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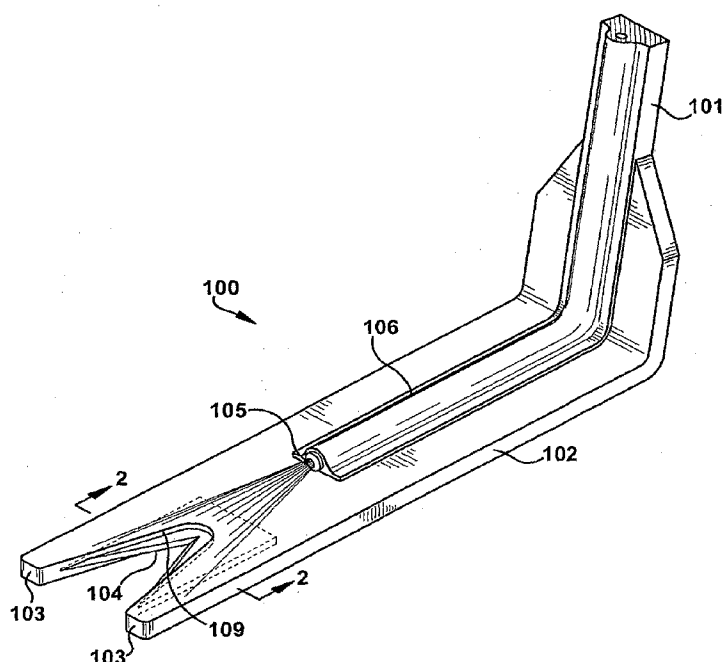
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(57) Abstract: An apparatus cuts tissue. The apparatus includes a shaft, a flat portion, and a blade. The shaft has a first end and a second end opposite the first end. The first end forms a handle for the apparatus. The flat portion is formed adjacent the second end of the shaft and angled relative to the shaft. The flat portion has a generally triangular indentation. The blade cuts the tissue. The blade is secured within the triangular indentation of the flat portion. The blade has a V-shaped cutout formed by inner sharpened portions for engaging the tissue.



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AN APPARATUS FOR CUTTING TISSUE

Related Application

This application claims priority from U.S. Provisional Patent Application Serial No. 60/835,349, filed on August 3, 2006, the subject matter of which is
5 incorporated herein by reference.

Technical Field

The present invention relates to the field of surgery, and more particularly, to an apparatus for cutting tissue during a surgery such as spinal surgery.

Background of the Invention

10 Spinal ailments may be treated by electrical stimulation of nerves. The stimulation may be performed using "paddle"-type electrodes that are placed on or near nerves to be treated. In particular, it may be desirable to place these electrodes in specific structures of the spine, such as in the spinal canal under the lamina. Typically, previous surgeries, scarring, or other aggravating factors make
15 it necessary to perform a procedure known as a "laminectomy" in order to place electrodes at a desired anatomical site. A laminectomy removes bone at the back of the spine to make way for a paddle-type electrode. In the long term, a laminectomy may have undesirable consequences for the health of a patient. However, placing an electrode in the spinal canal in the absence of a laminectomy
20 can be difficult because of fibrous obstructions known as "septa" in the spinal canal.

The spinal canal is the space within the vertebral column encasing a spinal cord. Access to the spinal cord, its surrounding membranes, and exiting nerve roots and blood supply veins and arteries is required for instrumentation to
25 undertake procedures on these structures and for placement of devices, such as a paddle-type electrode for spinal cord stimulation.

A laminectomy, which removes the bon arch and spinous process, opens a segment to the spinal canal for necessary access. However, as stated above, a laminectomy can be a cause of significant morbidity due to scarring and loss of the
30 bon arch, where spinal muscles are attached. Placement of a spinal cord stimulator

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lead, or paddle-type electrode, and an associated lead wire requires formation of an opening between the arches of two adjacent vertebrae. Thus, removal of a certain amount of bone, either on one side (i.e., a hemilaminectomy) or the removal of the same bone on the opposite side (i.e., a laminectomy) is thus required.

