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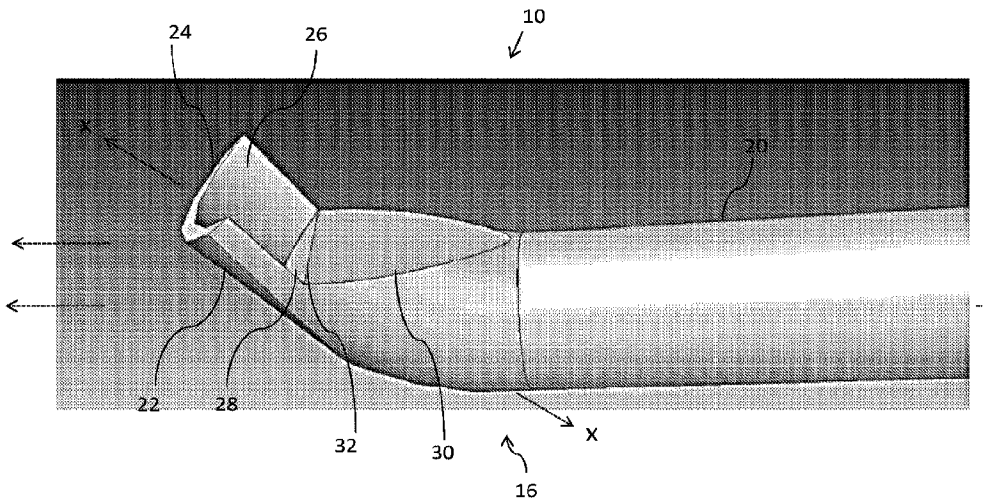

(57) Abrégé/Abstract:
A surgical cutting device (10) for cutting and removing cartilage from a diseased area. The surgical cutting device includes an elongated shaft (12) having a proximal portion (18) and a distal portion (20) connected between a proximal end (14) and a distal end (16). A central longitudinal axis extends through the elongated shaft. The proximal portion has a first diameter and the distal portion has a second diameter, the first diameter being larger than the second diameter. The cutting device also includes a cutting tip (22) at the distal end of the elongated shaft. The cutting tip extends along a second axis at an angle relative to the central longitudinal axis and includes a curved blade (24). The curved blade includes an inner wall (26) extending to a base (28) of the cutting tip.

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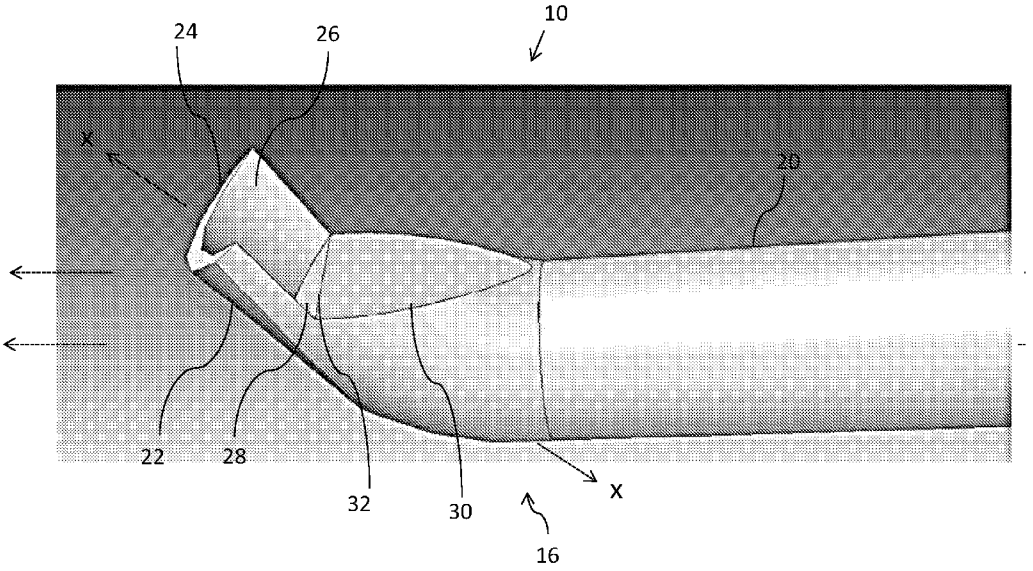

FIG. 2

(57) Abstract: A surgical cutting device (10) for cutting and removing cartilage from a diseased area. The surgical cutting device includes an elongated shaft (12) having a proximal portion (18) and a distal portion (20) connected between a proximal end (14) and a distal end (16). A central longitudinal axis extends through the elongated shaft. The proximal portion has a first diameter and the distal portion has a second diameter, the first diameter being larger than the second diameter. The cutting device also includes a cutting tip (22) at the distal end of the elongated shaft. The cutting tip extends along a second axis at an angle relative to the central longitudinal axis and includes a curved blade (24). The curved blade includes an inner wall (26) extending to a base (28) of the cutting tip.

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CHONDROTOME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Serial No. 62/735,290, filed on September 24, 2018 and entitled "Chondratome."

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention is directed generally to a surgical cutting device and, more particularly, to a blade for cutting and removing cartilage from a diseased area.

