Abstract: A combined apparatus for compression and distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising a connected rod fixedly connected to one of the first and second bone screw heads and slidably connected to the other of the first and second bone screw heads, a rod holder, and an adjusting member comprising an adjusting means and a turning means, such that when the adjusting member is turned by use of the turning means, the adjusting means forces an increase in distance between the rod holder and adjacent bone screw head, resulting in compression or distraction as desired of the physical components.
— as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
— of inventorship (Rule 4.17(iv))
Published:
— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
— with information concerning request for restoration of the right of priority in respect of one or more priority claims (Rules 26bis.3 and 48.2(b)(vii))
Spinal Compressor and Disiractor

[001] Cross-References to Related Applications:

This Application claims priority to, and Incorporates and restates, U.S. Non-Provisional Application Number 14/200,785, Spinal Compressor and Disiractor by Dr. John Song, filed on March 7, 2014. Said Application is incorporated by reference in its entirety herein.

[002] Statement Regarding Federally Sponsored Research or Development:

Not applicable.

Technical Field

[003] We have discovered, in accordance with the present invention, an apparatus for both compression and distraction of physical components within the body during surgery that is superior to tools for surgical compression and tools for surgical distraction currently known to the art.

Background Art

[004] During orthopedic surgical procedures, such as by way of example spinal orthopedic surgery, it is often desirable to use pedicle screws or other bone screws. Such screws can serve a variety of functions, such as stabilizing the spine, fixating two or more vertebrae with respect to each other, or serving as anchor points for various instruments such as rods, retractors, compressors, and distractors.

[005] During orthopedic surgical procedures, it is also often desirable to distract various physical components into locations further separated from each other, such as distracting two vertebrae to increase the space between them. Distraction can be desirable to, among other
functions, increase the space between two vertebrae preparatory to the insertion of an implant. In other situations, it is desirable to compress various physical components into locations closer to each other, such as compressing two vertebrae to decrease the space between them. Compression can be desirable to, among other functions, space two vertebrae a desired distance from each other prior to fixating the vertebrae.

[006] In some situations in orthopedic surgery, it is desirable both to distract and to compress various physical components during the same surgical procedure. At times, both distraction and compression are desirable at the same physical location, with respect to the same physical components, at various times during the procedure. In orthopedic spinal surgery, by way of example, compression and/or distraction may be desirable with respect to vertebrae that are to be fixated with pedicle or other bone screws.

[007] Tools adapted to distract physical components such as vertebrae are known to the art. Tools known to the art function in general by providing a pair of tips or ends adapted to fit between the two physical components to be distracted, such as, for example, two vertebrae. Mechanical force is then applied to the handle of the distractor tool, typically by squeezing or rotating. Through lever, screw, or other mechanical action, the distractor tool converts such mechanical force applied to the handle into force pressing the tips or ends of the distractor away from each other. Tools adapted to compress physical components such as vertebrae are similarly known to the art, and work in a similar but largely opposite fashion from distractors. Such compressor tools function generally by providing a pair of tips or ends adapted to fit on or around the outer surfaces of two physical components to be compressed, such as, for example, two vertebrae. Mechanical force is applied to the handle of the compressor tool, typically by squeezing or rotating. Through lever, screw, or other mechanical action, the compressor tool
converts such mechanical force applied to the handle into force pressing the tips or ends of the compressor towards each other.

**Technical Problem to Be Solved**

[008] Tools known to the art suffer a number of deficiencies. First, many surgical kits provide a distractor and a compressor as separate tools. This complicates the surgical procedure by requiring the surgeon and other surgical staff to manage and keep track of a larger number of tools. The use of separate tools also pose problems if one of the tools becomes contaminated and must be removed from the procedure.

[009] Although some tools exist that are capable of both distraction and compression, combined tools known to the art suffer a number of additional disadvantages. For example, combined distractor-compressor tools known to the art require the application of significant mechanical force to achieve distraction or compression. It is often difficult to apply sufficient mechanical force to a combined distractor-compressor tool while keeping the tips or ends of the tool properly located to achieve the desired distraction or compression. Additionally, the risk of tool slippage and resultant injury to the patient is significant. Since such combined tools must often be kept in place to maintain the desired positioning of physical components while screws or other fixation devices are installed, combined tools known to the art can result in a cluttered and difficult-to-navigate surgical opening, resulting in inconvenience and difficulty for the surgeon and an increased risk of poor outcome for the patient.