5 At best, a minimal procedure such as a laminotomy is made to provide an opening in the ligament (ligamentum flavum) at the lower border of an arch sufficient to accommodate the paddle electrode. Passage of the paddle electrode under the arch is frequently prevented due to attachments (fibrous bands) between the arch and the dura. Thus, either total removal of the lamina arch together with
10 spinous process, or a second laminotomy opening in the ligament between the two arches of the space above that which was originally entered, may be required so that the electrode can be passed from below. Also, it may be further necessary to remove a third lamina, since similar difficulties may be encountered underneath the lamina arch due to the coverings of the spinal cord. Thus, placing an electrode
15 in a desired location, with as little disruption as possible, is desirable.

Summary of the Invention

 An apparatus in accordance with the present invention cuts tissue. The apparatus includes a shaft, a flat portion, and a blade. The shaft has a first end and a second end opposite the first end. The first end forms a handle for the apparatus.
20 The flat portion is formed adjacent the second end of the shaft and angled relative to the shaft. The flat portion has a generally triangular indentation. The blade cuts the tissue. The blade is secured within the triangular indentation of the flat portion. The blade has a V-shaped cutout formed by inner sharpened portions for engaging the tissue.

25 A method in accordance with the present invention cuts tissue from a surgical area of a patient. The method includes the steps of: aligning an apparatus along a longitudinal axis of a spinal canal of the patient; working a flat portion of the apparatus between two lamina of the spinal canal; manipulating the flat portion of the apparatus within the spinal canal; viewing the interior of the spinal canal
30 with an optical visualization device of the apparatus; and cutting away tissue within the spinal canal to accommodate a nerve stimulator.

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Brief Description of the Drawings

FIG. 1 shows a schematic perspective view of an apparatus in accordance with the present invention;

FIG. 2 shows a schematic orthogonal end view of the apparatus of Fig. 1;

5 FIG. 3 shows a schematic plan view of a portion of the apparatus of Fig. 1; and

FIGS. 4-5 show various orientations of the apparatus of Fig. 1 relative to a spinal column and vertebrae.

Description of an Example Embodiment

10 An apparatus 100 in accordance with the present invention may be inserted through a small laminotomy sufficient to accommodate a paddle electrode. The apparatus 100, commonly referred to as a septotome, will allow the cutting of ligamentous attachments connecting the dura to the arch, as viewed through a fiberoptic component of the apparatus. The space under the arch may thereby be
15 cleared without removal of the arch for a distance of one vertebral lamina.

As shown in Figs. 1-4, the apparatus 100 includes a blade 104 adjacent a flat portion 102 at one end of a rod 101, or shaft. The apparatus 100 may be inserted between lamina of the spine and subsequently manipulated into the spinal canal to cut away obstructions and clear a path for insertion and placement of a
20 nerve stimulator, such as a paddle electrode.

As shown in FIG. 1, the apparatus 100 comprises a shaft 101 and a flat, or planar, portion 102 at an angle to the shaft. The shaft 101 may be constructed of a rigid material such as metal, rigid polymer, or any suitable biocompatible metal or polymer. The inexpensive nature of these materials may further allow the
25 apparatus 100 to be discarded after a first use. As shown in FIG. 1, the flat portion 102 of the apparatus 100 is angled approximately 100 degrees to the shaft 101. However, other suitable angles may be utilized. The flat portion 102 terminates in two blunt tines 103 forming a triangular indentation or recess 109 therebetween. The distance between the two tines 103 of the apparatus 100 may
30 be 0.5-3.0 cm. The angle of the flat portion 102 relative to the shaft 101 may be formed by bending an initially straight shaft/flat portion piece. Alternatively, the

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flat portion 102 and the shaft 101 may be two separate pieces secured together in a suitable manner.

