



- (51) International Patent Classification:
A61B 17/3207 (2006.01)
- (21) International Application Number:
PCT/US2014/049852
- (22) International Filing Date:
6 August 2014 (06.08.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/863,338 7 August 2013 (07.08.2013) US
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

(54) Title: MENISCAL PROBE CUTTER

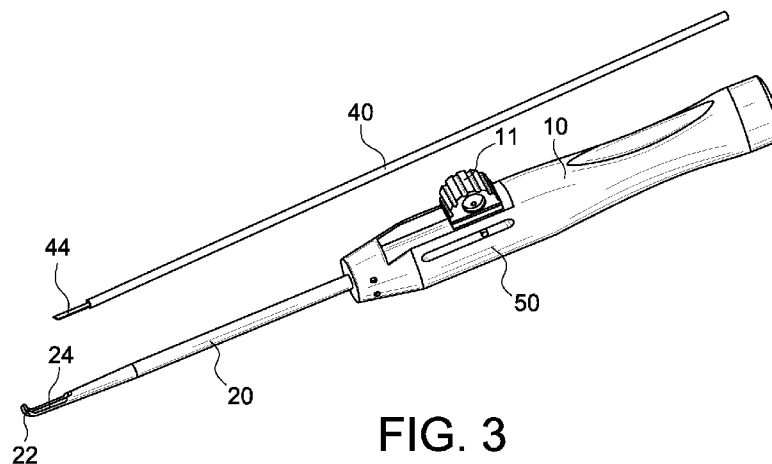


FIG. 3

(57) Abstract: An instrument that provides a minimally invasive way to probe, locate, and cut a meniscus during a meniscectomy procedure. The instrument is a single hybrid probe/cutter instrument provided with both probing and cutting means that allow probing and cutting of the meniscus with the same hybrid instrument. The instrument can be used in a minimally invasive technique for probing and cutting (resecting) a torn area of a meniscus. The technique provides a consistently good-quality meniscus with improved cosmetic results, and is simple and easily reproducible, strong, and time-saving for meniscal repairs.

MENISCAL PROBE CUTTER

FIELD OF THE INVENTION

[0001] The present invention relates to the field of surgery and, more particularly, to instruments for probing and cutting tissue such as meniscal tissue.

BACKGROUND OF THE INVENTION

[0002] A meniscectomy procedure is typically performed to remove torn segments of a meniscus or to release a meniscus. During the procedure, a miniature camera is inserted through a small incision to allow the orthopedic surgeon to insert surgical instruments such as probes and cutters through other small incisions to probe around the meniscal area, locate any tear, and trim or repair the tear.

[0003] There is a need for instruments for probing and locating a meniscus tear, and cutting a tear of the meniscus at the desired location, with minimal error and by simplified methods and instruments. An instrument designed to both probe and cut a meniscus is also needed, particularly an instrument that can be used in a minimally invasive technique for probing/locating/cutting a meniscus that is safe, provides a consistently good-quality meniscal cut with high cosmetic results, and is simple and easily reproducible. Instruments for delivering a “protected” cutting edge to a precise location (and then using a single device to probe a joint and deliver a precise cut without damaging/cutting the surrounding articular surfaces and structures) are also needed.

SUMMARY OF THE INVENTION

[0004] The present invention provides instruments that allow for a minimally invasive way to probe, locate, and cut a meniscus during a meniscectomy procedure. The instrument of the present invention is a hybrid probe/cutter instrument provided with both probing and cutting means that allow probing and cutting of the meniscus with the same hybrid instrument.

[0005] The instrument of the present invention can be used in a technique for probing and cutting (resecting) a torn area of a meniscus which provides consistently good-quality meniscus with improved cosmetic results, and is simple and easily reproducible, strong, and time-saving for meniscal repairs.

[0006] These and other features and advantages will become apparent from the following description that is provided in connection with the accompanying drawings and illustrated embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIGS. 1-4 illustrate various schematic views of a hybrid meniscal probe cutter according to an exemplary embodiment of the present invention.

[0008] FIG. 5 illustrates a perspective view of a hybrid meniscal probe cutter according to another exemplary embodiment of the present invention.

