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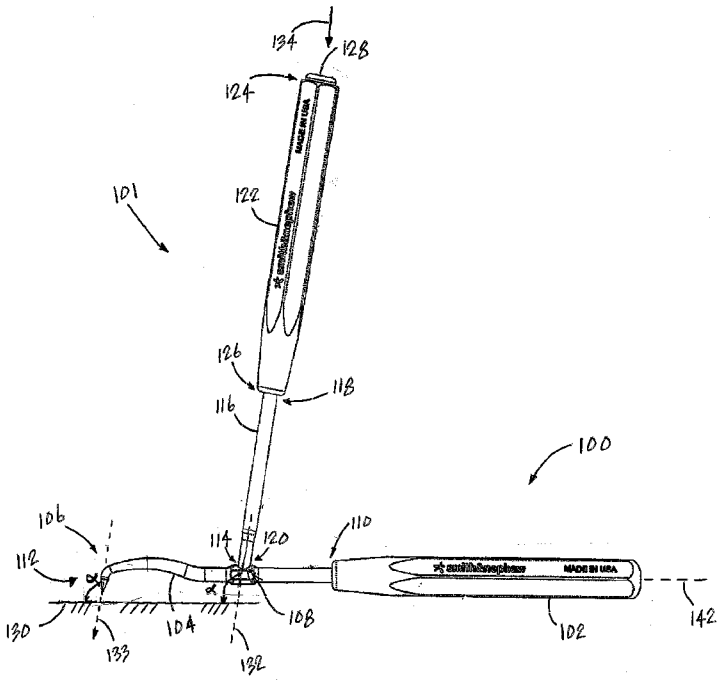
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) Title: MICROFRACTURE PICK



(57) Abstract: A microfracture pick having features configured to aid a user in advancing the microfracture pick through bone. The microfracture pick has an elongated member with a proximal end, a distal end, a sharp, optionally angled tip disposed adjacent the distal end of the elongated member, and at least one engaging feature disposed at one or more locations on the elongated member for engaging a complementary feature of a strike instrument. By striking an impact surface of the strike instrument, the user can to produce a force that is translated via the elongated member of the microfracture pick through the tip, thereby making penetration of the tip through the bone more effective.

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— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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MICROFRACTURE PICK

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CROSS REFERENCE TO RELATED APPLICATIONS

This patent application claims benefit of the priority of U.S. Provisional Patent Application No. 61/591,980 filed January 29, 2012 entitled MICROFRACTURE PICK.

FIELD OF THE INVENTION

[0001] The subject application relates generally to microfracture stimulation, and more specifically to surgical devices for use in performing microfracture stimulation.

BACKGROUND

[0002] In the human body, articulating joints are surfaced with hyaline cartilage, which is a durable natural material with a low coefficient-of-friction. Such hyaline cartilage surfaces can become damaged over time when subjected to high levels of repeated loading or injury, such as the loading that can occur when a person runs. This is particularly the case for articulating joints in the lower body that are subject to compressive forces, such as the joints located in the ankle, knee, hip, and spine.

[0003] In recent years, the resurfacing of cartilage surfaces has been widely studied in the orthopedic industry. One known method of resurfacing cartilage surfaces is referred to as “microfracture stimulation”. Instead of replacing damaged hyaline cartilage with an artificial cartilage implant, microfracture stimulation can be performed to stimulate the human body to replace the damaged cartilage with fibrous cartilage

tissue (also referred to herein as "fibrocartilage"). Fibrocartilage is generally not as robust as hyaline cartilage, and typically has a higher coefficient-of-friction compared with that of hyaline cartilage. Nonetheless, such fibrocartilage provides many people with reduced pain, enabling them to assume more active lifestyles.

[0004] A conventional microfracture pick for use in performing microfracture stimulation has a handle, a shaft coupled to the handle, and a sharp, optionally angled tip disposed at a distal end of the shaft. For example, conventional microfracture picks can have tips that are optionally bent at angles of about 20°, 40°, 60°, or 90° relative to the longitudinal axis of the shaft. In a typical mode of operation, microfracture stimulation first involves the removal of the damaged layer of cartilage. The thickness of the damaged cartilage layer can typically vary from about 1 mm to 6 mm. The sharp tip of the microfracture pick is then driven about 2 mm to 5 mm through underlying subchondral bone in the region of the removed layer of cartilage to reach a blood supply. The microfracture pick is then removed, causing a small channel to remain in the subchondral bone. The microfracture pick is typically used to create a series of such channels through the subchondral bone. As a result, blood eventually travels along the series of channels and clots in the region of the removed cartilage layer, ultimately causing the formation of fibrocartilage.

[0005] When a surgeon uses such a conventional microfracture pick to perforate the subchondral bone of a patient, he or she may experience difficulties manually advancing the sharp tip through a hard cortical layer of the bone. This can be problematic since not advancing the microfracture pick deep enough into the bone may prohibit the formation of fibrocartilage in the region of the removed cartilage layer. To

aid in advancing the sharp tip of the microfracture pick through the subchondral bone, surgeons have traditionally used a hammer or mallet to strike an end of the handle of the microfracture pick, while applying a downward pressure to the handle. However, such use of a hammer or mallet has drawbacks in that it can produce a shear force at the tip of the microfracture pick, potentially causing the tip to become broken or otherwise damaged. Such a broken tip can become a loose body in the surgical site, and can cause a delay in the progress of the microfracture procedure. In addition, the tip can skive across the bone surface, potentially causing the microfracture pick to impinge on and possibly damage surrounding tissue surfaces.

[0006] To address this problem, a strike plate can be directly attached to the shaft or handle of the conventional microfracture pick. Such a strike plate is typically attached to the shaft or handle perpendicular to the direction of the sharp tip of the microfracture pick. When a surgeon strikes the strike plate with a hammer or mallet, the resulting force causes the tip of the microfracture pick to advance through the subchondral bone. Directly attaching a strike plate to the shaft or handle of a microfracture pick also has drawbacks, however, in that it can make the microfracture pick heavy and cumbersome. The act of striking the strike plate so close to the patient's body can also be problematic, especially when performed near delicate joint access locations such as the ankle. The strike plate can also interfere with the microfracture procedure by preventing complete access to the surgical site, potentially making it extremely difficult for the surgeon to treat the entire affected surface area of the bone.

[0007] It would therefore be desirable to have a microfracture pick that avoids at least some of the drawbacks of the conventional microfracture picks discussed above.

SUMMARY

[0008] In accordance with the subject application, a surgical device (referred to herein as a "microfracture pick") is disclosed that has features configured to aid a user in advancing the microfracture pick through bone. In one aspect, the disclosed microfracture pick includes at least one elongated member such as a shaft having a proximal end and a distal end, a sharp, optionally angled tip disposed at the distal end of the shaft, an optional handle coupled to the proximal end of the shaft, and at least one engaging feature disposed at one or more locations on the shaft or handle for engaging a complementary feature of a strike instrument. In an exemplary aspect, the strike instrument includes at least one elongated member such as a shaft having a proximal end and a distal end, the complementary feature disposed at the distal end of the shaft, an optional handle having a proximal end as well as a distal end coupled to the proximal end of the shaft, and an impact surface disposed at the proximal end of the shaft or handle. In a further exemplary aspect, the engaging feature disposed on the shaft or handle of the microfracture pick is configured as a receptacle, and the complementary feature of the strike instrument is configured to operatively engage the receptacle on the microfracture pick. In another exemplary aspect, the complementary feature of the strike instrument is configured as a receptacle, and the engaging feature disposed on the shaft or handle of the microfracture pick is configured to operatively engage the receptacle on the strike instrument.