**Summary of the Invention and Solution to Technical Problem to Be Solved**

[010] The present invention overcomes the deficiencies of surgical compression and surgical distraction tools known to the art by providing a combined tool apparatus that reduces the number of tools in the surgical theater and minimizes the need for mechanical force and the
associates risks of slippage. Versions of the present invention are directed to a combined distractor-compressor tool apparatus adapted for use in orthopedic surgery, and preferably for use in orthopedic spinal surgery. Versions of the present invention include a combined distractor-compressor tool capable of both distracting and compressing physical components during surgical procedures. The combined tool apparatus of the present invention mounts to screws secured in bone, preferably pedicle screws. Thus, a combined too! apparatus according to the teachings of the present invention reduces the number of tools required to perform a surgical procedure, and, by its connection to installed bone screws, eliminates the risks associated with slippage of the tool when mechanical force is applied. Further, versions of the present invention incorporate rods that can be used as fixation devices. Since the combined too! apparatus of the present invention mounts directly to bone screws, and preferably to bone screw heads, versions of the present invention provide an additional advantage of eliminating the need to install a separate fixation device while attempting to use a distracting or compressing tool.

[01] In one embodiment, the combined too! apparatus of the present invention comprises a connecting rod mounted to a first bone screw head and to a second bone screw head, said first and second bone screw heads being installed in bone, wherein the connecting rod is mounted fixedly to the first bone screw head and mounted slidably to the second bone screw head. A rod holder is attached to said connecting rod at a point between a said first bone screw head and said second bone screw head, wherein said rod holder is adjacent to either said first bone screw head or said second bone screw head and is generally co-axial with said first and second bone screw heads. An adjusting member is mounted to the bone screw head to which the rod holder is adjacently connected by sliding said adjusting member over said screw head. When the adjusting member is turned by a turning means, a portion of the adjusting member presses
against the rod holder, forcing the first bone screw head and second bone screw head to move away from each other and thus distracting the physical components to which the first and second bone screws are connected.

[012] In another embodiment, the combined tool apparatus comprises a connecting rod mounted to a first bone screw head and a second bone screw head, said first and second bone screw heads being installed in bone, wherein the connecting rod is mounted fixedly to the first bone screw head and mounted slidably to the second bone screw head. A rod holder is attached to said connecting rod at a point adjacent to either said first bone screw head or said second bone screw head, but not in between said first and second bone screw heads, and is generally co-axial with said first and second bone screw heads. An adjusting member is mounted to the bone screw head to which the rod holder is adjacently connected by sliding said adjusting member over said bone screw head. When the adjusting member is turned by a turning means, a portion of the adjusting member presses against the rod holder, forcing the first bone screw head and second bone screw head to move towards each other, thus compressing the physical components to which the bone screws are connected.

[013] In another embodiment, the combined tool apparatus comprises a connecting rod mounted to a first bone screw head and a second bone screw head, said first and second bone screw heads being installed in bone, wherein the connecting rod is mounted fixedly to the first bone screw head and mounted slidably to the second bone screw head. A rod holder is attached to said connecting rod at a point in between a said first bone screw head and said second bone screw head, wherein said rod holder is disposed so as to be in between said first and second bone screw heads, adjacent to said first bone screw head or second bone screw head, and generally co-axial with said first and second bone screw heads. An adjusting member is mounted to the rod
holder. Optionally, the adjusting member is mounted to the rod holder by sliding said adjusting member over said rod holder. Alternately, said rod holder may comprise said adjusting member. When the adjusting member is turned by the turning means, a portion of the adjusting member presses against the bone screw head to which said rod holder is adjacent, forcing the first bone screw head and second bone screw head to move away from each other, thus distracting the physical components to which the bone screws are connected.

[014] In another embodiment, the invention comprises a connecting rod mounted to a first bone screw head and a second bone screw head, said first and second bone screw heads being installed in bone, wherein the connecting rod is mounted fixedly to the first bone screw head and mounted slidably to the second bone screw head. A rod holder is attached to said connecting rod at a point adjacent to either said first bone screw head or said second bone screw head, but not in between said first and second bone screw heads, and is generally co-axial with said first and second bone screw heads. An adjusting member is mounted to the rod holder. Optionally, the adjusting member is mounted to the rod holder by sliding said adjusting member over said rod holder. Optionally, said rod holder can comprise an adjusting member. When the adjusting member is turned by the turning means, a portion of the adjusting member presses against the bone screw head to which said rod holder is adjacent, forcing the first bone screw head and second bone screw head to move towards each other, thus compressing the physical components to which the bone screws are connected.