[0009] FIG. 6 illustrates the hybrid meniscal probe cutter of FIG. 1 used on a meniscal repair according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] The present invention provides surgical systems for meniscal repairs. A hybrid combined probe/cutter instrument is provided with dual means for probing and cutting a torn meniscus. The instrument is a cannulated (fully or partially) meniscal probe or meniscal trimmer that has a cutting device/blade placed through the cannulation to cut tissue. The hybrid instrument allows a surgeon to probe tissue and insert the blade once the desired location has been determined, and then cut/trim the tissue without removing the probe.

[0011] The present invention also provides devices that allow for delivering a “protected” cutting edge to a precise location. A single device can then be used to probe a joint and deliver a precise cut without damaging/cutting surrounding articulating surfaces and structures.

[0012] As detailed below, the invention provides a single device used to hook the meniscus and cut a tear or the meniscus at desired location. The device is in the form of a cannulated meniscal probe that can have a cutting device placed through the cannulation to cut tissue. The device allows a surgeon to probe tissue and insert blade once the surgeon has found the desired location and cut the tissue without removing the probe. In an exemplary embodiment, the device comprises a handle and an outer probe tip shaft. The handle and the shaft are preferably reusable. The inner blade is preferably “single use” and is configured to snap into the handle and slide along the track in the handle. The device tip may be an exemplary cannulated 2.5mm probe tip with a blade that slides into a slot formed (machined) into the probe tip. The assembled device in its original configuration has the cutting blade not exposed.

[0013] Referring now to the drawings, where like elements are designated by like reference numerals, FIGS. 1-4 illustrate an exemplary instrument 100 of the present invention. Instrument 100 is a hybrid probe/cutter provided with a probe 50 comprising a handle 10 (for example, a grip handle 10 with an actuating mechanism 11) that is fully or partially cannulated and an outer tube or shaft 20 connected to the handle. Outer tube or shaft 20 is also fully or partially cannulated and is provided with distal end 22 having probing means 22 (for example, probing tip 22) to allow probing and/or hooking of tissue to be examined and repaired.

[0014] In an exemplary embodiment, the outer tube or shaft 20 of probe 50 houses an inner cutting instrument 40 which may be in the form of a cutting blade, for example, an inner cutting blade. As detailed below, the probing tip 22 of probe 50 probes and hooks the tissue so that, upon actuation and advancement, the inner cutting blade 40 then cuts/trims/scopes the tissue to remove any torn area of the tissue. Blade 40 may be a single-use, disposable blade for a single-use insertion and single-use with probe 50. The probe 50 (the handle and outer probe tip shaft) may be reusable.

[0015] FIG. 1 illustrates instrument 100 with inner cutting blade 40 assembled with the probe 50, i.e., passing through cannulated outer tube 20 and handle 10

of probe 50. FIG. 2 shows only the probe 50 without the cutting blade 40. FIG. 3 depicts an exploded view of instrument 100 with the probe 50 and cutting blade 40 in the unassembled state. FIG. 4 shows an enlarged view of the distal end of the hybrid instrument 100, showing most distal end 44 of cutting instrument 40 extending through window 24 of probing means 22 of probe 50. Probing means 22 is an exemplary probe tip or probing tip 22 that is provided with a slot 25 (shown more clearly in FIG. 6) formed within the probe tip to allow cutting blade 40 to pass/slide therethrough.

[0016] FIG. 5 illustrates another embodiment of a hybrid (combined) probe/cutter instrument 100a of the present invention which is similar to instrument 100 of FIGS. 1-4 but differs in the configuration of actuating mechanism 11a to actuate the blade 40.

[0017] Cutting blade 40 may be assembled with (loaded or inserted into) the probe 50 by any known methods in the art. In an exemplary-only embodiment, the probe 50 is fully cannulated (i.e., both handle 10 and shaft 20 are fully cannulated) and the blade is inserted from a most proximal end of the handle all the way through the probing tip 22. Upon assembly, the blade 40 may be either in a retracted, non-cutting, non-exposed or first position (when probing of tissue is conducted with the probing tip 22) or in an actuating, cutting, exposed or second position (when cutting of the torn meniscus is conducted with the cutting blade). Manipulation of actuating mechanism 11 on handle 10 allows actuation of the blade 40 from the first position to the second position and vice-versa. Various sized blades can be attached to strip/cut different width and depth meniscal sizes and shape variations.