2. Description of Related Art

[0003] A variety of conditions may negatively affect the human knee including arthritis, ligament instability, and localized trauma. These conditions may be surgically treated by repairing portions of the knee cartilage, meniscus, or ligaments or by replacing them with natural or artificial replacements. In such procedures, it is often necessary to correct the alignment of the knee to relieve pressure from the damaged portion of the joint and balance the load on the joint. In some instances, correcting the knee alignment alone, without additional repair or replacement of injured or diseased tissue, is sufficient to provide relief and improve function. Often, in a young arthritis patient, correcting the knee alignment may be a first surgical choice to provide years of relief prior to resorting to a more aggressive total knee replacement procedure. Typically, injured or diseased knees will develop a varus deformity in which the medial side of the person's knee joint has become compressed resulting in a bowlegged alignment of the lower limb.

[0004] A frequently used procedure to correct knee alignment is high tibial osteotomy. In this procedure, the knee alignment is changed by cutting the tibia on one side and then expanding or compressing the cut side to change the angle between the axes of the tibia and femur. For example, in a closing high tibial osteotomy, a wedge of bone is removed from the tibia and then the opposite sides of the cut are brought together to angle the tibia towards the side on which the cut was made. In an opening high tibial osteotomy, a cut is made partway across the tibia and the cut is opened to create a wedge-shaped gap thereby angling the tibia away from the side on which the cut was made. A fixturing device, such as a bone plate or external fixator, is then applied to the tibia to hold the tibial alignment until the bone heals. Typically, for opening high tibial osteotomy, bone is taken from the patient's pelvis and

applied to the gap in the tibia to aid in bone healing. An opening high tibial osteotomy may be performed on the medial side of a patient's knee to treat a varus deformity.

[0005] Another procedure used to correct knee alignment is a distal femoral osteotomy. For example, in an opening lateral distal femoral osteotomy, a cut is made partway across the femur from the lateral side and the cut is opened to create a wedge-shaped gap thereby angling the femur away from the lateral side.

[0006] It is often necessary to use powered tissue cutting tools in order to perform surgical procedures. Such tools generally comprise a handpiece which cyclically moves a tissue cutting device such as a blade or burr in some oscillating or reciprocating manner. The handpiece generally includes a pneumatic or electric drive motor having an output shaft to which the cutting device is attached, the shaft being axially aligned with a drive axis of the handpiece. As used herein, the term "drive axis" refers to the axis of the motor output shaft through which power is delivered from the motor. The handpiece may be a "pencil" type handpiece in which the body is elongated and the drive axis is aligned with the axis of the body or a pistol-grip type of handpiece in which the drive axis is aligned in a chosen direction relative to the grip. The drive motor of the handpiece produces a driving force which reciprocates the output shaft and cutting device either longitudinally, i.e. linearly along the drive axis (like a saber saw), or arcuately in a plane perpendicular to the drive axis. Handpieces utilizing the former type of action are generally referred to as reciprocating saws while those utilizing the latter action are generally referred to as oscillating saws. In some cases an oscillating saw may transfer the oscillating drive motion so that it is cyclical within a plane parallel to the axis of the elongated body of the handpiece. A sagittal saw is a type of oscillatory saw in which the cyclical reciprocating action is in a plane aligned with the drive axis.

[0007] In all instances, numerous conventional tissue cutting blades or burrs or other devices (all collectively referred to herein as "blades") are adapted to be secured to the handpiece via a collet mechanism which is utilized to selectively attach and release a desired blade. A variety of different cuts can be made with a single saw depending upon the shape of the blade. For oscillating saws, the blades are often in the form of a flat, elongated body having a cutting edge (e.g. teeth, abrader, etc.) at one end and a hub at the other end, the hub being shaped and adapted to fit the particular collet. Such flat blades are used to make cuts in a plane perpendicular to the drive axis. An oscillating saw may also be used for effecting cuts in a plane parallel to the handpiece axis by attaching a transverse hub to a flat blade. A

crescentic blade having a curved instead of a flat body may be used for curved cuts. The body of a crescentic blade has teeth (or another cutting edge) at its distal end which follow the shape of the arcuate body so that as the blade oscillates about the axis, the teeth follow an arcuate pattern having a center of curvature on the axis. Some flat blades may have the cutting edge at an angle to the blade body to make cuts in an angled plane. Angled blades may have an axially elongated body either on or off the blade axis. That is, the proximal end of the blade body may have a transverse hub or it may simply be attached in-line with the drive axis. The resulting cut is arcuate and facing away from the axis.

[0008] Any of the blades described above may be used to make cuts into the bone. However, in most surgical procedures involving the knee (or foot, angle, hand and/or wrist), damage or diseased cartilage may also need to be removed from the surgical site for proper repair of a particular surgical site.

[0009] Therefore, there is a need for a tool that is specialized for cutting and removing diseased cartilage.

[0010] Description of the Related Art Section Disclaimer: To the extent that specific patents/publications/products are discussed above in this Description of the Related Art Section or elsewhere in this disclosure, these discussions should not be taken as an admission that the discussed patents/publications/products are prior art for patent law purposes. For example, some or all of the discussed patents/publications/products may not be sufficiently early in time, may not reflect subject matter developed early enough in time and/or may not be sufficiently enabling so as to amount to prior art for patent law purposes.