[015] In the Summary above and in the Description, and the claims below, and in the accompanying drawings, reference is made to particular features of the invention. It is to be understood that the disclosure of the invention in this specification includes all possible combinations of such particular features.
Brief Description of the Drawings

[016] These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description and accompanying drawings, where:

Figure 1 shows a perspective view of a version of the invention adapted for distraction, in which the adjusting member is mounted to a first bone screw head;

Figure 2 shows a perspective view of a version of the invention adapted for compression, in which the adjusting member is mounted to a first bone screw head;

Figure 3 shows a perspective view of a version of the invention adapted for distraction, in which the adjusting member is mounted to the rod holder;

Figure 4 shows a perspective view of a version of the invention adapted for compression, in which the adjusting member comprises the rod holder.

Description of Embodiments

[017] Embodiments of the present combined tool apparatus are directed towards an apparatus for distraction and compression of physical components during surgery, wherein said apparatus makes use of bone screws installed in the physical components to be distracted or compressed. In preferred embodiments, the combined tool is adapted for use in connection with orthopedic spine surgery, and the bone screws are pedicle screws installed into vertebrae.

[018] A "bone screw" according to the versions of the present invention is, as will be recognized by one skilled in the art, a screw adapted to be fixed to bone. A "bone screw" according to versions of this invention comprises a screw adapted for fixation to bone, and also comprises a screw head, wherein said screw head is an elongated member extending outwardly from said screw and adapted to accommodate rotatable connection with an adjusting member [3],

7
as described elsewhere herein. Embodiments of the present invention include a first bone screw and a second bone screw, which comprise a first bone screw head [1] and second bone screw head [2]. Preferably, the first and second bone screws are installed into vertebra, and most, preferably, are installed into adjacent vertebra. Further preferably, the first and second bone screws are pedicle screws. Other forms and types of screws may be used within the scope of this invention, as will be apparent to one skilled in the art.

[019] A "connecting rod" [5] is a rod adapted to mount to at least the first bone screw [1] and second bone screw [2]. Preferably, the connecting rod [5] is adapted to mount to bone screw heads. A connecting rod [5] mounts to at least one of the first and second bone screw heads fixedly, and mounts to at least one of the first and second bone screw heads slidably. Preferably, the connecting rod [5] is a metal rod used for temporary or permanent fixation of vertebrae, such as in a bone fusion procedure, as would be recognized by one skilled in the art.

[020] A fixed mount between said connecting rod [5] and said first or second bone screw head can be accomplished by a variety of mechanical connection means, as will be recognized by one skilled in the art. Preferably, at least one of said first and second bone screw beads comprise in part a collar [7], said collar comprises in part a void [8], and said collar [7] further comprises a set screw [9] such that when said connecting rod [5] is placed in or through said void [8] and said set screw [9] is tightened, said connecting rod [5] and said bone screw head are fixedly connected. As will be appreciated by one skilled in the art, a fixed mount achieved in this manner can be separated by loosening the set screw [9].

[021] A slidable mount between said connecting rod [5] and said first or second bone screw head can be accomplished by a variety of mechanical connection means, as will be recognized by one skilled in the art. Preferably, at least one of said first or second bone screw
head comprises in pari aperture [i 1] adapted to allow said connecting rod [5] to pass through said aperture [11] slidably. As will be recognized by one skilled in the art, the collar [7] and aperture [1 i] can be comprised by the saddle or tulip of bone screws known to the art.

[022] A "rod holder" [13] according to some embodiments of the present invention comprises an elongated member adapted at its distal end for removable connection to the connecting rod [5] and shaped to accommodate rotatably connection with the adjusting member [3]. A rod holder [13] according to these embodiments of the present invention may connect to said connecting rod [5] by any removable mechanical means, as will be appreciated by one skilled in the art. Preferably, said rod holder [13] in these embodiments is adapted for connection to said connection rod [5] by way of a slot [15] in the distal end of said rod holder [13], said slot [15] adapted to form a friction fit between said rod holder [13] and said connecting rod [5] when the distal end of said rod holder [13] is pressed against said connecting rod [5]. Preferably, in these embodiments said rod holder [13] extends generally coaxially with said first and second bone screw heads when said rod holder [13] is in connection with said connecting rod [5]. Optionally, said rod holder [13] can comprise a ridge, knob, tab, flange, pin, thread, or other feature integral to said connecting rod [5] adapted to provide a surface against which the adjusting member [3] can exert pressure when turned. It will be understood by those skilled in the art that references to the rod holder [13] herein being attached to the connecting rod [5] refer to embodiments in which the rod holder [1 3] comprises a ridge, knob, tab, flange, pin, thread, or other feature integral to said connecting rod [5] as well as to embodiments in which the rod holder [13] comprises an elongated member separate from the connecting rod [5].

