition, the coil 120 is not limited to the spring-like coil illustrated, but may include other types of coils such as threads around a tapered cylinder, spiral cannulas, etc. The cross section of the coil 120 may be triangular, polygonal, or any other shape. Likewise, the coil 120 may be designed to be inserted by rotating clockwise and removed by rotating

counterclockwise or by moving the coil in a different manner, such as in a substantially linear motion.

[0025] The coil 120 and the interface 118 may be releasably or directly coupled. The mating portion 402 and the opening 404 to receive the mating portion 402 may be shaped differently. Likewise, the interface 118 may include a mating portion while the shaft 108 includes an opening to receive the mating portion.

[0026] These and other alternatives are considered equivalents and within the spirit and scope of this disclosure and the appended claims.

CLAIMS:

1. A device, comprising:

a shaft;

a coil having a sharp tip and being releasably coupled to the shaft; and

a suture coupled to the coil and extending through the shaft.

2. The device of claim 1, further comprising:

a handle coupled to the shaft and defining a passageway through the handle.

3. The device of claim 2, wherein the shaft defines a longitudinal passageway therethrough that cooperates with the passageway defined through the handle to receive the suture therethrough.

4. The device of claim 1, wherein the shaft is rigid.

5. The device of claim 1, further comprising:

an interface releasably coupled to one of the coil and the shaft.

6. The device of claim 5, wherein the interface defines an opening that is configured to receive a mating portion of the shaft.

7. The device of claim 6, wherein the interface and the shaft, when coupled, permit the sharp tip of the coil to be driven into tissue upon rotation of the coupled interface and shaft.

8. The device of claim 5, wherein the interface comprises an element for releasably securing the suture to the coil.

9. The device of claim 5, wherein the interface is releasably coupled to the coil.

10. A method of lifting tissue, comprising:

advancing a coil into the tissue, the coil having a suture attached thereto; and

tensioning the suture to lift the tissue.

11. The method of claim 10, wherein tensioning the suture comprises pulling on a proximal end of the suture with sufficient force to lift the tissue.