SUMMARY OF THE INVENTION

[0011] Embodiments of the present invention are directed to a surgical cutting device for cutting and removing cartilage from a diseased area. In particular, embodiments of the present invention are used to cut and scrape away diseased or damaged cartilage (e.g., in extremities procedures (foot and ankle / hand and wrist)). According to one aspect, the surgical cutting device includes an elongated shaft having a proximal portion and a distal narrowing portion connected between a proximal end and a distal end. A central longitudinal axis extends through the elongated shaft. The proximal portion has a first diameter and the distal narrowing portion has a second diameter. The first diameter is larger than the second

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diameter. The cutting device also includes a cutting tip at the distal end of the elongated shaft. The cutting tip extends at an angle relative to the central longitudinal axis and includes a curved blade.

[0012] According to another aspect, the surgical cutting device includes an elongated shaft having a proximal portion and a distal narrowing portion connected between a proximal end and a distal end. A central longitudinal first axis extends through the elongated shaft. The surgical cutting device also includes a cutting tip at the distal end of the elongated shaft. The cutting tip extends along a second axis, which is at an angle relative to the central longitudinal first axis. The cutting tip comprises a curved blade which is open in a proximal direction.

[0013] According to yet another aspect, the surgical cutting device includes an elongated shaft having a proximal portion and a distal narrowing portion connected between a proximal end and a distal end. A central longitudinal first axis extends through the elongated shaft. The surgical cutting device also includes a cutting tip at the distal end of the elongated shaft. The cutting tip extends along a second axis, which is at an angle relative to the central longitudinal first axis. The cutting tip comprises a curved blade which is open in a proximal direction. The surgical cutting device also includes a handle attached at the proximal end of the elongated shaft.

[0014] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] One or more aspects of the present invention are particularly pointed out and distinctly claimed as examples in the claims at the conclusion of the specification. The foregoing and other objects, features, and advantages of the invention are apparent from the following description taken in conjunction with the accompanying drawings in which:

[0016] FIG. 1 is a side perspective view schematic representation of a cutting device, according to an embodiment;

[0017] FIG. 2 is a close-up, side perspective view schematic representation of the distal end of the cutting device, according to an embodiment;

[0018] FIG. 3 is a side view schematic representation of a cutting device, according to an alternative embodiment; and

[0019] FIG. 4 is a close-up, top perspective view schematic representation of the distal end of the cutting device, according to an alternative embodiment.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Aspects of the present invention and certain features, advantages, and details thereof, are explained more fully below with reference to the non-limiting examples illustrated in the accompanying drawings. Descriptions of well-known structures are omitted so as not to unnecessarily obscure the invention in detail. It should be understood, however, that the detailed description and the specific non-limiting examples, while indicating aspects of the invention, are given by way of illustration only, and are not by way of limitation. Various substitutions, modifications, additions, and/or arrangements, within the spirit and/or scope of the underlying inventive concepts will be apparent to those skilled in the art from this disclosure.

[0021] Referring now to the figures, wherein like reference numerals refer to like parts throughout, FIG. 1 shows a side perspective view schematic representation of a cutting device 10, according to an embodiment. The cutting device 10 comprises an elongated shaft 12 extending along a central longitudinal y – y axis between a proximal end 14 and a distal end 16. In the depicted embodiment, the elongated shaft 12 is cylindrical; however, any other suitable geometry may be used. The elongated shaft 12 may have a uniform diameter or a varied diameter. In the depicted embodiment, the elongated shaft 12 has a first diameter and a second diameter that is different from the first diameter.

[0022] As shown in FIG. 1, the elongated shaft 12 has proximal portion 18 and a distal portion 20 (which can be narrowing and taper in the distal direction, but does not need to be). The proximal portion 18 has the first diameter and the distal narrowing portion 20 has the second diameter. In the depicted embodiment, the second diameter of the distal narrowing portion 20 is smaller than the first diameter of the proximal portion 18. In an embodiment, the distal narrowing portion 20 can be tapered in the distal direction and the second diameter is any diameter along the distal narrowing portion 20. The narrowing portion 20 allows the cutting device 10 to access and cut smaller surgical areas, such as in the hand and wrist.

[0023] Turning now to FIG. 2, there is shown a close-up, side perspective view schematic representation of the distal end 16 of the cutting device 10, according to an embodiment. The narrowing portion 20 of the elongated shaft 12 extends to the distal end 16. The distal end 16 comprises a cutting tip 22, as shown in FIG. 2. In the depicted embodiment, the cutting tip 22 extends along an x – x axis. In general, the cutting tip 22 extends at angle relative to the central longitudinal y – y axis (which extends through the

elongated shaft 12). In FIG. 2, the cutting tip 22 extends at an angle greater than 90 degrees relative to the central longitudinal y – y axis.

[0024] Still referring to FIG. 2, the cutting tip 22 comprises a curved blade 24. In the depicted embodiment, the curved blade 24 has a semi-circular cross-section such that the curved blade 24 is crescent-shaped and open toward the proximal direction. The curved blade 24 comprises an inner wall 26 extending to a flat, semi-circular base 28. Further, the base 28 of the curved blade 24 extends to and abuts a flat portion 30 of the cutting tip 22. In the depicted embodiment, the flat portion 30 is D-shaped and extends proximally.