[023] A "adjusting member" [3] according to versions of the present invention is an elongated tubular member comprising a means for adjustment near the distal end of the adjusting
member, and further comprising a turning means [21] at or near the proximal end of the adjusting member [3]. The means for adjustment is preferably a cam [19] or a blade, but can be any means for converting rotational motion of the adjusting member to linear motion approximately perpendicularly to the adjusting member [3]. As will be appreciated by one skilled in the art, suitable means for adjustment includes cranks, ratchets, swashplates, and the like.

[024] The turning means [21] may be any means to facilitate rotation of the adjusting member [3] around its central longitudinal axis, as will be appreciated by one skilled in the art. Preferably, the turning means [21] may comprise a hexagonal profile or handle at the proximal end of the adjusting member which, as will be appreciated by one skilled in the art, may be engaged with a wrench or ratchet to facilitate rotation of the adjusting member [3]. Optionally, the turning means [21] may be a T-handie or other device adapted to facilitate rotation of the adjusting member.

[025] Said rod holder [13] may optionally comprise the adjusting member [3]. In these embodiments of the invention, said rod holder [13] may be releasably attached to said connecting rod [5], but may also comprise pivot or bearing permitting said rod holder [13] to rotate about its longitudinal axis. Optionally, said rod holder [13] may be rotatably attached to said connecting rod [5]. In versions of the invention in which the rod holder [13] comprises an adjusting member [3], the rod holder additionally comprises a turning means [21] and an adjusting means, such as a cam [19] or blade.

[026] As depicted in Figure 1, in one embodiment the combined tool apparatus comprises a connecting rod [5] mounted sdbably to a first bone screw head [1] and fixedly to a second bone screw head [21]. Said bone screws being installed in bone. A rod holder [13] is
attached to said connecting rod [5] at a point between said first bone screw head [1] and said second bone screw head [2], wherein said rod holder [13] is generally adjacent to said first or second bone screw head and generally co-axial with said first and second bone screw heads. An adjusting member [3] is mounted to the bone screw head to which the rod holder [5] is adjacently connected by sliding said adjusting member [3] over said screw head. When said adjusting member [3] is turned by the turning means [21], the adjusting means [19] presses against the rod holder [13], forcing the first bone screw head [1] and second bone screw head [2] to move away from each other, thus distracting the physical components to which the first and second bone screws are connected.

[027] As depicted in Figure 2, in another embodiment the combined tool apparatus comprises a connecting rod [5] mounted to at least a first bone screw head [1] and a second bone screw head [2], said bone screws being installed in bone, wherein the connecting rod [5] is mounted slidably to the first bone screw head [1] and mounted fixedly to the second bone screw head [2]. A rod holder [13] is attached to said connecting rod [5] at a point adjacent to either first bone screw head [1] or said second bone screw head [2] but not in between said first and second bone screw heads, and is generally co-axial with said first and second bone screw heads. An adjusting member [3] is mounted to the bone screw head to which the rod holder [13] is adjacently connected by sliding said adjusting member [3] over said screw head. When the adjusting member [3] is turned by the turning means [21], the adjusting means presses against the rod holder [13], forcing the first bone screw head [1] and second bone screw head [2] to move towards each other and compressing the physical components to which the first and second bone screws are connected.
As depicted in Figure 3, in another embodiment the combined tool apparatus comprises a connecting rod [5] mounted to a first bone screw head [1] and a second bone screw head [2], said first and second bone screw heads being installed in bone, wherein the connecting rod [5] is mounted sidably to the first bone screw head [1] and mounted fixedly to the second bone screw head [2]. A rod holder [13] is attached to said connecting rod [5] at a point in between a said first bone screw head [1] and said second bone screw head [2], wherein said rod holder [13] is adjacent to said first bone screw head or said second bone screw head and is generally co-axial with said first and second bone screw heads. An adjusting member [3] is mounted to the rod holder [13] by sliding said adjusting member [3] over said rod holder [13]. Optionally, said rod holder [13] comprises an adjusting member [3]. When the adjusting member [3] is turned by the turning means [21], the adjusting means presses against the bone screw head to which said rod holder [13] is adjacent, forcing the first bone screw head [1] and second bone screw head [2] to move away from each other and distracting the physical components to which the first and second bone screws are connected.