[0018] FIG. 6 illustrates an exemplary torn knee meniscus 90 that is repaired with exemplary hybrid (combined) probe/cutter instrument 100 of the present invention. Once inserted into the knee joint, the probe 50 probes around the meniscal area and locates the torn meniscus, also hooking onto the torn meniscal parts. Blade 40 is then actuated (from a retracted, non-cutting or first position to an actuating, cutting or second position) to allow cutting off (snipping) any of the torn meniscal part of meniscus 90. During the probing

operation, the blade is kept recessed (retracted or non-exposed in the first position) and then advanced to the second position to cut tissue. In this manner, the single device/instrument of the present invention is used to probe and hook the meniscus and then cut the tear in the meniscus at the desired location.

[0019] The probe 50 and blade 40 may be interchangeable with each other, may be removable, may be sterilizable (autoclavable), and may be provided as single-use only devices (disposable) or as multiple-use devices. In particular applications, the blade 40 and probe 50 may be designed so that one may be snapped onto the other while the other may be snapped out of the other (or vice-versa). The blade 40 may be also designed so that it can be removed from the probe 50.

[0020] The handle and the shaft are preferably reusable. The inner blade is preferably “single use” and is configured to snap into the handle and slide along the track in the handle. The device tip may be an exemplary cannulated 2.5mm probe tip with a blade that slides into a slot formed (machined) into the probe tip. The assembled device in its original configuration has the cutting blade not exposed.

[0021] The present invention also provides a method of soft tissue repair with instrument 100, 100a of FIGS. 1-5. According to an exemplary only embodiment, a method of sizing and cutting a torn meniscus to desired dimensions (i.e., width and length) comprises the steps of: (i) providing a hybrid (combined) probe/cutter instrument 100, 100a; and (ii) employing the hybrid (combined) probe/cutter instrument 100, 100a to both probe and cut/resect a torn meniscus.

[0022] The instrument of the present invention 100, 100a can be used in minimally invasive techniques for probing and cutting (resecting) a meniscus. The techniques provide a consistently good-quality graft with improved cosmetic results, and are simple and easily reproducible while saving time for meniscal repairs. The instruments 100, 100a of the present invention deliver a “protected” cutting edge to a precise location. In this manner, a single device

can be used to probe a joint and deliver a precise cut without damaging/cutting surrounding articulating surfaces and structures.

[0023] The instrument 100, 100a may be employed for various tissue repairs, for example, in veterinary applications to cut and release the meniscus, and/or in hip applications in humans to hook any torn pieces of cartilage (labral or acetabular tear) around the acetabulum in the hip socket and then snip them off (cut around the margins) to address hip conditions that cause pain, stiffness, and other disabling symptoms of the hip joint. The instrument 100, 100a may be also employed in any other ligament/tendon/graft reconstructions known in the art, for example, ACL reconstructions among many others.

[0024] While the present embodiments are described herein with reference to illustrative figures for particular applications, it should be understood that the embodiments are not limited thereto. Those having ordinary skill in the art and access to the teachings provided herein, will recognize additional modifications, applications, embodiments and substitution of equivalents all falling within the scope of the presented embodiments.

CLAIMS

1. A hybrid probe/cutter instrument for meniscal probing and cutting, comprising:
 - a handle;
 - an outer tube attached to the handle, the outer tube having a proximal end and a distal end;
 - a probe tip provided at a most distal end of the outer tube;
 - a cutting device extending through the outer tube and being housed within the outer tube, the cutting device being configured to move from a first position to a second position relative to the probe tip; and
 - an actuator mechanism for actuating the cutting device from the first position to the second position.
2. The hybrid probe/cutter instrument of claim 1, wherein the actuator mechanism is provided on or within the handle.
3. The hybrid probe/cutter instrument of claim 1, wherein the cutting device is a cutting blade that snaps onto the handle and slides within a track formed within the handle.
4. The hybrid probe/cutter instrument of claim 3, wherein the cutting blade is interchangeable and disposable.
5. The hybrid probe/cutter instrument of claim 3, wherein the cutting blade is sterilizable.
6. The hybrid probe/cutter instrument of claim 3, wherein the probe tip is provided with a machined slot that allows the cutting blade to slide into it.