[0025] In the embodiment depicted in FIG. 2, the base 28 of the curved blade 24 and the flat portion 30 are connected at a flange 32 or edge. The base 28 extends at an angle relative to the flat portion 30. In an embodiment, the flat portion 30 extends along both a plane and an axis (z – z axis) that are substantially parallel to the central longitudinal y – y axis, while the base 28 extends along a plane and axis that is transverse to both the central longitudinal y – y axis and the x – x axis. In one embodiment, the base 28 extends along which is substantially perpendicular to the x – x axis. The angular configuration and curvature of the cutting tip 22 is optimized for use in hand and wrist procedures.

[0026] Referring now to FIG. 3, there is shown a side view schematic representation of a cutting device 10, according to an alternative embodiment. In the depicted embodiment, the proximal end 14 of the cutting device 10 comprises a handle 34 . In accordance with an embodiment, there is no motor or automated actuation for the described device 10, which include curved blade(s) or cutting tip on a shaft that will be stuck into a handle 34 so the surgeon can cut and pry and scrape away cartilage. Thus, the cutting device 10 can be manipulated directly by the user via the hanlde 34 (or otherwise at the proximal end 14 f the device 10).

[0027] Similar to the embodiment shown in FIGs. 1 and 2, the embodiment of the cutting device 10 in FIG. 3 comprises an elongated shaft 12 extending along a central longitudinal y – y axis between a proximal end 14 and a distal end 16. The elongated shaft 12 may be cylindrical and have a uniform diameter or a varied diameter, as described above. As also similar to the embodiment shown in FIGs. 1 and 2, the elongated shaft 12 of the cutting device 10 in FIG. 3 comprises a proximal portion 18 and a distal narrowing portion 20. As shown, the distal narrowing portion 20 is tapered in the distal direction. The distal narrowing portion 20 allows the cutting device 10 to access and cut small surgical areas, such as in the foot and ankle.

[0028] The distal end 16 of the cutting device 10 comprises a cutting tip 22. In the depicted embodiment, the cutting tip 22 extends along an x – x axis. In general, the cutting tip 22 extends at angle relative to the central longitudinal y – y axis (which extends through the elongated shaft 12). In FIG. 3, the cutting tip 22 extends at an angle greater than 90 degrees relative to the central longitudinal y – y axis. The cutting tip 22 in FIG. 3 is configured and optimized for use in foot and ankle procedures. For example, the cutting tip 22 is longer than the cutting tip 22 in the embodiment in FIGs. 1 and 2. Accordingly, the cutting tip 22 of the cutting device 10 in FIGs. 3 and 4 varies from that shown in FIGs. 1 and 2.

[0029] Turning now to FIG. 4, there is shown a close-up, side perspective view schematic representation of the distal end 16 of the cutting device 10, according to an alternative embodiment. As shown in FIG. 4, the cutting tip 22 comprises a curved blade 24 which is open in the proximal direction. In the depicted embodiment, the curved blade 24 has a semi-circular cross-section such that the curved blade 24 is crescent-shaped. The curved blade 24 comprises an inner wall 26 extending to a base 28. The base 28 in the embodiment shown in FIG. 3-4 is sloped, extending toward the central longitudinal y – y axis (and elongated shaft 12). Further, the sloped base 28 of the curved blade 24 extends to and abuts a flat portion 30 of the cutting tip 22. In the depicted embodiment, the flat portion 30 is circular or semi-circular and extends proximally.

[0030] In the embodiment depicted in FIG. 4, the base 28 of the curved blade 24 slopes or extends to the flat portion 30 of the curved blade 24. The base 28 also extends at least partially around the flat portion 30, as shown in FIG. 4. The flat portion 30 extends along a plane and a z – z axis, which are substantially parallel to the central longitudinal y – y axis, as shown in FIG. 3. The angular configuration and curvature of the cutting tip 22 is optimized for use in foot and ankle procedures.

[0031]

[0032] While various embodiments have been described and illustrated herein, those of ordinary skill in the art will readily envision a variety of other means and/or structures for performing the function and/or obtaining the results and/or one or more of the advantages described herein, and each of such variations and/or modifications is deemed to be within the scope of the embodiments described herein. More generally, those skilled in the art will

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readily appreciate that all parameters, dimensions, materials, and configurations described herein are meant to be exemplary and that the actual parameters, dimensions, materials, and/or configurations will depend upon the specific application or applications for which the teachings is/are used. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments described herein. It is, therefore, to be understood that the foregoing embodiments are presented by way of example only and that, within the scope of the appended claims and equivalents thereto, embodiments may be practiced otherwise than as specifically described and claimed. Embodiments of the present disclosure are directed to each individual feature, system, article, material, kit, and/or method described herein. In addition, any combination of two or more such features, systems, articles, materials, kits, and/or methods, if such features, systems, articles, materials, kits, and/or methods are not mutually inconsistent, is included within the scope of the present disclosure.