As depicted in Figure 4, in another embodiment the combined tool apparatus comprises a connecting rod [5] mounted to a first bone screw head [1] and a second bone screw head [2], said first and second bone screw heads being installed in bone, wherein the connecting rod [5] is mounted sidably to the first bone screw head [1] and mounted fixedly to the second bone screw head [2]. A rod holder [13] is attached to said connecting rod [5] at a point adjacent to either first bone screw head [1] or said second bone screw head [2], but not in between said first and second bone screw heads, and is generally co-axial with said first and second bone screw heads. An adjusting member [3] is mounted to said rod holder [13] by sliding said adjusting member [3] over said rod holder [13]. Optionally, said rod holder [13] comprises said
adjusting member [3]. When the adjusting member [3] is turned by the turning means [21], the adjusting means presses against the bone screw head to which said rod holder [13] is adjacent, forcing the first bone screw head [1] and second bone screw head [2] to move towards each other and compressing the physical components to which the first and second bone screws are connected.

[030] Although the present invention has been described in considerable detail with reference to certain preferred versions thereof, other versions are possible. For example, other screws, materials, connection means, turning means, or adjusting means may be used than those described in detail. Similarly, other placements of the versions of the invention may be employed than those shown in detail, and the invention may be used to compress or distract physical components other than those described herein. Therefore, the spirit and scope of the claims should not be limited to the description of the preferred versions described herein.
What is claimed is:

1. A combined tool apparatus for compression or distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising:
   a. a first bone screw and a second bone screw, each of said first bone screw and said second bone screw comprising a screw, a collar, and a screw head;
   b. a connecting rod mounted fixedly to said at least one of said first bone screw and said second bone screw and mounted stably to at least one of said first bone screw and said second bone screw;
   c. a rod holder attached to said connecting rod at a location adjacent to said first bone screw, but not in between said first bone screw and said second bone screw;
   d. an adjusting member comprising a turning means and an adjusting means, said adjusting member disposed adjacent to said first bone screw bead, wherein the adjusting means of said adjusting member will cause an increase in the distance between said first bone screw and said rod holder when said adjusting member is turned.

2. The apparatus of claim 1 wherein said adjusting means comprises at least one of a cam and a blade.

3. The apparatus of claim 1 wherein said turning means comprises a hex profile.

4. The apparatus of claim 1 wherein said rod holder is detachably attached to said connecting rod.

5. A combined tool apparatus for compression or distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising:
a. a first bone screw and a second bone screw, each of said first bone screw and said second bone screw comprising a screw, a collar, and a screw head;

b. a connecting rod mounted fixedly to said at least one of said first bone screw and said second bone screw and mounted slidably to at least one of said first bone screw and said second bone screw;

c. a rod holder attached to said connecting rod adjacent to said first bone screw at a location between said first bone screw and said second bone screw;

d. an adjusting member comprising a turning means and an adjusting means, said adjusting member disposed over said first bone screw head, wherein the adjusting means of said adjusting member will cause an increase in the distance between said first bone screw head and said rod holder when said adjusting member is turned.

6. The apparatus of claim 5 wherein said adjusting means comprises at least one of a cam and a blade.

7. The apparatus of claim 5 wherein said turning means comprises a hex profile.

8. The apparatus of claim 5 wherein said rod holder is detachably attached to said connecting rod.

9. A combined tool apparatus for compression or distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising:

   a. a first bone screw and a second bone screw, each of said first bone screw and said second bone screw comprising a screw, a collar, and a screw head;
b. a connecting rod mounted fixedly to said at least one of said first bone screw and said second bone screw and mounted slidably to at least one of said first bone screw and said second bone screw;

c. a rod holder attached to said connecting rod adjacent to said first bone screw at a location between said first bone screw and said second bone screw;

d. an adjusting member comprising a turning means and an adjusting means, said adjusting member disposed over said rod holder, wherein the adjusting means of said adjusting member will cause an increase in the distance between the rod holder and said first bone screw head when said adjusting member is turned.