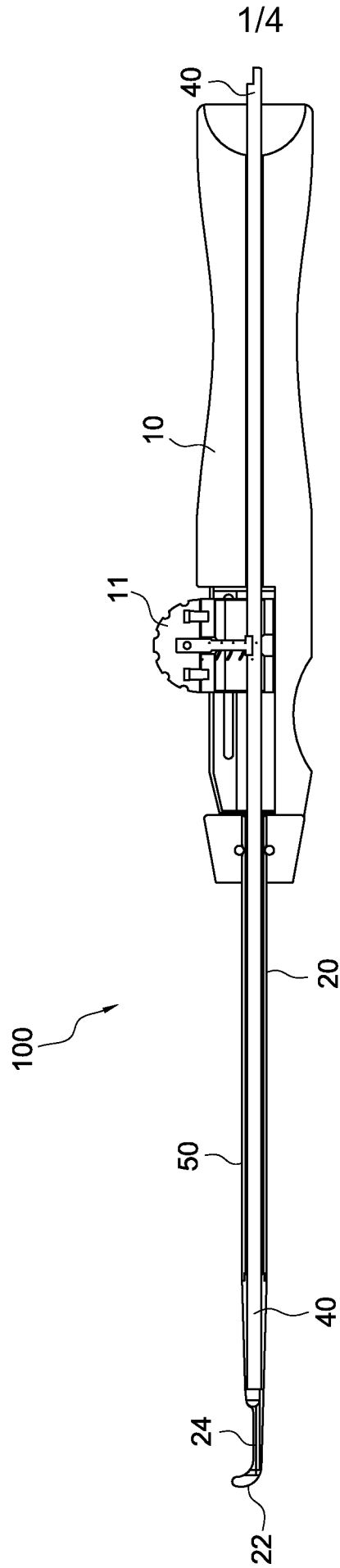


FIG. 1

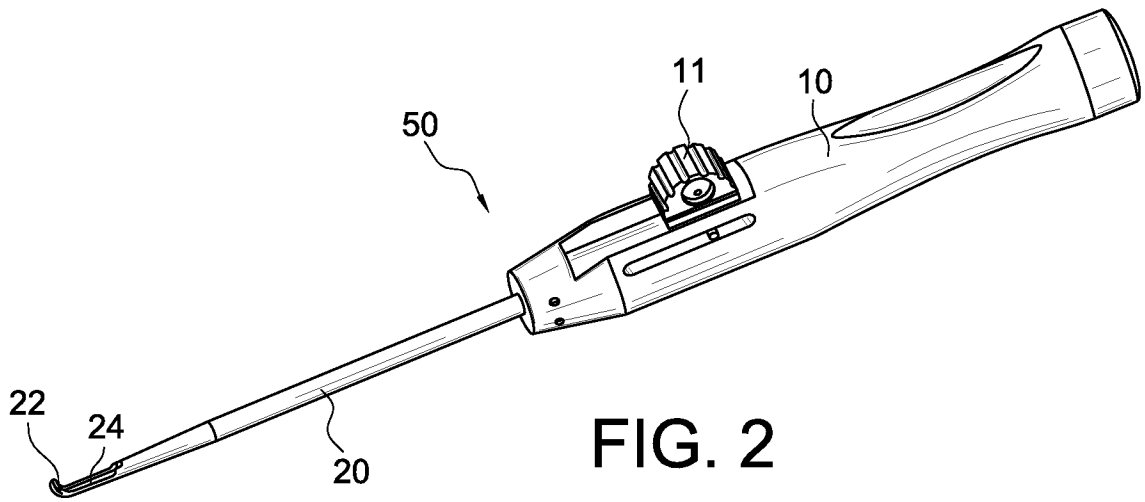