[0009] In another aspect, a system for use in performing a microfracture procedure is disclosed that includes a strike instrument having an elongated member such as a handle with a proximal end, a distal end, and a hole located near the distal

end of the handle, a strike pin configured to pass through the hole in the handle, an impact surface located at one end of the strike pin, and a complementary feature located at the other end of the strike pin. The system further includes a surgical device having an optional handle, an elongated member such as a shaft with a distal end, an engaging feature located on the shaft or handle, and a sharp, optionally angled tip located at the distal end of the shaft. The engaging feature of the surgical device is operative to engage the complementary feature of the strike instrument. Moreover, the handle of the strike instrument is configured to be disposed generally parallel to the longitudinal axis of the surgical device to facilitate engagement of the engaging feature with the complementary feature. Upon striking the impact surface of the strike instrument in a direction generally parallel to the direction of the tip of the surgical device, a force is produced that is translated via the shaft of the surgical device through the tip.

[0010] In a further aspect, a method of performing a microfracture procedure is disclosed that includes providing a surgical device having at least one elongated member such as a shaft with a proximal end and a distal end, a sharp, optionally angled tip disposed at the distal end of the shaft, an optional handle coupled to the proximal end of the shaft, and at least one engaging feature disposed at one or more locations on the shaft or handle for engaging a complementary feature of a strike instrument. The method also includes locating the tip at a desired point of stimulation, and striking an impact surface of the strike instrument in a direction generally parallel to the direction of the tip to produce a force that is translated via the shaft through the tip. The tip is then removed from the desired point of stimulation. Such use of a strike instrument in

performing a microfracture procedure allows a surgeon to place the microfracture perforation at the desired point of stimulation with increased accuracy. Such use of the strike instrument also reduces the amount of force that the surgeon must manually apply to the microfracture pick to achieve the desired microfracture perforation.

[0011] By providing a microfracture pick having an elongated member with a proximal end, a distal end, a sharp, optionally angled tip disposed at the distal end of the elongated member, and at least one engaging feature disposed at one or more locations on the elongated member for engaging a complementary feature of a strike instrument, a user can use the strike instrument to produce a force that is translated via the elongated member of the microfracture pick through the tip, thereby making penetration of the tip through bone more effective. As a result, the number of instances of fracturing the tip during use can be reduced. Further, the number of instances of skiving the tip along the bone surface during use can be substantially eliminated.

[0012] Other features, functions, and aspects of the invention will be evident from the Detailed Description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate one or more embodiments described herein and, together with the Detailed Description, explain these embodiments. In the drawings:

[0014] FIG. 1 is a side view illustrating an exemplary microfracture pick, and an exemplary strike instrument configured to operatively engage the microfracture pick, in accordance with the subject application;

[0015] FIG. 2 is a perspective view illustrating the microfracture pick of FIG. 1;

[0016] FIG. 3 is a perspective view illustrating the microfracture pick of FIG. 1, and the strike instrument of FIG. 1;

[0017] FIG. 4 is a sectional view illustrating the microfracture pick of FIG. 1, and the strike instrument of FIG. 1, including an engaging feature of the microfracture pick, and a complementary feature of the strike instrument;

[0018] FIG. 5 is a perspective view illustrating a first alternative embodiment of the microfracture pick of FIG. 1;

[0019] FIG. 6 is a perspective view illustrating a second alternative embodiment of the microfracture pick of FIG. 1;

[0020] FIG. 7 is a perspective view illustrating an exemplary microfracture pick, and an alternative embodiment of the strike instrument of FIG. 1;

[0021] FIG. 8 is another perspective view illustrating the microfracture pick of FIG. 7, and the strike instrument of FIG. 7; and

[0022] FIG. 9 is a flow diagram illustrating a method of performing a microfracture procedure using the microfracture pick of FIG. 1.

DETAILED DESCRIPTION

[0023] The disclosure of U.S. Provisional Patent Application No. 61/591,980 filed January 29, 2012 entitled MICROFRACTURE PICK is incorporated herein by reference in its entirety.

[0024] A microfracture pick is disclosed having features configured to aid a user in advancing the microfracture pick through bone. The microfracture pick has a shaft with a proximal end, a distal end, a sharp, optionally angled tip located at the distal end of the shaft, and at least one engaging feature disposed at one or more locations on the shaft for engaging a complementary feature of a strike instrument. By striking an impact surface of the strike instrument, the user can produce a force that is translated via the shaft of the microfracture pick through its tip, thereby making penetration of the tip through the bone more effective.

[0025] FIG. 1 depicts an illustrative embodiment of a microfracture pick 100, in accordance with the subject application. As shown in FIG. 1, the microfracture pick 100 has a proximal portion that includes an elongated handle 102, and a distal portion that includes a generally elongated shaft 104, which has a proximal end 110 and a distal end 112. The handle 102 is coupled to the proximal end 110 of the shaft 104. The microfracture pick 100 further includes a sharp, optionally angled tip 106 located at the distal end 112 of the shaft 104, and an engaging feature 108 disposed at a fixed location on the shaft 104 for engaging a complementary feature 114 of a strike instrument 101. The strike instrument 101 can include a shaft 116 that has a proximal end 118 and a distal end 120, and the complementary feature 114 can be located at the

distal end 120 of the shaft 116. The strike instrument 101 can further include a handle 122 having a proximal end 124 and a distal end 126 coupled to the proximal end 118 of the shaft 116, and an impact surface 128 located at the proximal end 124 of the handle 122.

[0026] It is noted that the handle 122, the shaft 116, and the impact surface 128 of the strike instrument 101 can be implemented as a single component. Likewise, the handle 102 and the shaft 104 of the microfracture pick 100 can be implemented as a single component. It is also noted that the shaft 104 of the microfracture pick 100, as well as the shaft 116 of the strike instrument 101, can be made from machined medical grade material such as hardened stainless steel, or any other suitable material. Further, the handle 102 of the microfracture pick 100, as well as the handle 122 of the strike instrument 101, can have a cylindrical shape, or any other suitable shape. In some embodiments, the handle 102 of the microfracture pick 100 may be omitted. Moreover, the tip 106 can be optionally bent at an angle of about 20°, 40°, 60°, 90°, or any other suitable angle, relative to the longitudinal axis 142 of the microfracture pick 100. For example, the tip 106 can be optionally bent at an angle greater than 90° relative to the longitudinal axis 142 by bending the tip 106 back toward the handle 102.

[0027] During use, the direction 133 of the sharp tip 106 of the microfracture pick 100 can be aligned at an angle α relative to a surface 130 (see FIG. 1), which can correspond to the surface of bone. Once the complementary feature 114 of the strike instrument 101 is engaged with the engaging feature 108 of the microfracture pick 100, the longitudinal axis 132 the strike instrument 101 can be aligned at about the same

angle α relative to the surface 130. Accordingly, when a user (*e.g.*, a surgeon) strikes the impact surface 128 of the strike instrument 101 with a hammer, mallet, or any other suitable striking implement, in a direction substantially parallel to the direction 133 of the tip 106, a force 134 is produced that is translated via the shaft 104 of the microfracture pick 100 through the tip 106.

[0028] FIG. 2 depicts a perspective view of the microfracture pick 100, including the handle 102, the shaft 104, the sharp, optionally angled tip 106, and the engaging feature (see reference numeral 108; FIG. 1), which is configured as a receptacle 208. In this illustrative embodiment, the complementary feature 114 of the strike instrument 101 (see FIG. 1) is configured to operatively engage the receptacle 208 of the microfracture pick 100. To assure that the strike instrument 101 is aligned at about the same angle α as the tip 106 relative to the surface 130 (see FIG. 1) while the complementary feature 114 is engaged with the receptacle 208, the receptacle 208 can be configured such that its axis 232 is substantially parallel to the direction 133 of the tip 106. Accordingly, if the surgeon experiences difficulties advancing the tip 106 of microfracture pick 100 through bone, he or she can insert the complementary feature 114 of the strike instrument 101 into the receptacle 208 of the microfracture pick 100, and strike the impact surface 128 of the strike instrument 101 one or more times with a hammer or mallet to produce a force along the axis 232 of the receptacle 208, thereby facilitating advancement of the tip 106 through the bone.