10. The apparatus of claim 9 wherein said adjusting means comprises at least one of a cam and a blade.

11. The apparatus of claim 9 wherein said turning means comprises a hex profile.

12. The apparatus of claim 9 wherein said rod holder is detachably attached to said connecting rod.

13. A combined tool apparatus for compression or distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising:

a. a first bone screw and a second bone screw, each of said first bone screw and said second bone screw comprising a screw, a collar, and a screw head;

b. a connecting rod mounted fixedly to said at least one of said first bone screw and said second bone screw and mounted slidably to at least one of said first bone screw and said second bone screw;
c. a rod holder, wherein said rod holder further comprises an adjusting member and is attached to said connecting rod adjacent to said first bone screw at a location between said first bone screw and said second bone screw, wherein the adjusting member comprises an adjusting means and said adjusting means will cause an increase in the distance between said rod holder and said first bone screw head when said adjusting member is turned.

14. The apparatus of claim 13 wherein said adjusting means comprises at least one of a cam and a blade,

15. The apparatus of claim 13 wherein said turning means comprises a hex profile.

16. A combined tool apparatus for compression or distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising:
   a. a first bone screw and a second bone screw; each of said first bone screw and said second bone screw comprising a screw, a collar, and a screw head;
   b. a connecting rod mounted fixedly to said at least one of said first bone screw and said second bone screw and mounted slidably to at least one of said first bone screw and said second bone screw;
   c. a rod holder attached to said connecting rod adjacent to said first bone screw, but not at a location between said first bone screw and said second bone screw;
   d. an adjusting member comprising a turning means and an adjusting means, said adjusting member disposed over said rod holder, wherein the adjusting means of said adjusting member will cause an increase in the distance between the rod holder and an adjacent bone screw head when said adjusting member is turned.
17. The apparatus of claim 16 wherein said adjusting means comprises at least one of a cam and a blade.

18. The apparatus of claim 16 wherein said turning means comprises a hex profile.

19. The apparatus of claim 16 wherein said rod holder is detachably attached to said connecting rod.

20. A combined too! apparatus for compression or distraction of a first physical component having a first bone screw and a second physical component having a second bone screw, said apparatus comprising:

   a. a first bone screw and a second bone screw, each of said first bone screw and said second bone screw comprising a screw, a collar, and a screw head;

   b. a connecting rod mounted fixedly to said at least one of said first bone screw and said second bone screw and mounted slidably to at least one of said first bone screw and said second bone screw;

   c. a rod holder, wherein said rod holder further comprises an adjusting member and is attached to said connecting rod adjacent to said first bone screw, but not at a location between said first bone screw and said second bone screw, wherein the said adjusting member comprises an adjusting means and said adjusting means causes an increase in the distance between said rod holder and said first bone screw head when said rod holder is turned.

21. The apparatus of claim 20 wherein said adjusting means comprises at least one of a cam and a blade.

22. The apparatus of claim 20 wherein said turning means comprises a hex profile.
INTERNATIONAL SEARCH REPORT

International application No. PCT/US 15/29190

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61B 17/58 (2015.01)
CPC - A61B 2017/0256

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
CPC: A61B 2017/0256 IPC(8): A61B 17/58 (2015.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 606/90, 99, 105, 279 CPC: A61B 17/025
IPC(8): A61B 17/60; A61 F 2/00 (2015.01) (keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase; Google Patents; Google Search Terms Used: compress*, distract*, spin*, vertebra*, disc%, turn*, rotat*, spinning, lobe, cam, camming, angl*, inclin*, slop*, wedge, blade

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>Y</td>
<td>US 2006/0082103 A1 (HUTTON et al) 03 April 2008 (03.04.2008) fig 1A, 1D, 6-6C, para [0053]-[0054]</td>
<td>1, 3-5, 7-9, 11-13, 15-16, 18-20, 22</td>
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<td>US 2003/0187453 A1 (SCHLAPFER et al) 02 October 2003 (02.10.2003) fig 1, para [0028]</td>
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Date of the actual completion of the international search 07 August 2015 (07.08.2015)

Date of mailing of the international search report 01 SEP 2015

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PCT OSP: 571-272-7774

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