FIG. 2

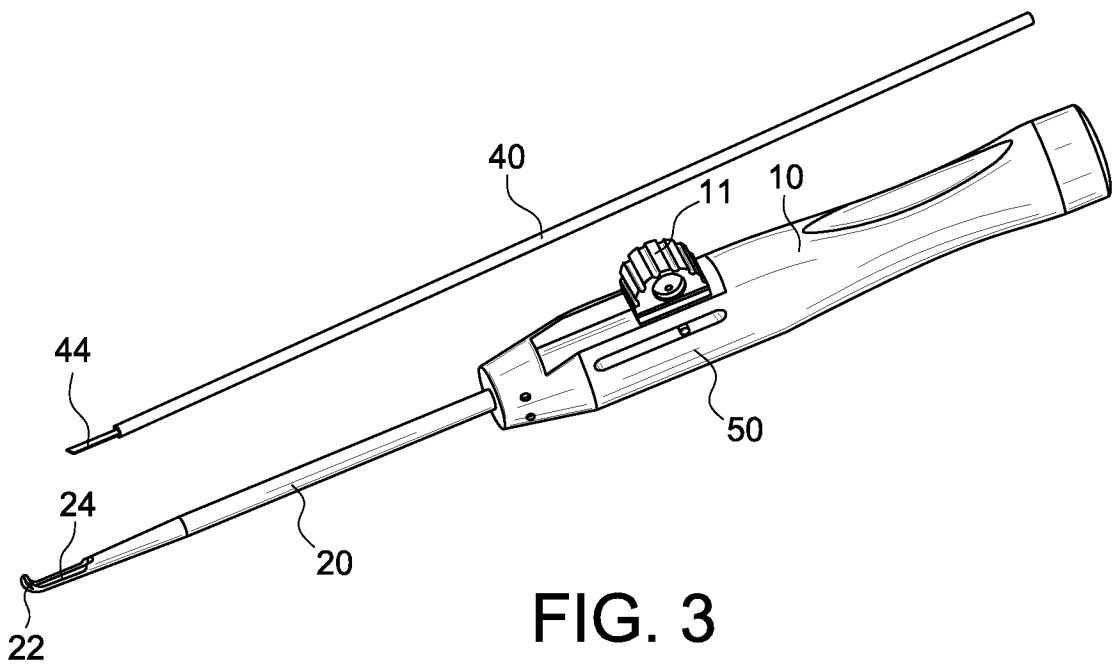