[0029] FIG. 3 depicts a perspective view illustrating the microfracture pick 100 and the strike instrument 101, in which the complementary feature (see reference

numeral 114; FIG. 1) is configured to include an optional nub 317 that can be temporarily or permanently fixated to the receptacle 208 of the microfracture pick 100. For example, the optional nub 317, or an end of the shaft 116 without the nub 317, can be temporarily or permanently fixated to the receptacle 208 by way of threading, a press fit, a lever lock, a cam lock, a snap fit, a set screw, a taper fit, a luer lock (with or without taper), or any other suitable mechanism.

[0030] FIG. 4 depicts a sectional view illustrating the microfracture pick 100 including the receptacle 208, as well as the strike instrument 101 including the optional nub 317. In the sectional view of FIG. 4, the receptacle 208 is illustrated as being substantially internal to the shaft 104 of the microfracture pick 100. To assure that the strike instrument 101 is aligned at about the same angle α as the sharp, optionally angled tip 106 relative to the surface 130 while the nub 317 is engaged with the receptacle 208, the receptacle 208 can be configured such that its axis 232 is substantially parallel to the direction 133 of the tip 106. For example, the nub 317 can be configured as a male connector or any other suitable connector, and the receptacle 208 can be configured as a female connector or any other suitable connector. In some embodiments, the microfracture pick 100 can be configured to include a male connector, and the strike instrument 101 can be configured to include a female connector for engaging the male connector of the microfracture pick 100. Such male and female connectors can be temporarily or permanently fixated to one another by way of threading, a press fit, a lever lock, a cam lock, a snap fit, a set screw, a taper fit, a luer lock (with or without taper), or any other suitable mechanism. Further, the receptacle 208 can be configured to include an external drain hole 409 for sterilization

and/or dry time purposes, as well as for avoiding a possible build-up of fluid in the receptacle 208 during use. For example, the external drain hole 409 can have a diameter of about 2 mm, or any other suitable diameter.

[0031] Having described the above illustrative embodiments of the disclosed microfracture pick, other alternative embodiments or variations may be made. For example, it was described with reference to FIG. 1 that the microfracture pick 100 includes the engaging feature 108 disposed at a fixed location on the shaft 104 for engaging the complementary feature 114 of the strike instrument 101. FIG. 5 depicts an alternative embodiment of a microfracture pick 500 that includes a handle 502, a shaft 504, a sharp, optionally angled tip 506, and an engaging feature 508. As shown in FIG. 5, the shaft 504 is configured to incorporate a channel 540 along at least a portion of its length, and the engaging feature 508 is configured to engage and slide along the channel 540 to a desired location on the shaft 504. The channel 540 is substantially parallel to the longitudinal axis 542 of the shaft 504. Further, the engaging feature 508 can be configured to include a receptacle like the receptacle 208 of FIG. 2. Once the engaging feature 508 is slid or otherwise moved along the channel 540 to the desired location on the shaft 504, the engaging feature 508 can be temporarily or permanently fixated at that location on the shaft 504 by at least one stop member 544, which, as shown in FIG. 5, can be inserted into or otherwise engaged with the channel 540 adjacent the engaging feature 508, or by any other suitable mechanism. In alternative embodiments, the engaging feature 508 can be temporarily or permanently fixated at a desired location on the shaft 504. In further alternative embodiments, the engaging feature 508 can be removed if it is not required to perform the microfracture procedure.

[0032] FIG. 6 depicts another alternative embodiment of a microfracture pick 600 that includes a handle 602, a shaft 604, a sharp, optionally angled tip 606, and a plurality of engaging features 608.1, 608.2, 608.3 disposed at a plurality of fixed locations, respectively, on the shaft 604. FIG. 6 depicts three (3) such engaging features on the shaft 604 for purposes of illustration. It should be understood, however, that the microfracture pick 600 can include any suitable number of engaging features disposed at respective locations on the shaft 604. For example, each of the plurality of engaging features 608.1, 608.2, 608.3 can be configured to include a receptacle like the receptacle 208 of FIG. 2. FIG. 6 further depicts a strike instrument 601, in which the complementary feature is configured to include an optional nub 617 at an end of a shaft 616 that can be temporarily or permanently fixated to a selected one of the plurality of engaging features 608.1, 608.2, 608.3 on the shaft 604. For example, the optional nub 617, or the end of the shaft 616 without the nub 617, can be temporarily or permanently fixated to the selected engaging feature 608.1, 608.2, or 608.3 by way of threading, a press fit, a lever lock, a cam lock, a snap fit, a set screw, a taper fit, a luer lock (with or without taper), or any other suitable mechanism.

[0033] FIG. 7 depicts an alternative embodiment of a strike instrument 701, which includes a complementary feature 714 for engaging an engaging feature 708 of a microfracture pick 700. As shown in FIG. 7, the strike instrument 701 includes a handle 722 having a proximal end 711, a distal end 713, and a hole 719 located near the distal end 713 of the handle 722. The strike instrument 701 further includes a strike pin 715 configured to pass snugly through the hole 719, the complementary feature 714 located at one end of the strike pin 715, and an impact surface 728 located at the other end of

the strike pin 715. It is noted that the handle 722, the strike pin 715, and the impact surface 728 of the strike instrument 701 can be implemented as a single component. As further shown in FIG. 7, the microfracture pick 700 includes a handle 702, a shaft 704, the engaging feature 708 located on the shaft 704, and a sharp, optionally angled tip 706 located at a distal end of the shaft 704. It is noted that the strike pin 715 can be temporarily or permanently fixated in the hole 719 through the handle 722 of the strike instrument 701.

[0034] FIG. 8 depicts the microfracture pick 700 and the strike instrument 701, in which the complementary feature 714 of the strike instrument 701 is configured to include an optional nub 717, and the engaging feature 708 of the microfracture pick 700 is configured to include a receptacle 709. For example, the optional nub 717, or an end of the strike pin 715 without the nub 717, can be temporarily or permanently fixated to the receptacle 709 of the microfracture pick 700 by way of threading, a press fit, a lever lock, a cam lock, a snap fit, a set screw, a taper fit, a luer lock (with or without taper), or any other suitable mechanism.

[0035] During use, the handle 722 of the strike instrument 701 can be temporarily or permanently fixated to the handle 702 of the microfracture pick 700 substantially parallel to its longitudinal axis 742, thereby allowing the surgeon to hold both the handle 722 of the strike instrument 701 and the handle 702 of the microfracture pick 700 with the same hand. For example, the handle 722 of the strike instrument 701 can be temporarily or permanently fixated to the handle 702 of the microfracture pick 700 by way of threading, a press fit, a lever lock, a cam lock, a snap fit, a set screw, a taper fit, a luer lock (with or without taper), a bayonet mount, or any other suitable mechanism.

Further, the strike pin 715 can pass through the hole 719 in the handle 722 to engage the nub 717 of the strike instrument 701 with the receptacle 709 of the microfracture pick 700. To assure that the strike pin 715 is aligned at about the same angle α as the sharp tip 706 relative to a surface 730 while the nub 717 is engaged with the receptacle 709, the receptacle 709 can be configured such that its axis 732 is substantially parallel to the direction 733 of the tip 706. Accordingly, if the surgeon experiences difficulties advancing the tip 706 of microfracture pick 700 through bone, he or she can strike the impact surface 728 of the strike pin 715 one or more times with a hammer or mallet to produce a force 734 along the axis 732 of the receptacle 709, thereby facilitating advancement of the tip 706 through the bone.