[0033] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprise" (and any form of comprise, such as "comprises" and "comprising"), "have" (and any form of have, such as, "has" and "having"), "include" (and any form of include, such as "includes" and "including"), and "contain" (any form of contain, such as "contains" and "containing") are open-ended linking verbs. As a result, a method or device that "comprises", "has", "includes" or "contains" one or more steps or elements. Likewise, a step of method or an element of a device that "comprises", "has", "includes" or "contains" one or more features possesses those one or more features, but is not limited to possessing only those one or more features. Furthermore, a device or structure that is configured in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

[0034] The corresponding structures, materials, acts and equivalents of all means or step plus function elements in the claims below, if any, are intended to include any structure, material or act for performing the function in combination with other claimed elements as specifically claimed. The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the invention. The

embodiment was chosen and described in order to best explain the principles of one or more aspects of the invention and the practical application, and to enable others of ordinary skill in the art to understand one or more aspects of the present invention for various embodiments with various modifications as are suited to the particular use contemplated.

CLAIMS

What is claimed is:

1. A surgical cutting device, comprising:

an elongated shaft having a proximal portion and a distal portion connected between a proximal end and a distal end;

a central longitudinal axis extending through the elongated shaft;

wherein the proximal portion has a first diameter and the distal portion has a second diameter, the first diameter being larger than the second diameter;

a cutting tip at the distal end of the elongated shaft, extending along a second axis, at an angle relative to the central longitudinal axis;

wherein the cutting tip comprises a curved blade which is open in a proximal direction;

wherein the curved blade comprises an inner wall extending to a base of the cutting tip,

wherein a cross-section of the curved blade in a plane perpendicular to the second axis is crescent-shaped, and the base is semi-circular.

2. The device of claim 1, wherein the distal portion is tapered, decreasing in diameter in a distal direction.
3. The device of claim 1, wherein the angle at which the cutting tip extends relative to the central longitudinal axis is greater than 90 degrees.
4. The device of claim 1, further comprising a flat portion on the cutting tip, wherein the flat portion is connected to the curved blade and extends in a proximal direction.
5. The device of claim 4, wherein the flat portion extends along a plane which is substantially parallel to the central longitudinal axis.
6. The device of claim 1, wherein the base extends along a plane which is substantially perpendicular to the second axis.
7. The device of claim 1, further comprising a flat portion connected to the base of the cutting tip by a flange.
8. The device of claim 7, wherein the flat portion is D-shaped.

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9. The device of claim 1, further comprising a handle attached at the proximal end of the elongated shaft.

10. The device of claim 9, wherein the base is sloped toward the elongated shaft.

11. The device of claim 9, wherein the base extends to and at least partially around a flat portion of the cutting tip.

12. The device of claim 11, wherein the flat portion is circular or semi-circular.

13. The device of claim 7 or claim 11, wherein the flat portion extends in a proximal direction along a third axis which is substantially parallel to the central longitudinal first axis.

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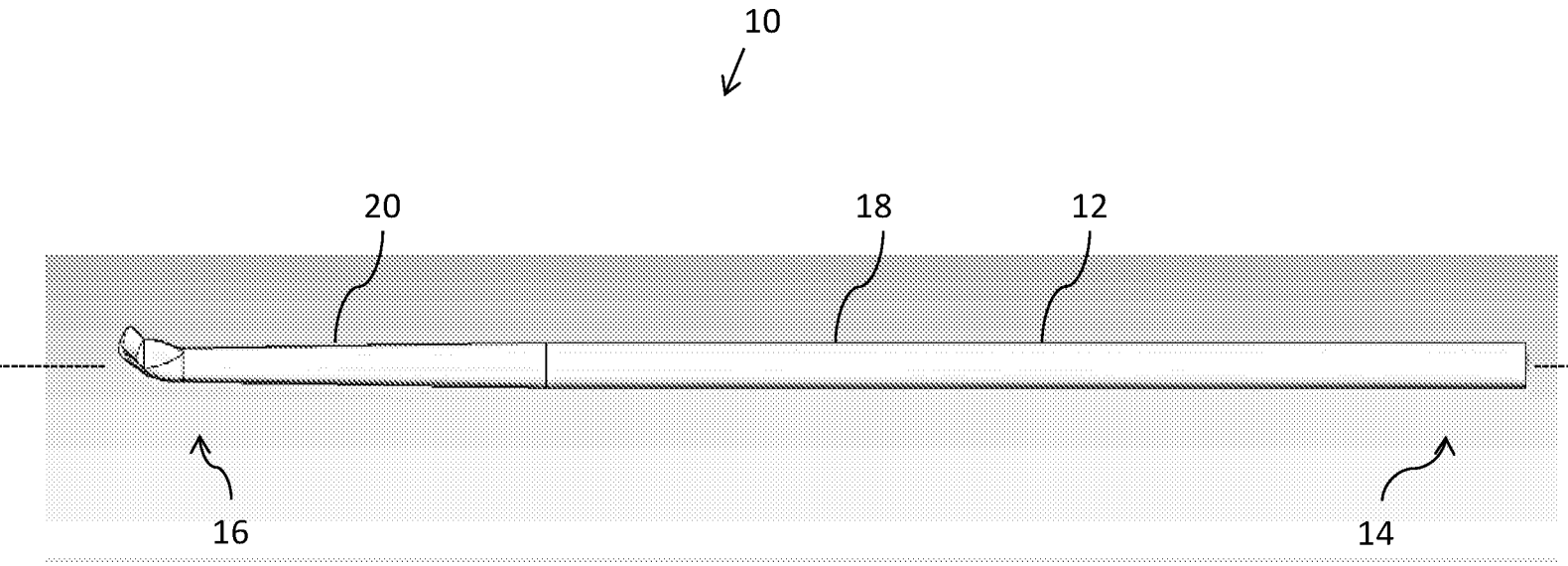