12. The method of claim 10, wherein advancing the coil comprises rotating a driver releasably coupled to the coil.

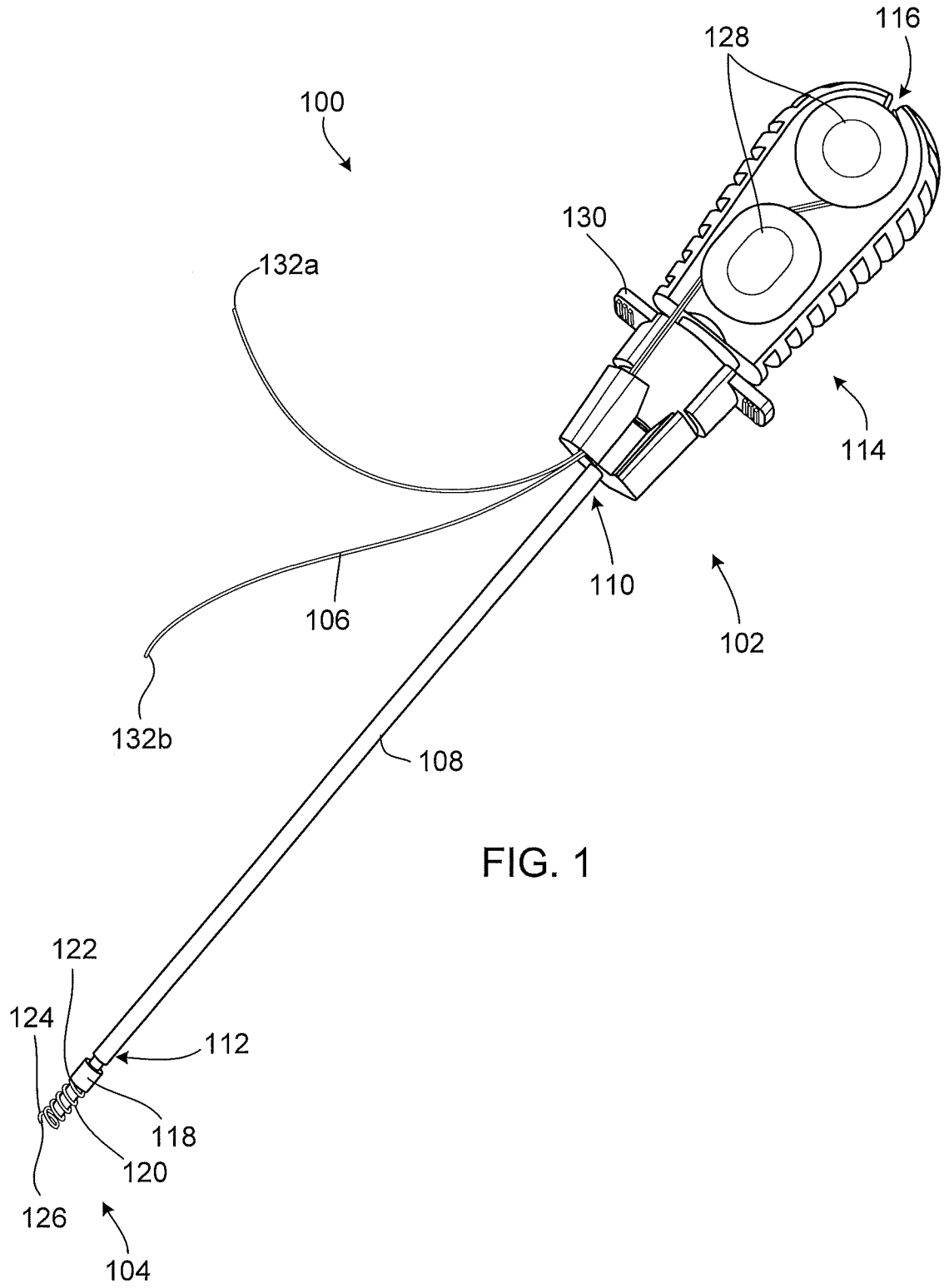
13. The method of claim 12, further comprising:

retracting the driver leaving the coil in the tissue.

14. The method of claim 12, wherein the driver is releasably coupled to the coil by engaging a distal end of the driver with a mating surface formed in an interface coupled to the coil.

15. The method of claim 10, wherein the tissue comprises a hip capsule.

16. The method of claim 10, wherein the driver has a rigid shaft.


116
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132a
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132b
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FIG. 1