[0036] It was further described herein that the microfracture pick could include a receptacle on its shaft, and the strike instrument could include an optional nub on its shaft for engaging the receptacle. In further alternative embodiments, the microfracture pick can include at least one engaging feature configured like a nub at a fixed or movable location on its shaft, and the strike instrument can include at least one complementary feature configured like a receptacle on its shaft. For example, such a receptacle on the shaft of the strike instrument can have a forked configuration for cradling the nub on the shaft of the microfracture pick. Moreover, the microfracture pick can alternatively include a nub or receptacle, such as a male or female connector, on its handle for engaging a complementary feature on the strike instrument. Likewise, the strike instrument can alternatively include a nub or receptacle, such as a male or female connector, on its handle for complementarily engaging an engaging feature on the microfracture pick.

[0037] It was also described herein that the microfracture pick could include a plurality of engaging features disposed at respective locations on its shaft for engaging a complementary feature of the strike instrument. In further alternative embodiments, the plurality of engaging features of the microfracture pick can be configured as respective receptacles having parallel or non-parallel axes. In addition, the plurality of engaging features of the microfracture pick can each be configured to accept a different configuration of the complementary feature of the strike instrument.

[0038] A method of performing a microfracture procedure, using the disclosed microfracture pick, is described below with reference to FIG. 9. As depicted in block 902, the method includes providing a microfracture pick having a shaft with a proximal end and a distal end, an optionally angled tip disposed at the distal end of the shaft, a handle coupled to the proximal end of the shaft, and at least one engaging feature disposed at one or more locations on the shaft for engaging a complementary feature of a strike instrument. As depicted in block 904, the tip is located at a desired point of stimulation. For example, while locating the tip at the desired point of stimulation, at least a portion of the shaft may be inserted into an arthroscopic cannula. As depicted in block 906, an impact surface of the strike instrument is struck by a hammer or mallet in a direction generally parallel to the direction of the tip to produce a force that is translated via the shaft through the tip at the desired point of stimulation. As depicted in block 908, the tip is then removed from the desired point of stimulation.

[0039] Although the above illustrative embodiments of the disclosed microfracture pick have been described for use in the context of resurfacing cartilage surfaces, they can also be used for perforating the subchondral bone in the subtalar/talus space

(ankle) in arthrodesis procedures. In such arthrodesis procedures, a surgeon typically removes the cartilage on both the subtalar bone and the talus bone, and uses the microfracture pick to perforate the subtalar and talus bones in multiple places to promote bleeding. A screw is then delivered between the subtalar and talus bones to fuse the two bones together.

[0040] It will be appreciated by those of ordinary skill in the art that further modifications to and variations of the above-described microfracture pick may be made without departing from the inventive concepts disclosed herein. Accordingly, the invention should not be viewed as limited except as by the scope and spirit of the appended claims.

CLAIMS

What is claimed is:

1. A surgical device for use in performing a microfracture procedure, comprising:

an elongated member having a proximal end and a distal end;

a tip disposed adjacent the distal end of the elongated member; and

at least one engaging feature disposed at one or more locations on the elongated member for engaging a complementary feature of a strike instrument,

whereby, upon striking an impact surface of the strike instrument in a direction generally parallel to a direction of the tip, a force is produced that is translated via the elongated member through the tip.

2. The surgical device of claim 1 wherein the engaging feature is configured as a receptacle.

3. The surgical device of claim 2 wherein the receptacle has an axis that is generally parallel to the direction of the tip.

4. The surgical device of claim 2 or claim 3 wherein the receptacle has an external drain hole.

5. The surgical device of any one of claims 1 to 4 wherein the engaging feature is configured as one of a female connector and a male connector.

6. The surgical device of claim 1 wherein the elongated member includes a channel along at least a portion of its length, and the engaging feature is configured to engage and slide along the channel to a desired location on the elongated member.

7. The surgical device of claim 6 further comprising:

at least one stop member operative to fixate the engaging feature at the desired location on the elongated member.

8. The surgical device of claim 1 further comprising:

a plurality of engaging features disposed at respective locations on the elongated member, each engaging feature for engaging the complementary feature of the strike instrument.

9. The surgical device of claim 8 wherein at least some of the engaging features have parallel axes.

10. The surgical device of claim 8 wherein at least some of the engaging features have non-parallel axes.

11. The surgical device of claim 8 wherein at least some of the engaging features are configured to engage different configurations of the complementary feature of the strike instrument.

12. A system for use in performing a microfracture procedure, comprising:

a strike instrument including an elongated member having a proximal end, a distal end, and a hole in the elongated member near its distal end, a strike pin configured to pass through the hole in the elongated member, and an impact surface located at one end of the strike pin; and

a surgical device including an elongated member having a distal end, an engaging feature located on the elongated member, and a tip disposed adjacent the distal end of the elongated member,

wherein the strike instrument further includes a complementary feature located at another end of the strike pin,

wherein the engaging feature of the surgical device is operative to engage the complementary feature of the strike instrument, and

wherein the elongated member of the strike instrument is configured to be disposed generally parallel to a longitudinal axis of the surgical device to allow engagement of the engaging feature with the complementary feature,

whereby, upon striking the impact surface of the strike instrument in a direction generally parallel to a direction of the tip of the surgical device, a force is produced that is translated via the elongated member of the surgical device through the tip.

13. The system of claim 12 wherein the elongated member of the strike instrument is configured to be at least temporarily fixated to the surgical device.

14. The system of claim 12 wherein the engaging feature of the surgical device is configured as a female connector, and the complementary feature of the strike instrument is configured as a male connector.

15. The system of claim 12 wherein the engaging feature of the surgical device is configured as a male connector, and the complementary feature of the strike instrument is configured as a female connector.

16. A method of performing a microfracture procedure, comprising the steps of:

providing a surgical device including an elongated member having a proximal end and a distal end, a tip disposed adjacent the distal end of the elongated member, and at least one engaging feature disposed at one or more locations on the elongated member for engaging a complementary feature of a strike instrument;

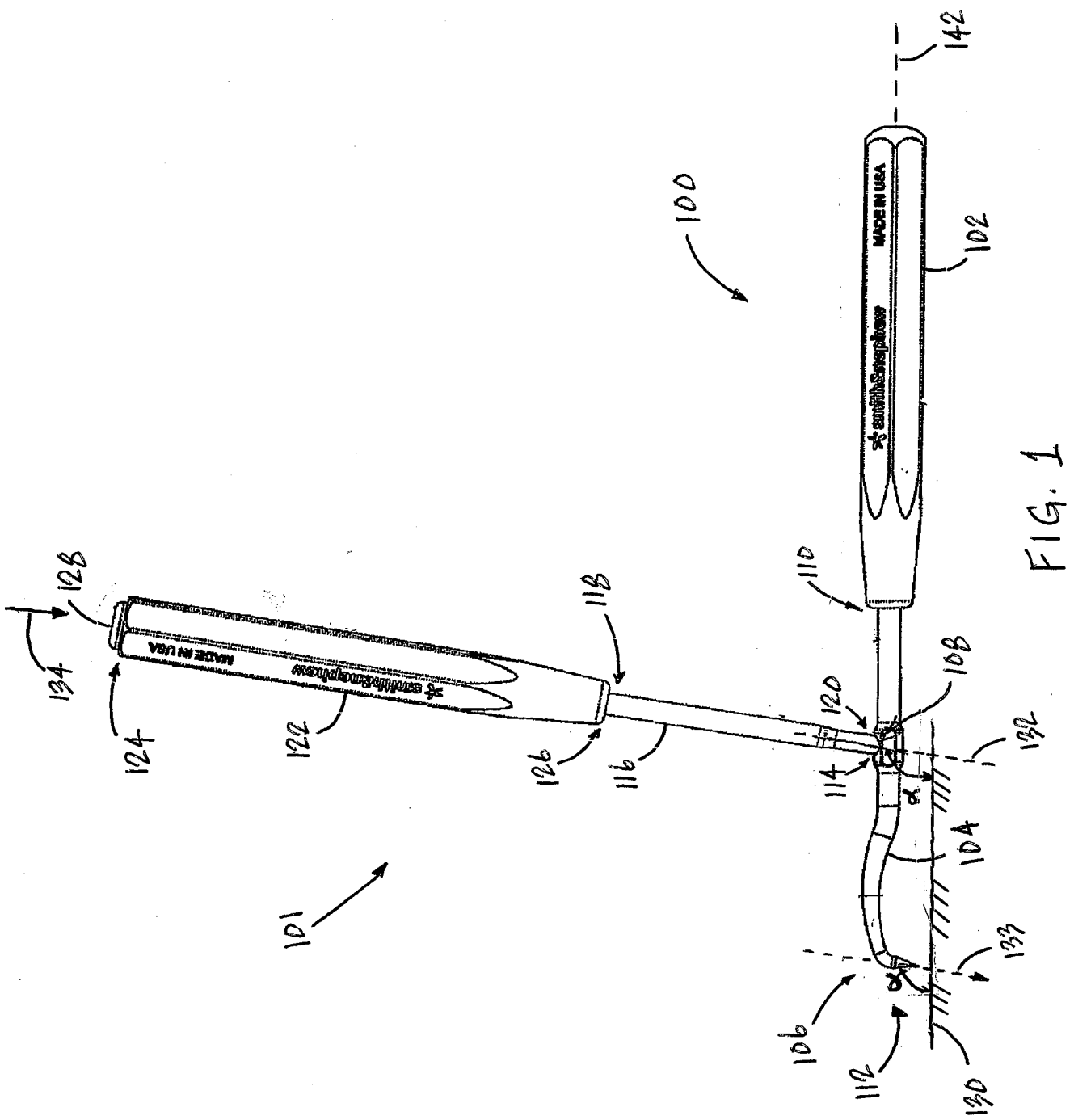
locating the tip at a desired point of stimulation;