5 A rectangular cutting blade 104 is secured in the indentation of the flat portion 102. The sharp portions of the cutting blade 104 are disposed on the inner portions of a "V"-shaped cutout so that surrounding tissue is not inadvertently damaged during use. The blade 104 may be formed integrally with the flat portion 102 (not shown), permanently attached (i.e., fixedly secured by glue) to the flat portion (not shown), or removably insertable into a rectangular recess 107 corresponding to the rectangular perimeter of the blade 104, as shown in
10 FIGS. 1-3.

A hollow channel 106 for an optical visualization device 105 is disposed along at least part of the flat portion 102 and at least part of the shaft 101. The hollow channel 106 may be formed integrally with the apparatus 100, as shown in the example of FIGS. 1-3, or attached to the device as a separate piece. The optical
15 visualization device 105 includes a camera and light source, and may be further implemented, at least in part, by a fiber-optic bundle with a connector cable and monitor at a distal end of the cable. FIG. 2 shows an orthogonal end view of the flat portion 101 of the apparatus 100. FIG. 3 shows a plan view of a part of the flat portion 101 of the apparatus 100.

20 FIG. 4 shows a section of a spine with the apparatus 100 partially inserted in the spinal canal. The apparatus 100 may be inserted between lamina of the spine and manipulated to cut away obstructions using the inner "V"-shaped portions of the cutting blade 104.

As shown in FIG. 5, the apparatus 100 may be brought into engagement
25 with a spine at a first orientation (i.e., with the shaft 101 approximately parallel to the spine and the flat portion 102 approximately perpendicular to the spine). The flat portion 102 may then be worked between lamina of the spine. Then, the orientation of the apparatus 100 may be altered with the shaft 101 approximately perpendicular to the spine and the flat portion 102 within the spinal canal and
30 approximately parallel to the spine.

The apparatus 100 may thus be manipulated in the spinal canal to cut away obstructions. The blunt outer contours of the tines 103 and the location of the

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cutting edges of the blade 104 within the recess 109 of the flat portion 102 prevents unintended surrounding tissue from being inadvertently cut while still allowing the apparatus 100 to cut tissue that the flat portion 102 of the apparatus is moved toward.

5 The optical visualization apparatus 105 enables a surgeon to view the surgical site and steer the cutting blade 104 to appropriate cutting locations. Further, the optical visualization apparatus 105 allows the apparatus 100 to be additionally utilized for other procedures, such as narrow spine canal surgery, removal/reduction of a calcified and thickened yellow ligament, and/or repair of
10 dural tears.

 Conventionally, blind means of clearing a passage for an electrode have been used, such as dural elevators, dural dissectors, or dural guides. The dimensions and physical form of the apparatus 100 provide a safe means of introducing the apparatus 100, throughout its length, at the dorsal aspect of the
15 dura within the spinal canal. Further, the unique nature of the apparatus 100, with the guarded V-cutout and fiberoptic means of visualization, provides a much less invasive and much less destructive means for inserting a paddle electrode. Further advantages of apparatus 100 are: 1) a reduction in time for performing a laminotomy procedure, 2) an atraumatic means of identifying the dorsal epidural
20 space for placement of a spinal cord stimulator lead wire, 3) reduction of morbidity by eliminating the need for one, two, and/or three laminotomies. The apparatus 100 thereby obviates the need to perform a laminectomy to insert an electrode.

 From the above description of the invention, those skilled in the art will
25 perceive improvements, changes, and modifications. Such improvements, changes and modifications within the skill of the art are intended to be covered by the appended claims.