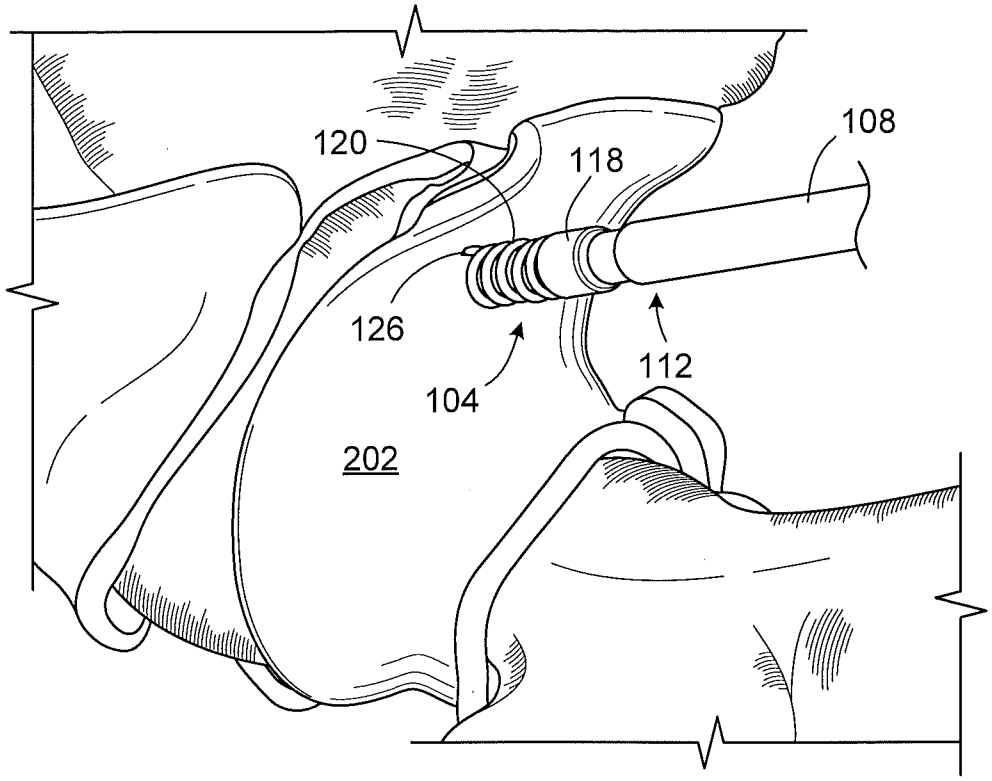

FIG. 2

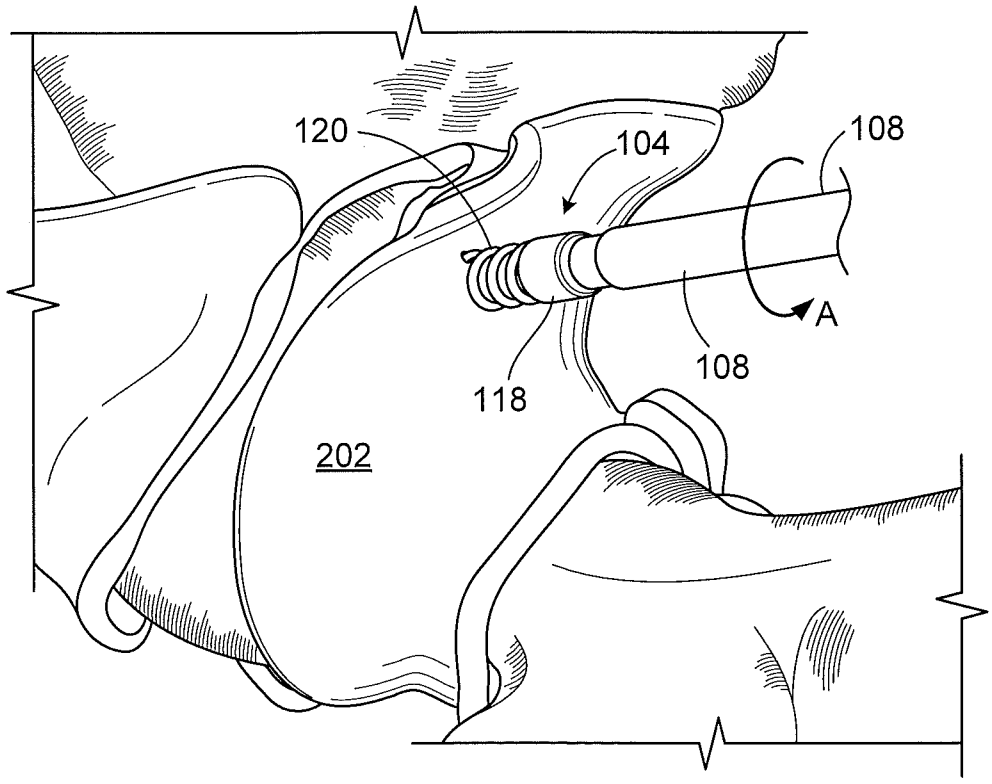

FIG. 3

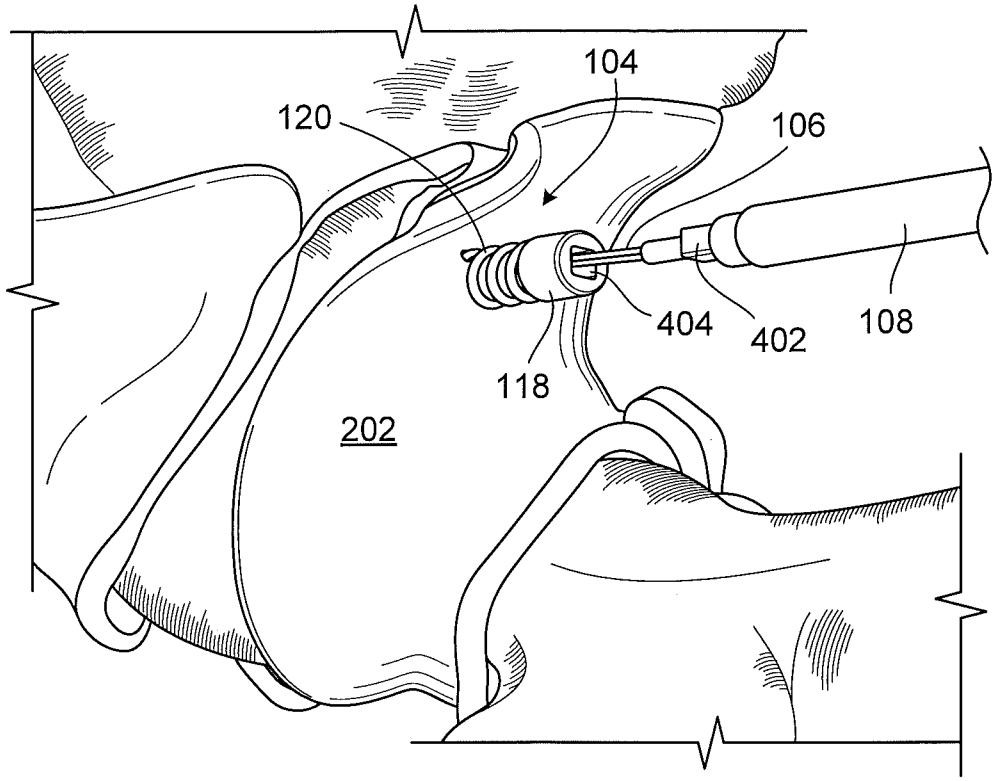

FIG. 4

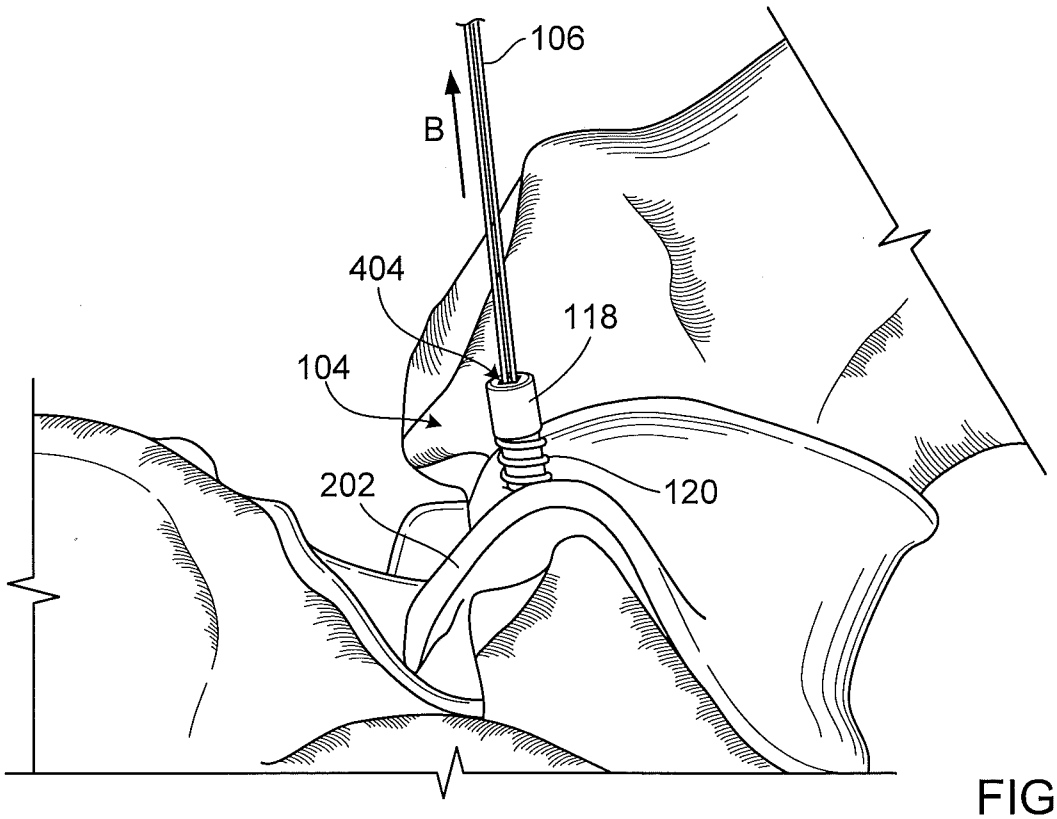

FIG. 5

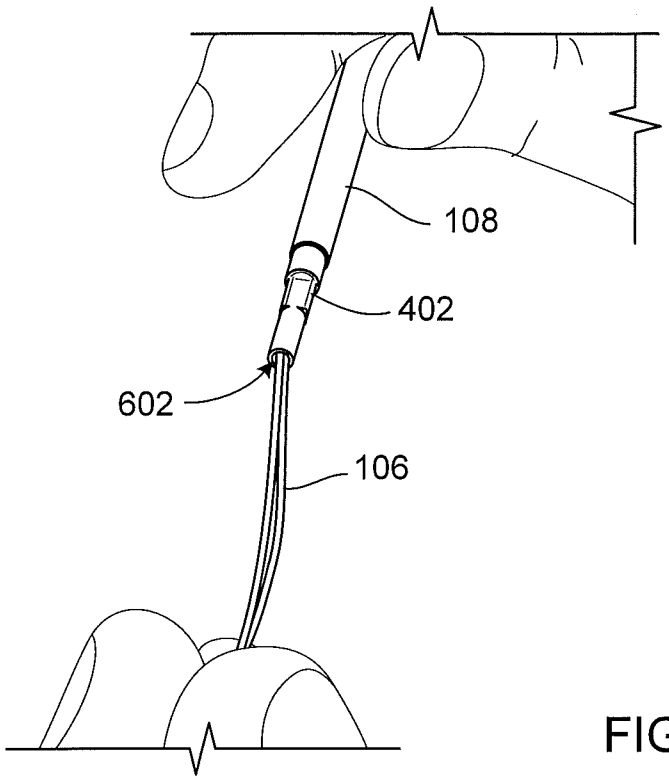

FIG. 6

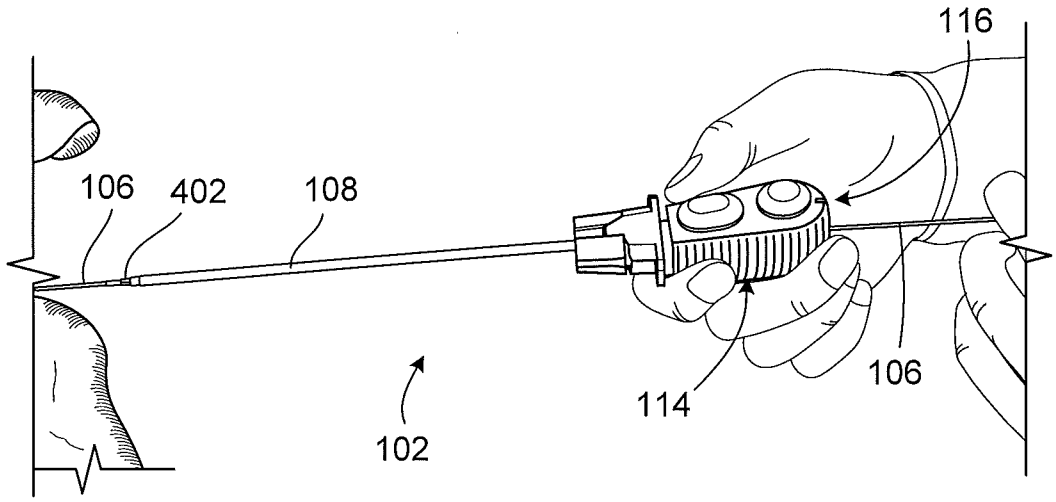

FIG. 7

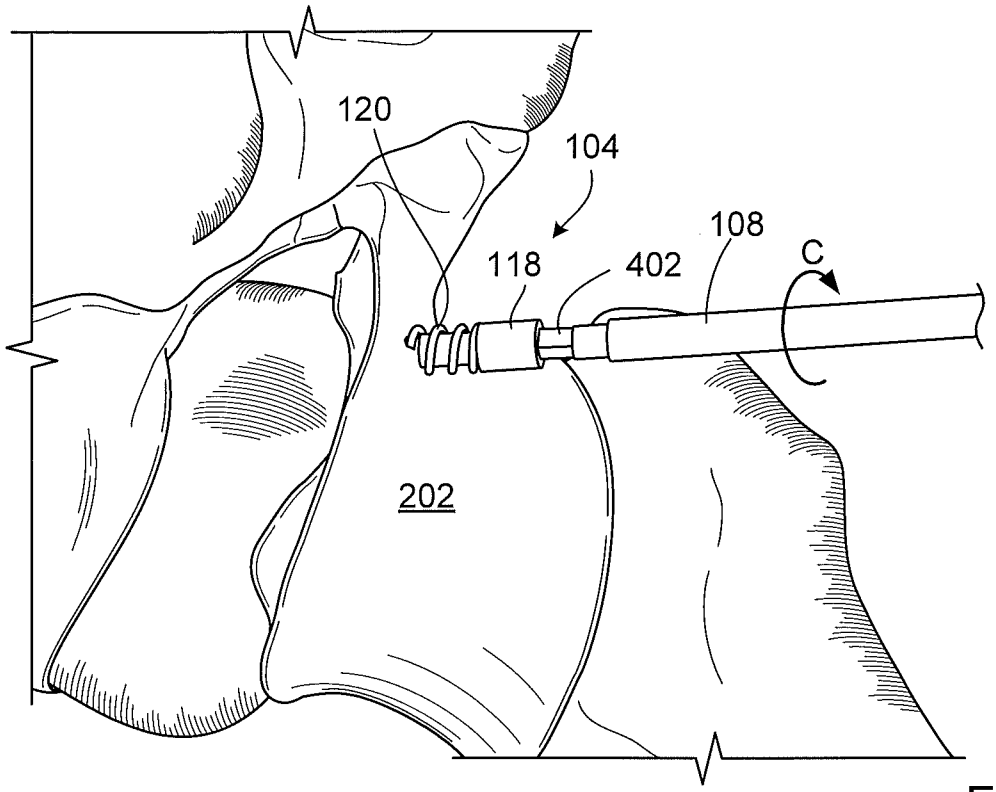

FIG. 8