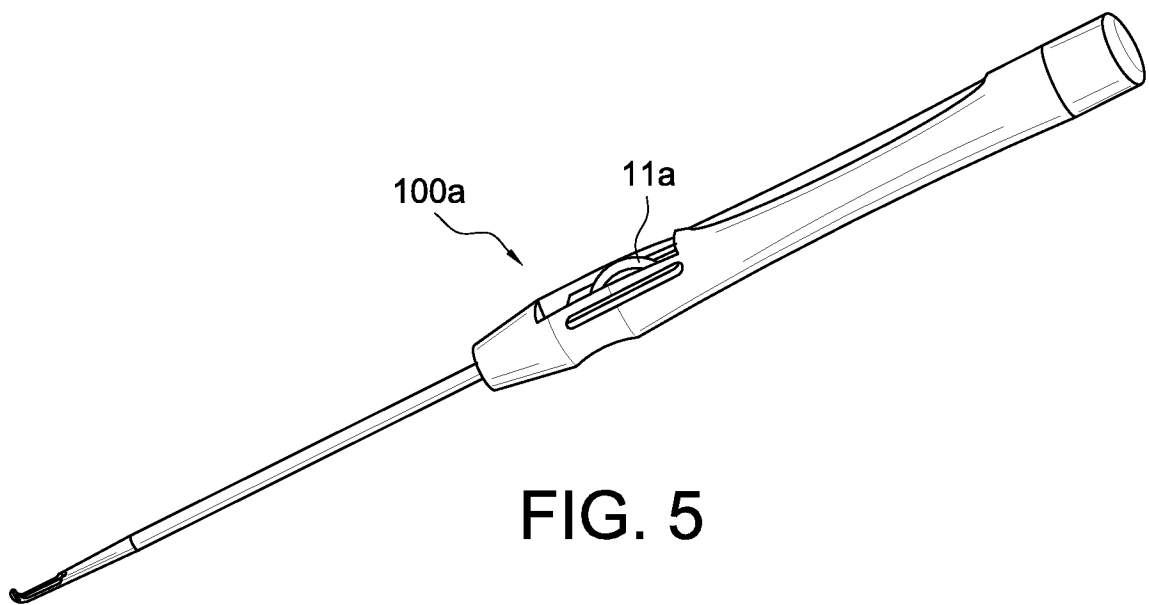
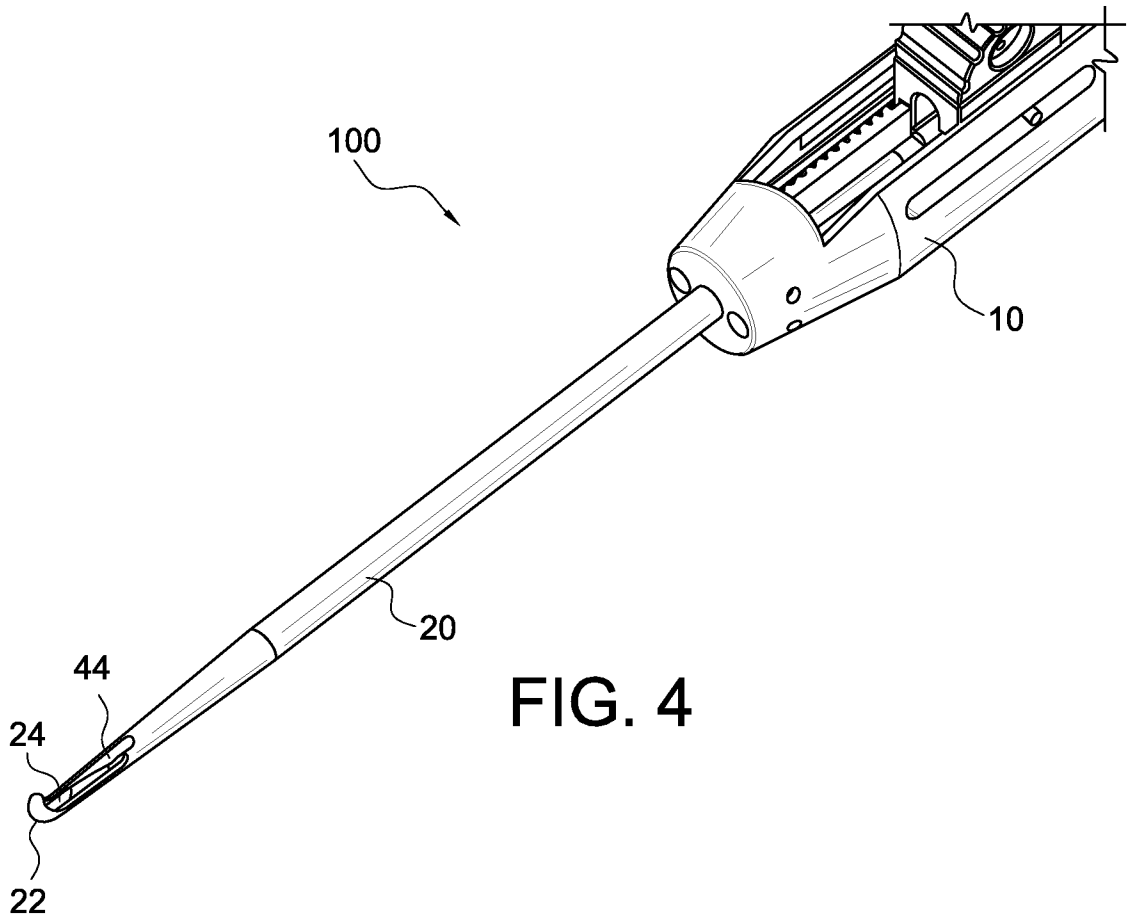