FIG. 1

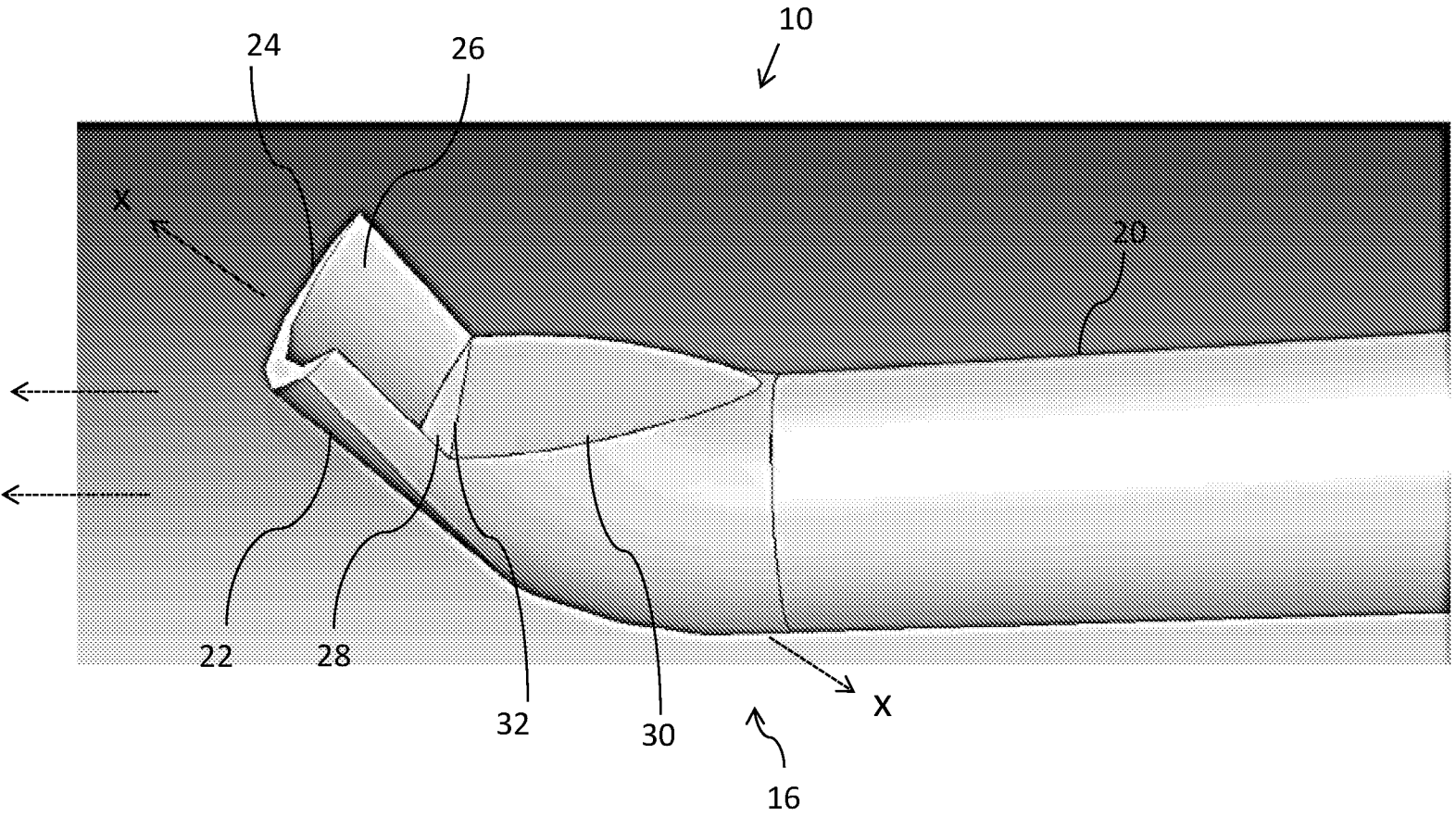


FIG. 2

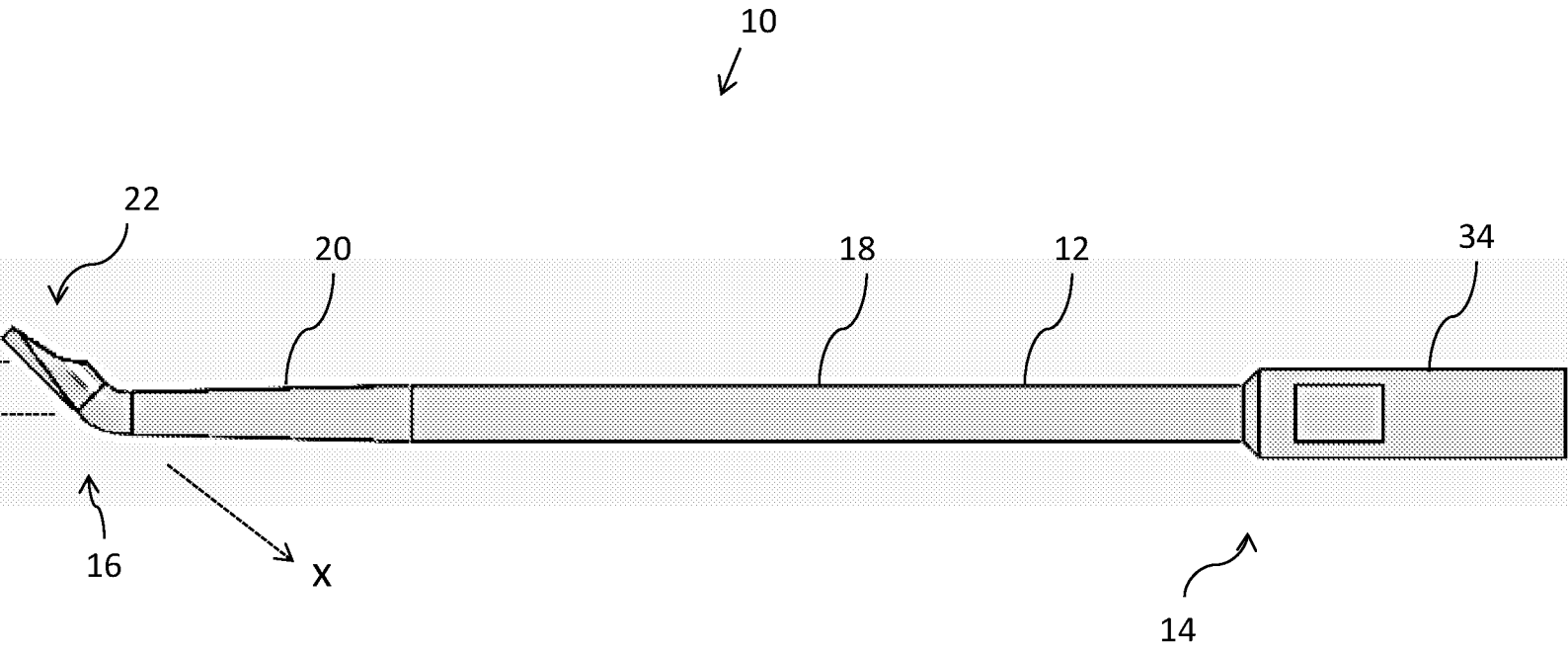