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What is claimed is:

1. An apparatus for cutting tissue, said apparatus comprising:
a shaft having a first end and a second end opposite said first end, said first end forming a handle for said apparatus;
a flat portion formed adjacent said second end of said shaft and angled relative to said shaft, said flat portion having a generally triangular indentation; and
a blade for cutting the tissue, said blade being secured within said triangular indentation of said flat portion, said blade having a V-shaped cutout formed by inner sharpened portions for engaging the tissue.
2. The apparatus as set forth in claim 1 wherein said flat portion extends at an obtuse angle relative to said shaft.
3. The apparatus as set forth in claim 2 wherein said obtuse angle is approximately 100 degrees.
4. The apparatus as set forth in claim 1 further including a hollow channel for optical visualization of the tissue.
5. The apparatus as set forth in claim 4 further including an optical visualization device disposed at least partially within said hollow channel.
6. The apparatus as set forth in claim 5 wherein said optical visualization device includes a camera, a light source, and a fiber optic bundle disposed within said hollow channel.
7. The apparatus as set forth in claim 4 wherein said hollow channel is formed integrally with said shaft and said flat portion.

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8. The apparatus as set forth in claim 1 wherein said blade is constructed integrally with said flat portion.

9. The apparatus as set forth in claim 1 wherein said blade is removably secured within a recess of said flat portion.

10. The apparatus as set forth in claim 1 wherein said blade is fixedly secured to said flat portion.

11. A method for cutting tissue from a surgical area of a patient, said method comprising the steps of:

aligning an apparatus along a longitudinal axis of a spinal canal of the patient;

working a flat portion of the apparatus between two lamina of the spinal canal;

manipulating the flat portion of the apparatus within the spinal canal;

viewing the interior of the spinal canal with an optical visualization device of the apparatus; and

cutting away tissue within the spinal canal to accommodate a nerve stimulator.

12. The method as set forth in claim 11 wherein the apparatus includes a shaft having a first end and a second end opposite the first end and a flat portion formed adjacent the second end of the shaft and angled relative to the shaft.

13. The method as set forth in claim 12 wherein the first end of the shaft forms a handle for the apparatus.

14. The method as set forth in claim 13 wherein the flat portion of the apparatus has a generally triangular indentation for receiving a blade for cutting the tissue.

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15. The method as set forth in claim 14 wherein the blade is secured within the triangular indentation of the flat portion, the blade having a V-shaped cutout formed by inner sharpened portions for engaging the tissue.

16. The method as set forth in claim 11 further including the step of bending the flat portion of the apparatus to an obtuse angle relative to the shaft of the apparatus.