FIG. 3



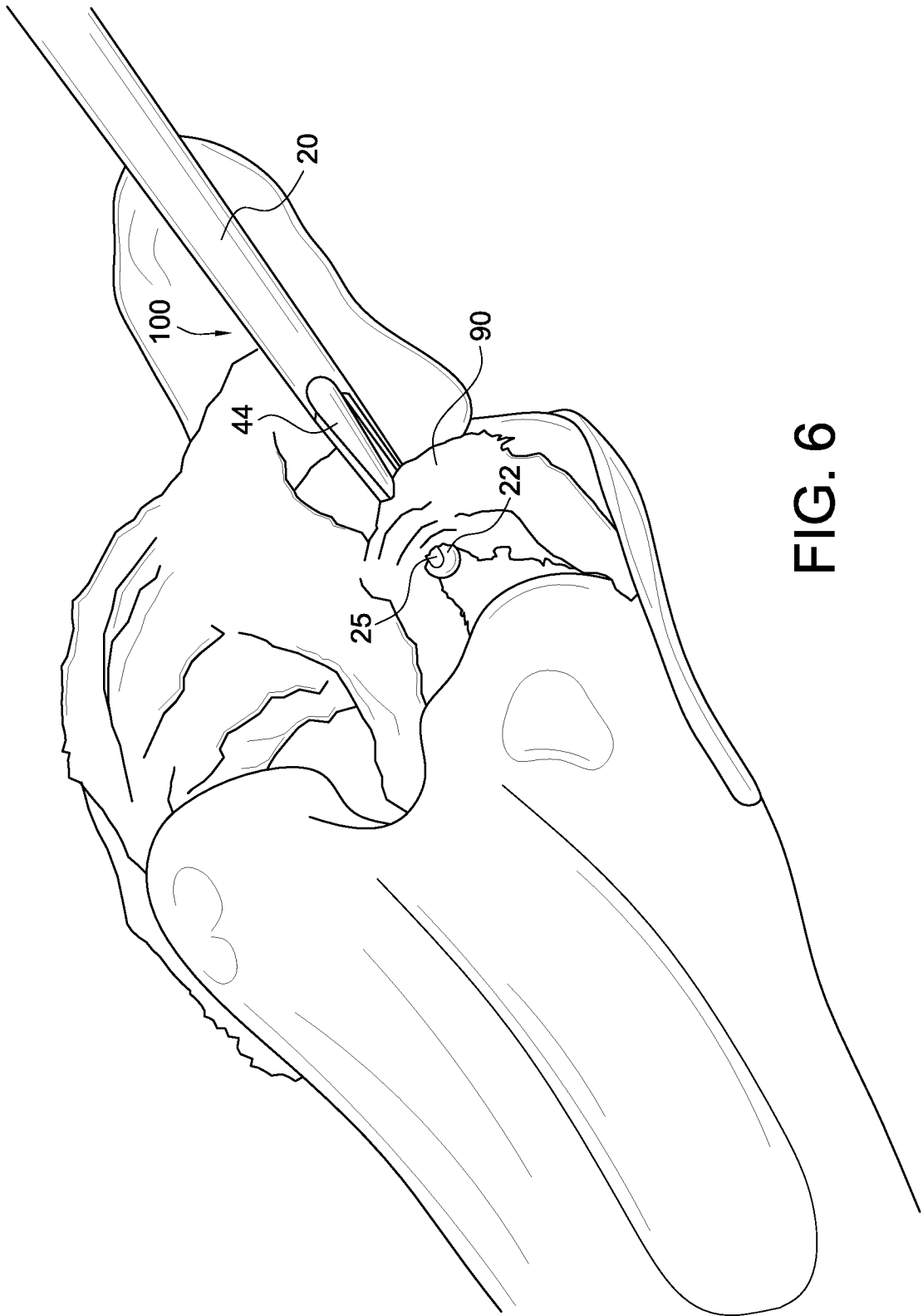


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/049852

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/3207
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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/288043 A1 (REHNKE ROBERT D [US]) 13 December 2007 (2007-12-13)	1,2,4,6
Y	paragraphs [0014], [0075], [0080]; figures 7,8	3,5
Y	----- WO 2012/089767 A1 (STAMPACCHIA MARCELLO [IT]; STAMPACCHIA STEFANO [IT]) 5 July 2012 (2012-07-05) page 7, line 14; claims 6,7; figure 1	5
Y	----- US 2007/255298 A1 (DJORDJEVIC ILIJA [US] ET AL) 1 November 2007 (2007-11-01) paragraph [0043]; figures 13,14	3
A	----- EP 1 110 520 A1 (H P BRAEM AG [CH]) 27 June 2001 (2001-06-27) paragraphs [0006] - [0009]; figures 1,2 ----- -/--	1-6

Further documents are listed in the continuation of Box C.

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
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- "O" document referring to an oral disclosure, use, exhibition or other means
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- "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
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Date of the actual completion of the international search

9 September 2014

Date of mailing of the international search report

19/09/2014

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/049852

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2013/079804 A1 (MILTON TREVOR JOHN [ZA] ET AL) 28 March 2013 (2013-03-28) paragraph [0056] -----	1-6

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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