striking an impact surface of the strike instrument in a direction generally parallel to a direction of the tip to produce a force that is translated via the elongated member through the tip; and

removing the tip from the desired point of stimulation.

17. The method of claim 16 wherein the elongated member of the surgical device includes a channel along at least a portion of its length, wherein the engaging feature is disposed in the channel, and wherein the method further comprises:

sliding the engaging feature along the channel to a desired location on the elongated member.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142
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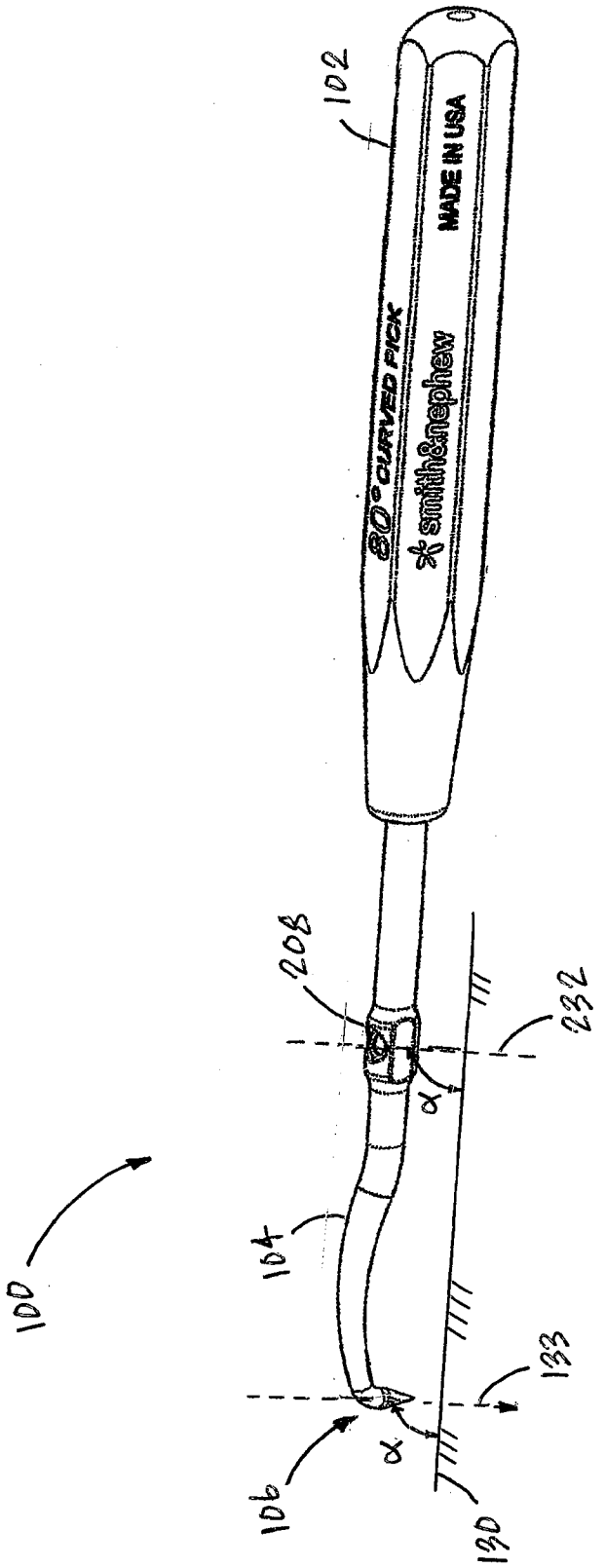
smithsaxophone

FIG. 1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α
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133
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α
130