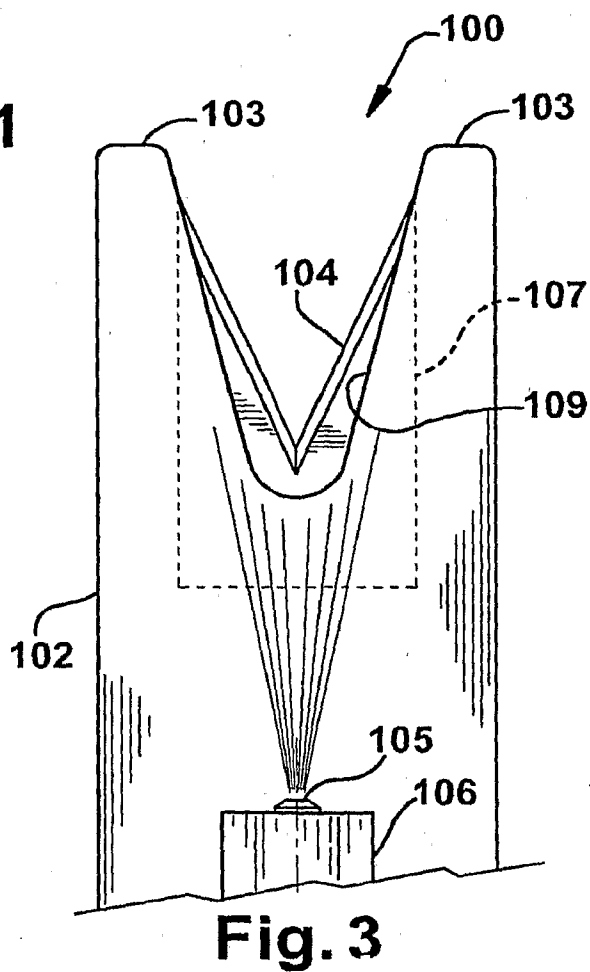
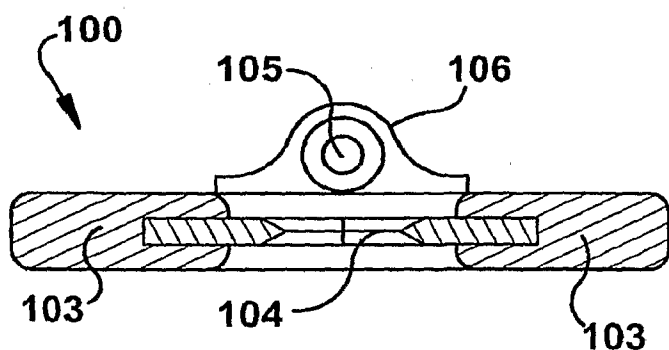
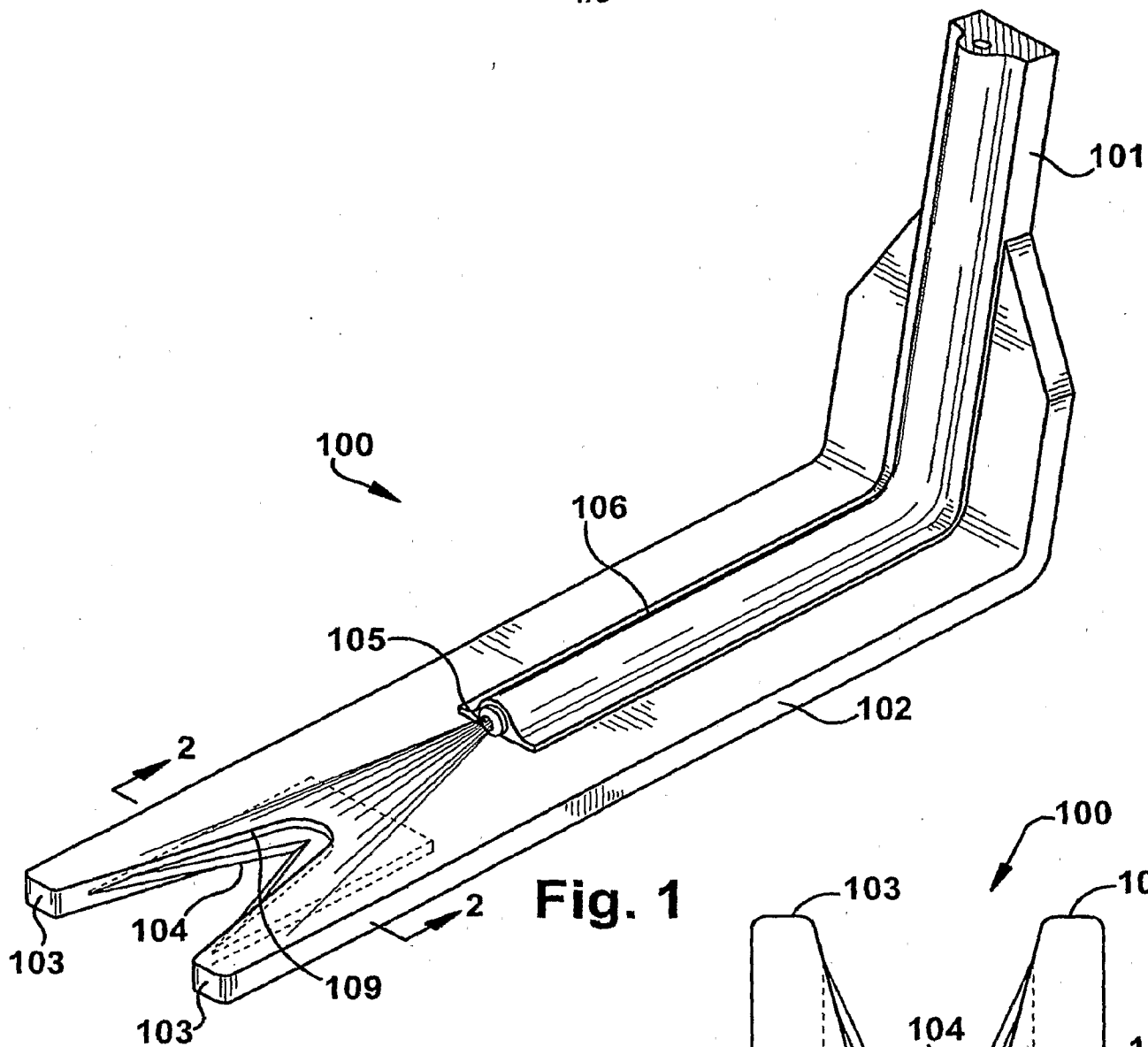
17. The method as set forth in claim 11 further including the step of inserting a blade into a recess of the flat portion of the apparatus.