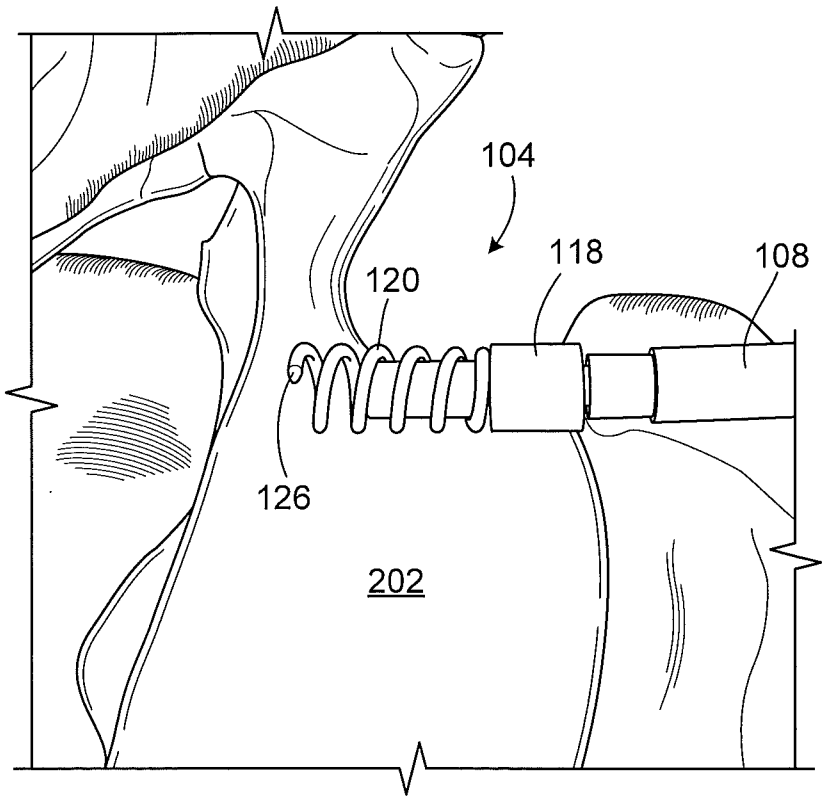

FIG. 9

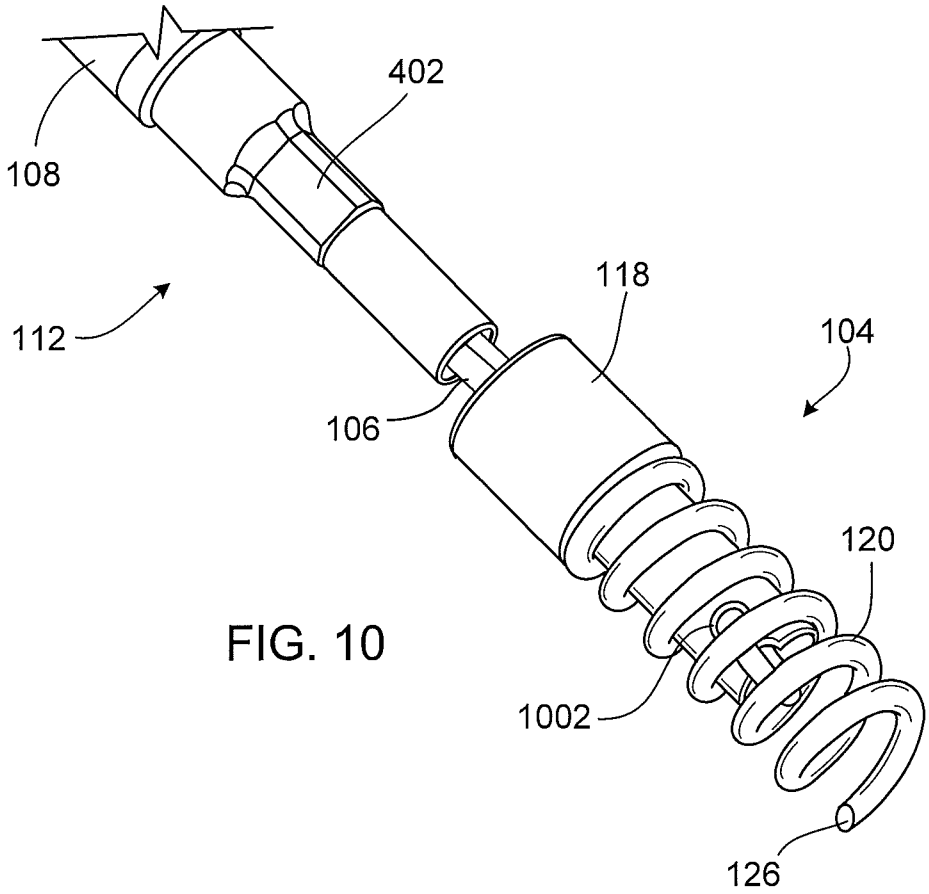
108
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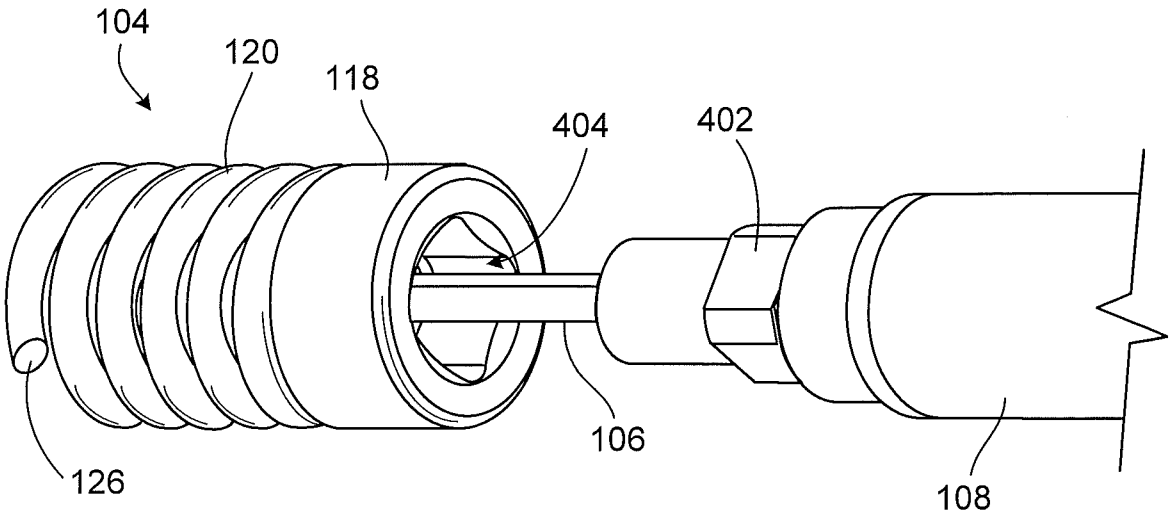
FIG. 10


104
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402
126
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108

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/030399

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 626 613 A (SCHMIEDING REINHOLD [US]) 6 May 1997 (1997-05-06) the whole document	1-8
X	US 2010/161042 A1 (MAISANO FRANCESCO [IT] ET AL) 24 June 2010 (2010-06-24) paragraph [0177] - paragraph [0185]; figures 1-3,11E	1-9
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-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 July 2012	07/08/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Strazdauskas, Gedas

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/030399

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/118151 A1 (DAVIDSON MICHAEL J [US]) 24 May 2007 (2007-05-24) paragraph [0116] - paragraph [0117]; figures 25-27 paragraph [0092] - paragraph [0097]; figures 11-14	1-9
X	EP 1 759 663 A2 (ST JUDE MEDICAL [US]) 7 March 2007 (2007-03-07) paragraphs [0044] - [0046]; figure 2 paragraph [0066] - paragraph [0069]; figures 13-16	1-9
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1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/030399

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos.: 10-16
because they relate to subject matter not required to be searched by this Authority, namely:

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery;Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy.

2. [ ] Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

[ ] The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2012/030399

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