FIG. 2

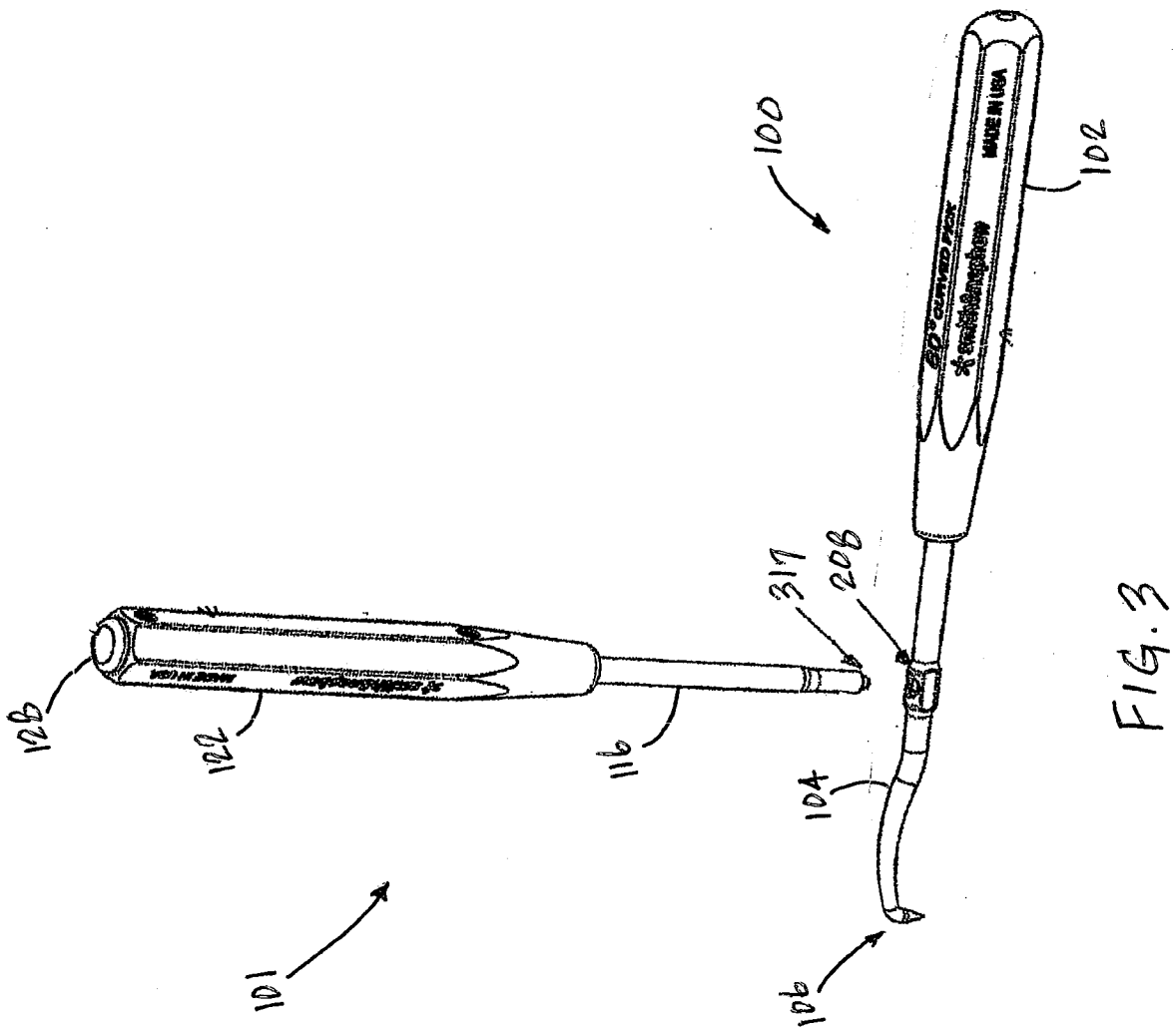


FIG. 3

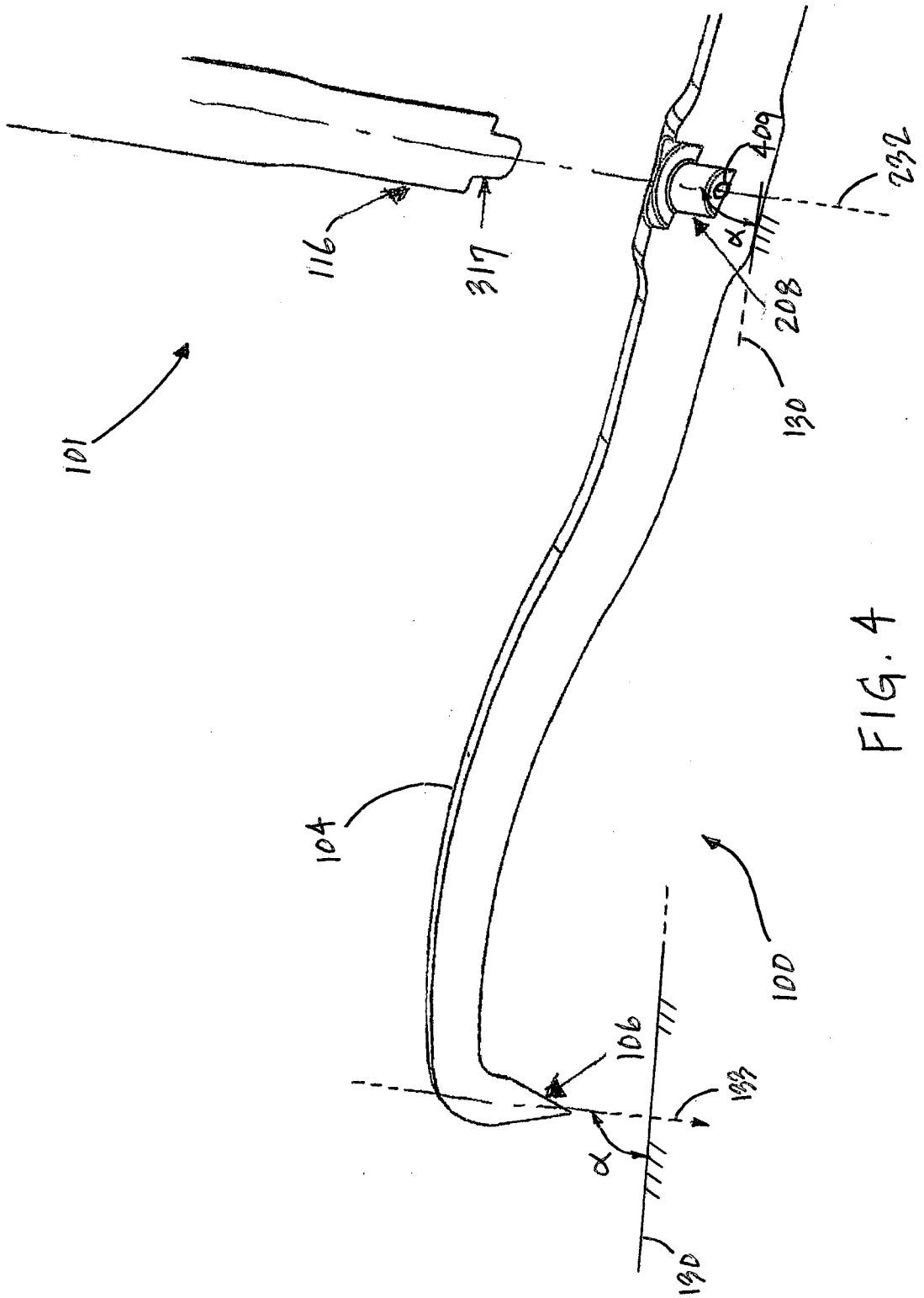


FIG. 4

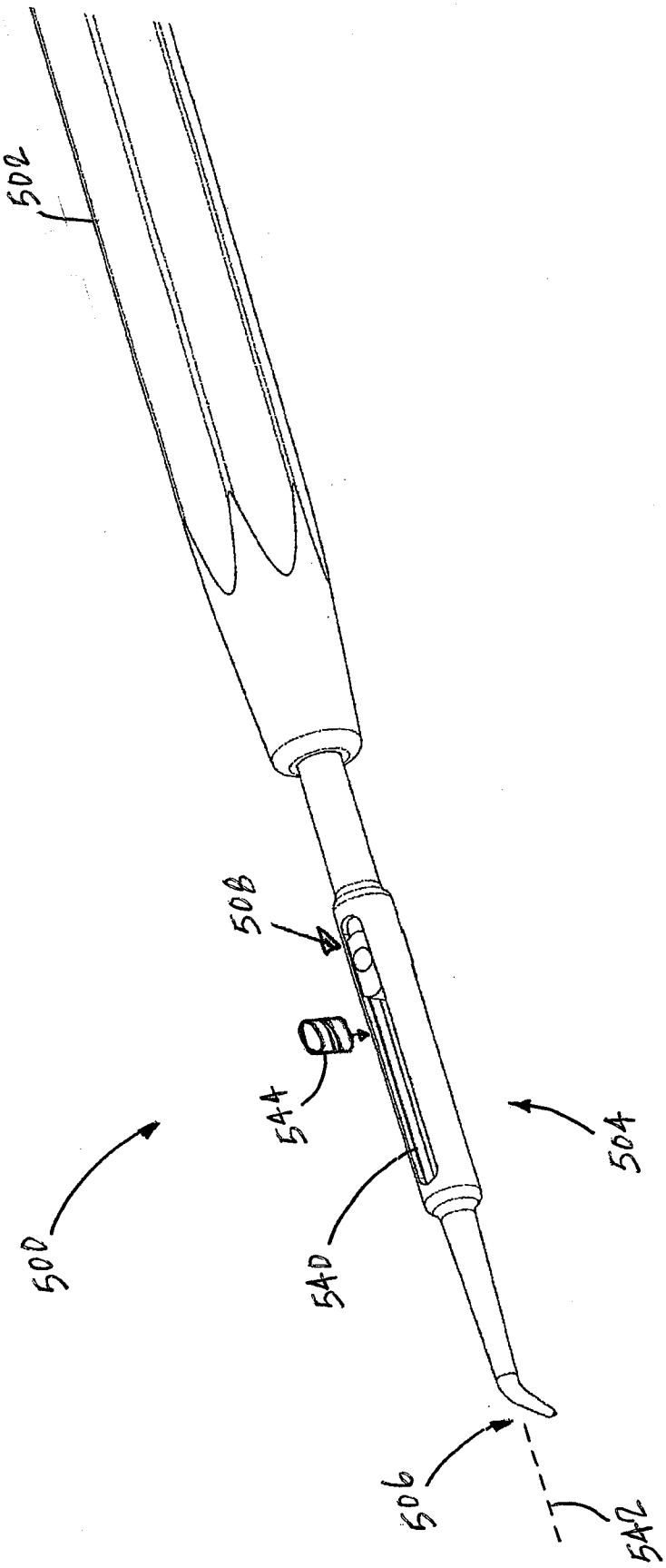


FIG. 5

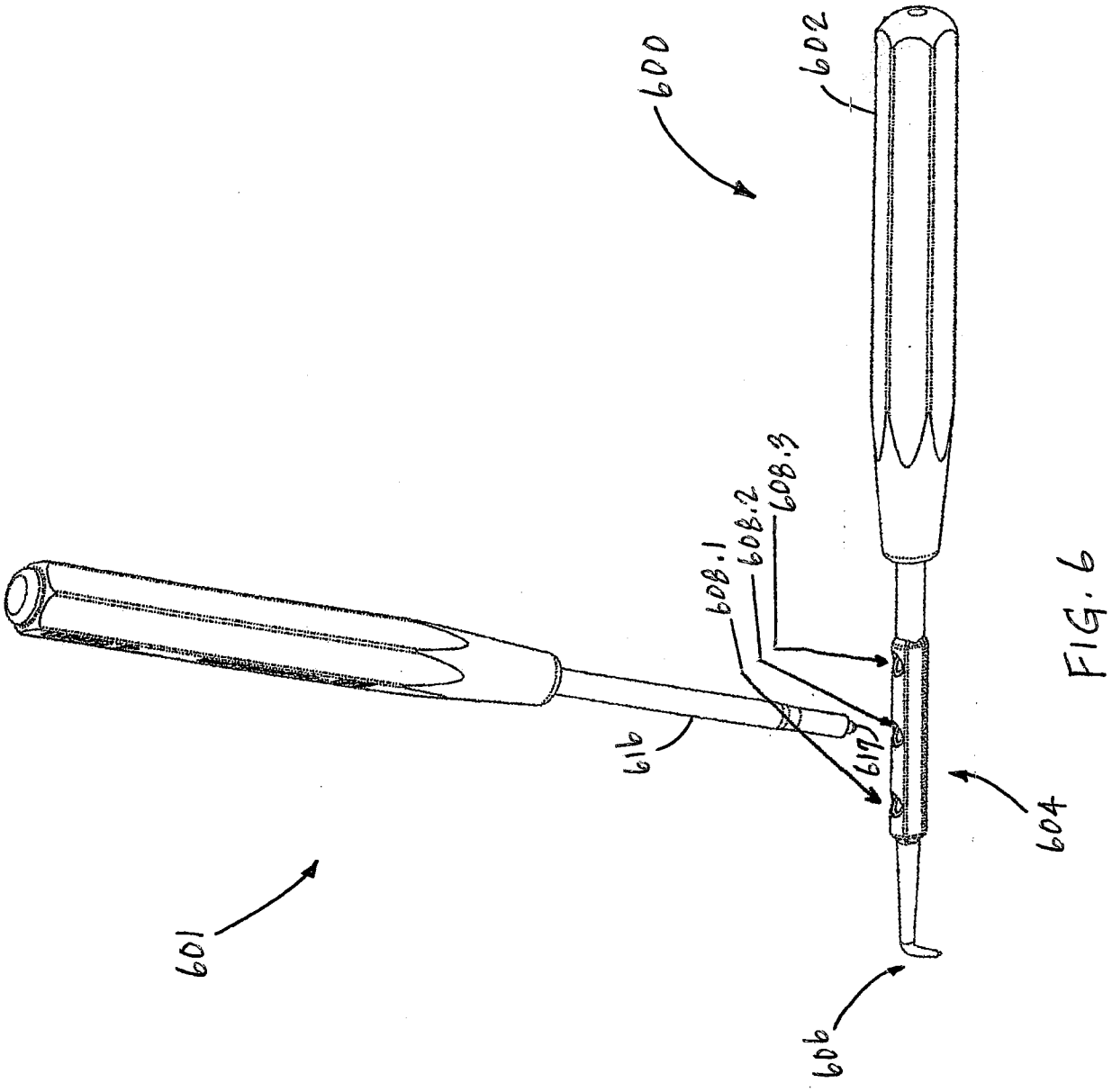


FIG. 6

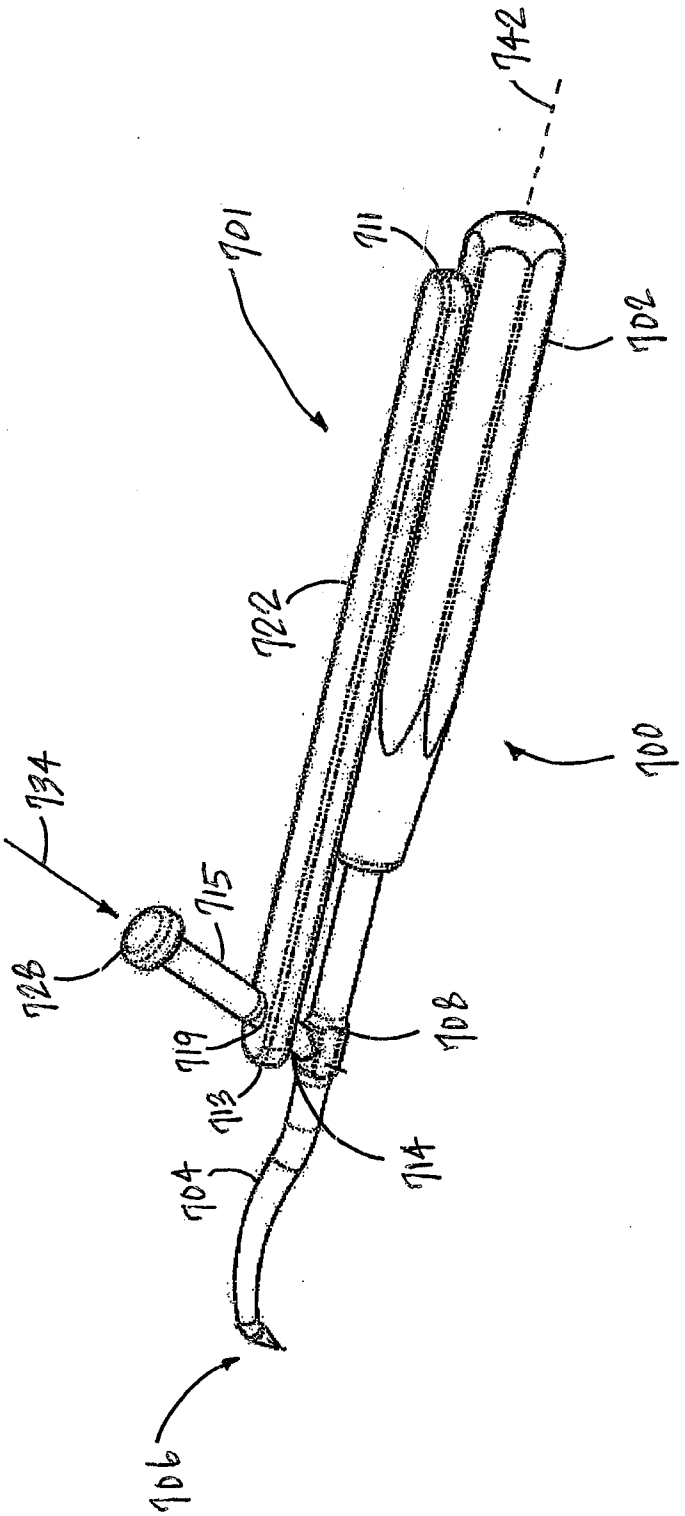
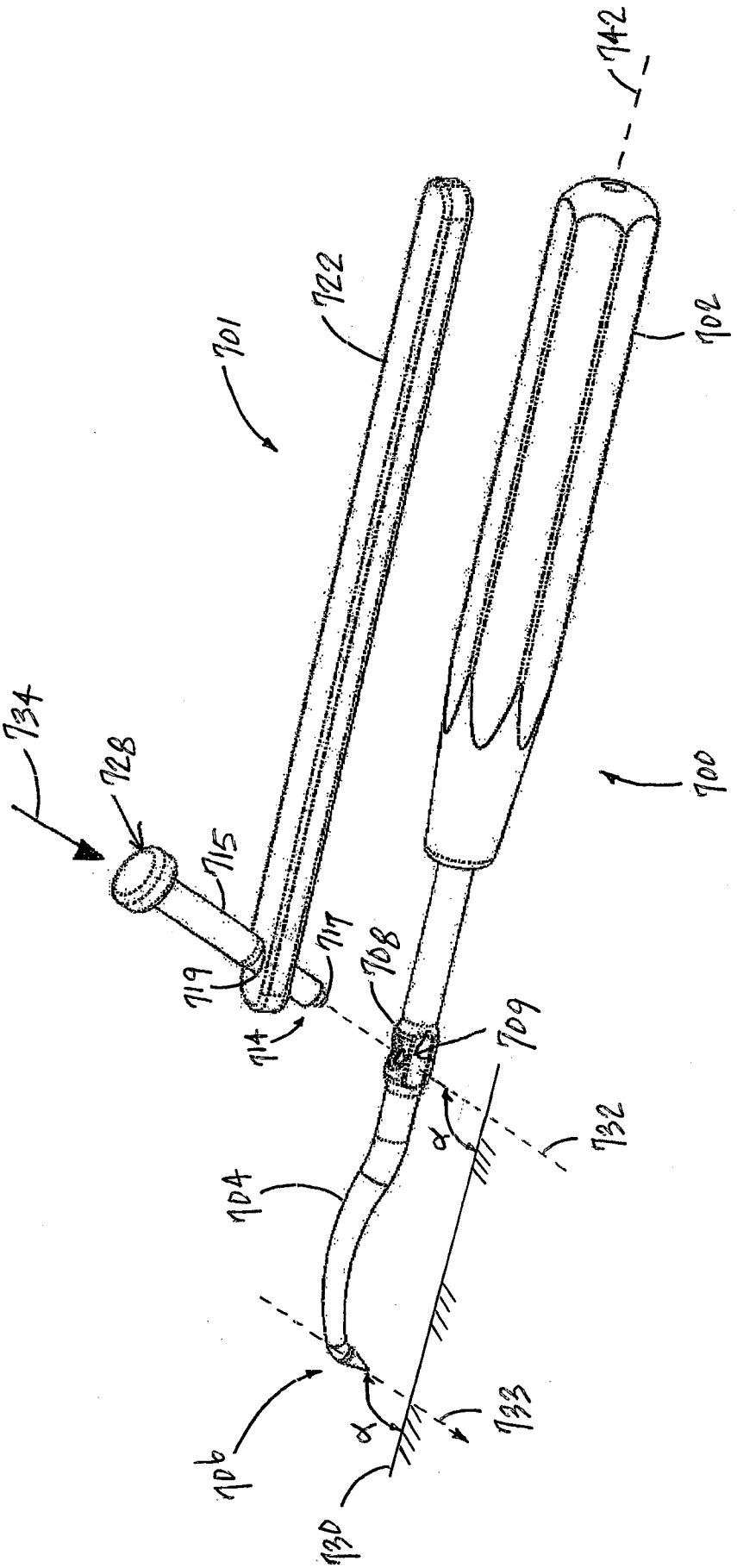


FIG. 1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100

FIG. 8

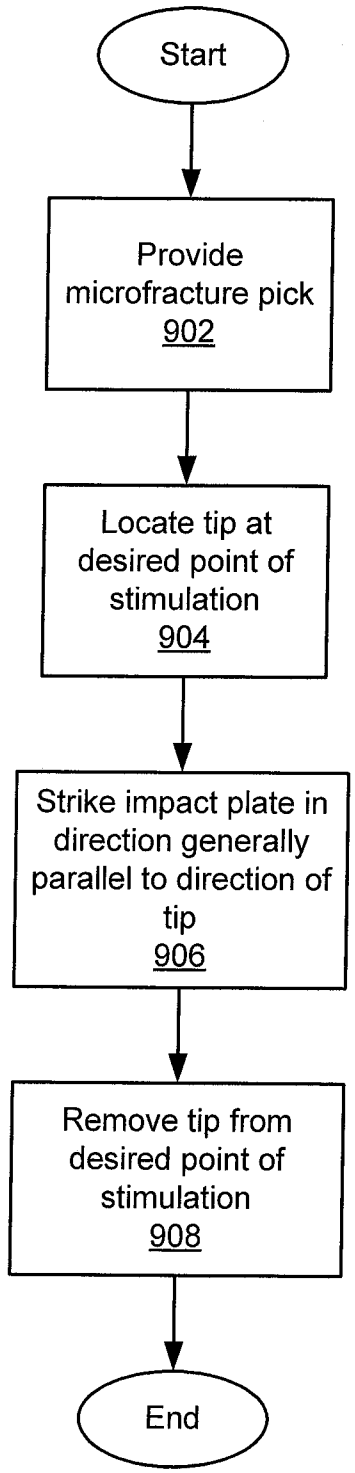
Start
Provide microfracture pick 902
Locate tip at desired point of stimulation 904
Strike impact plate in direction generally parallel to direction of tip 906
Remove tip from desired point of stimulation 908
End

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/021400

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/16
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	WO 2007/106895 A2 (TORRIE PAUL ALEXANDER [US]; PHILIPPON MARC [US] SMITH & NEPHEW INC [US) 20 September 2007 (2007-09-20) paragraphs [0039] - [0042]; figures 5-8	1-5