18. The method as set forth in claim 11 further including the step of connecting the optical visualization device to a monitor.

19. The method as set forth in claim 11 further including the step of removing a blade from the flat portion of the apparatus.

20. The method as set forth in claim 11 further including the step of disposing of the apparatus following removal of the apparatus from the spinal canal.

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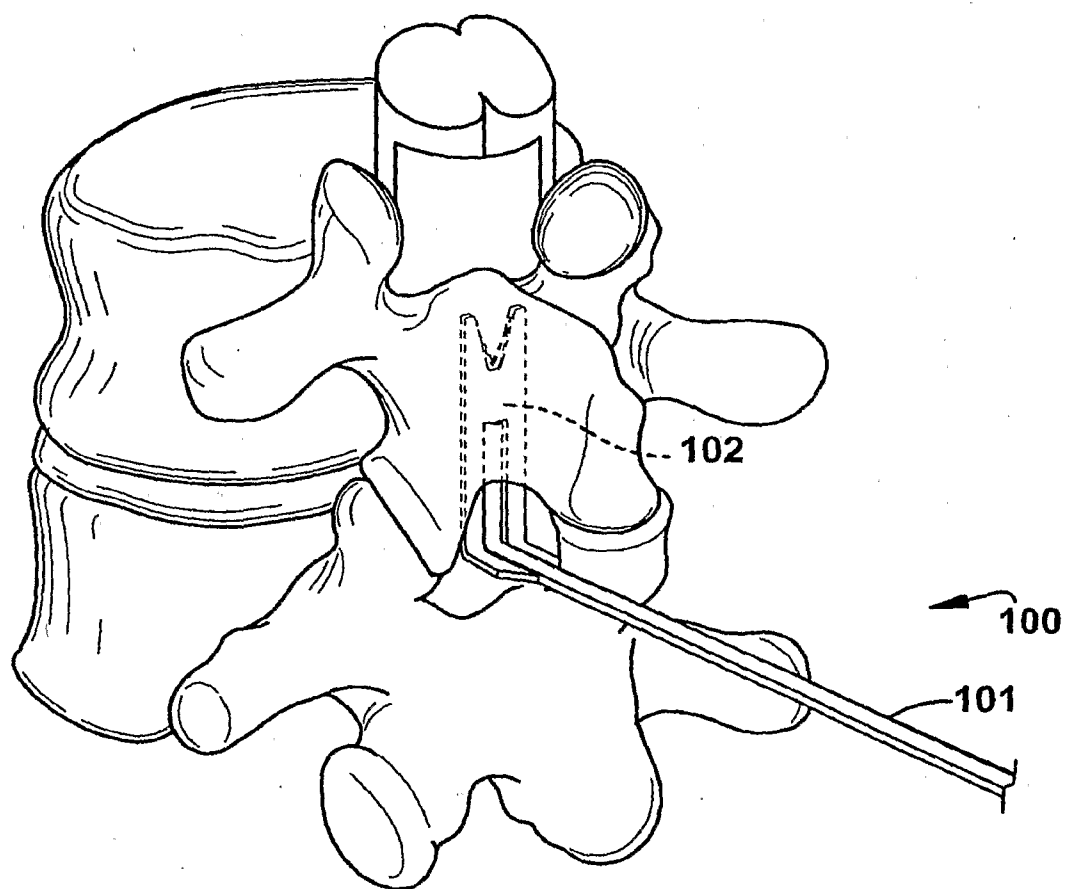