FIG. 3

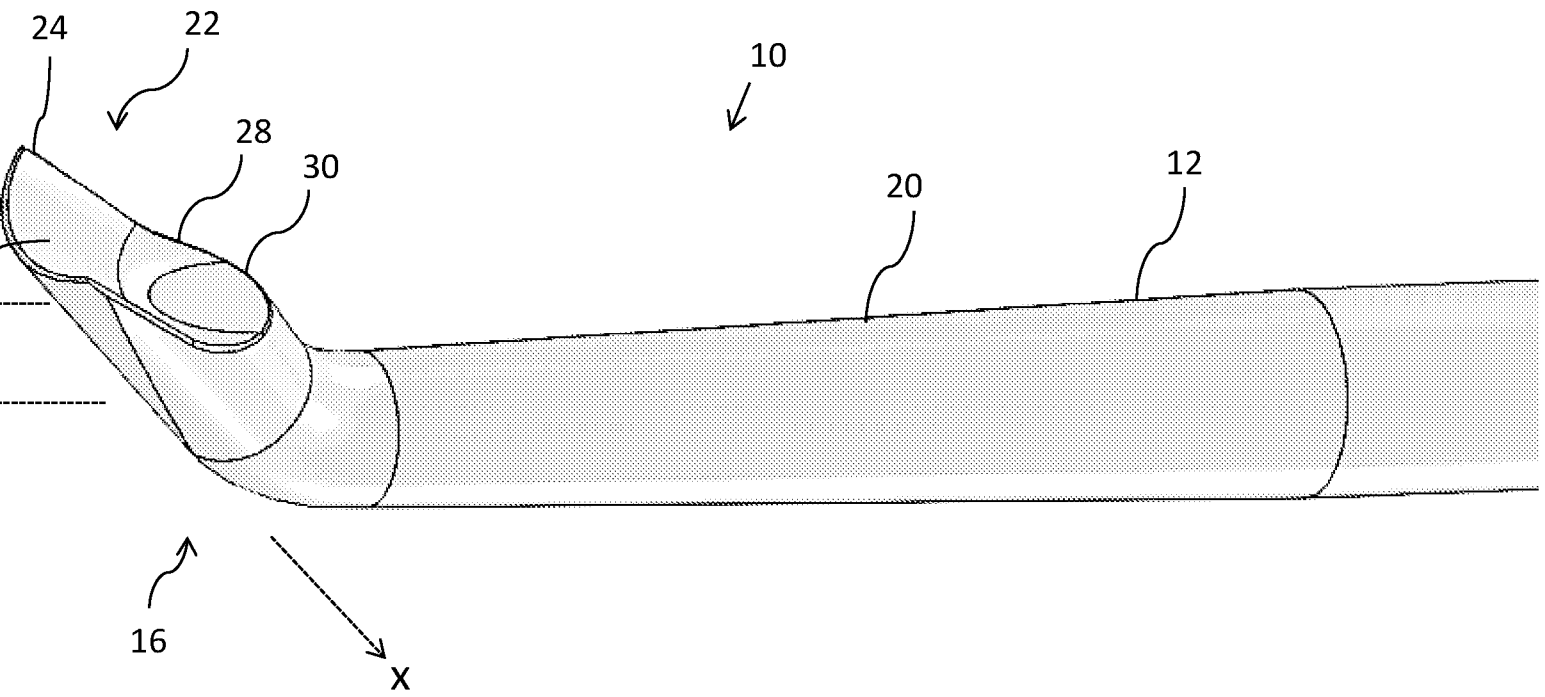