X	WO 2008/045902 A2 (KIRSCHENBAUM IRA [US]) 17 April 2008 (2008-04-17) page 12, line 17 - page 14, line 8; figures 1A,1B,8A-8F page 26, line 6 - page 27, line 17	1,5-7
X	US 2004/073223 A1 (BURKINSHAW BRIAN [US]) 15 April 2004 (2004-04-15) paragraphs [0038] - [0042]; figures 1-3	1
X	WO 2009/129272 A2 (PAULOS LONNIE [US]) 22 October 2009 (2009-10-22) paragraph [0031]; figures 1A,1B	1

☐ 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

"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
28 February 2013	12/03/2013

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	Fourcade, Olivier

1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/021400

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.: 16, 17
because they relate to subject matter not required to be searched by this Authority, namely:

see FURTHER INFORMATION sheet PCT/ISA/210

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/US2013/021400

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007106895 A2	20-09-2007	AU 2007226568 A1	20-09-2007
		EP 2001374 A2	17-12-2008
		JP 2009529987 A	27-08-2009
		US 2007270870 A1	22-11-2007
		WO 2007106895 A2	20-09-2007
WO 2008045902 A2	17-04-2008	US 2010191195 A1	29-07-2010
		WO 2008045902 A2	17-04-2008
US 2004073223 A1	15-04-2004	NONE	
WO 2009129272 A2	22-10-2009	US 2011034945 A1	10-02-2011
		WO 2009129272 A2	22-10-2009

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 16, 17

Claims 16 and 17 relate to subject-matter covered by the provisions of Rule 39.1(iv) PCT (Method for treatment of the human or animal body by surgery). Consequently, no opinion will be formulated with respect to the industrial applicability of the subject-matter of these claims which are also not searched.