Fig. 4

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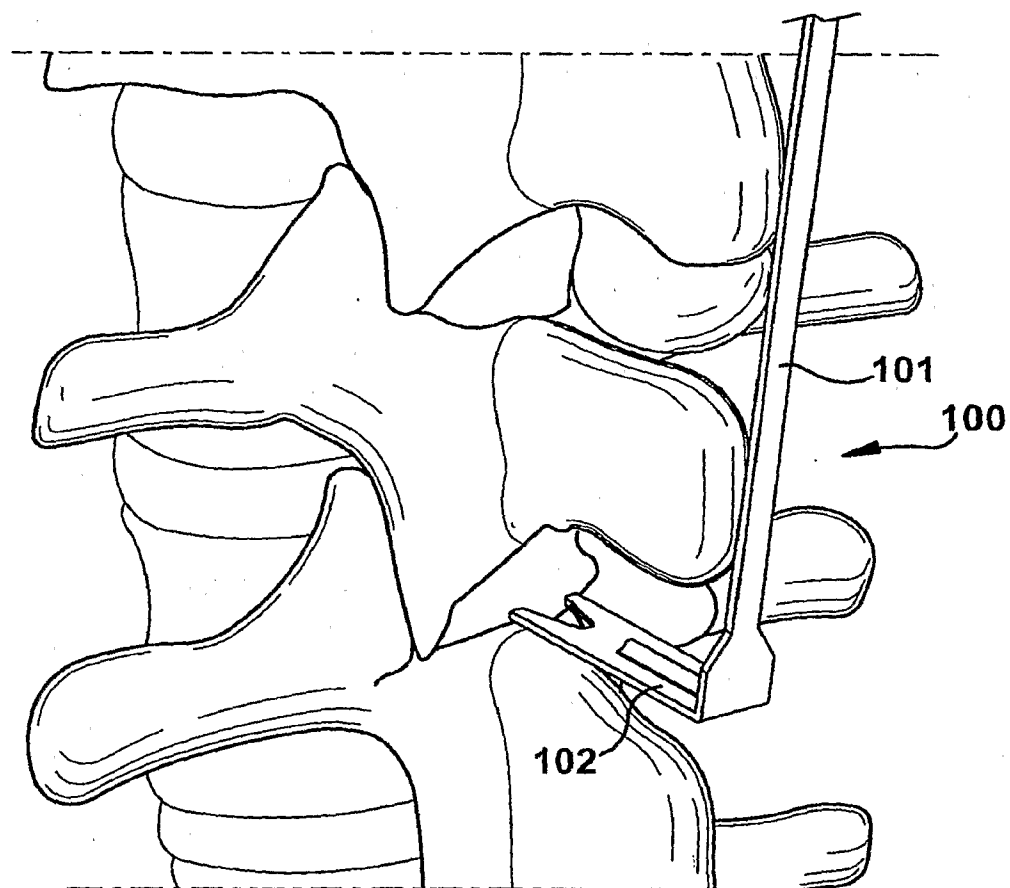


Fig. 5