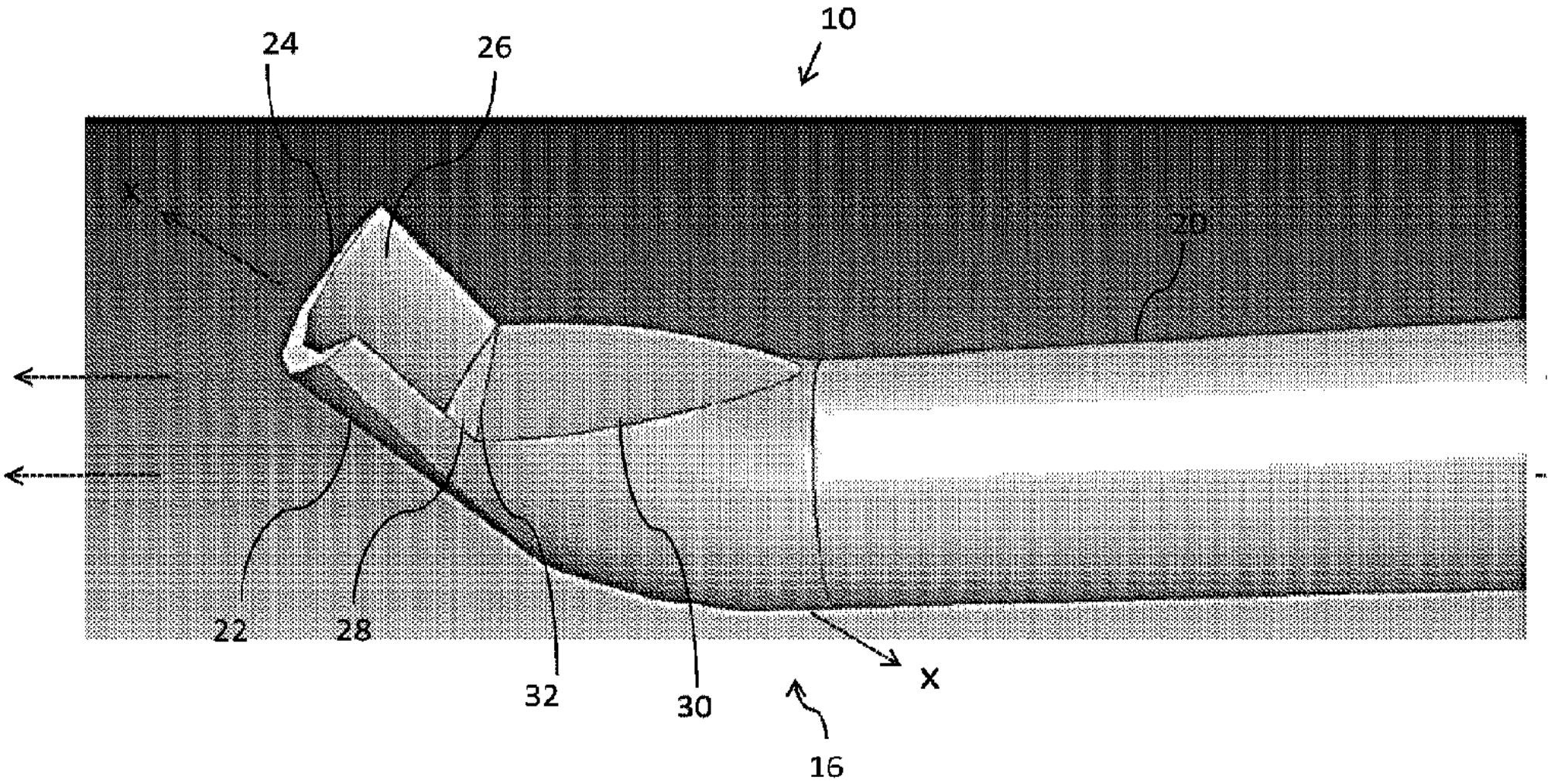


FIG. 4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