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(12) **United States Patent**
Suddaby

(10) **Patent No.: US 11,219,532 B2**
(45) **Date of Patent: Jan. 11, 2022**

(54) **STAND-ALONE EXPANDABLE INTERBODY SPINAL FUSION DEVICE WITH LOCKING MECHANISM**

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(72) Inventor: **Loubert S. Suddaby**, Orchard Park, NY (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 242 days.

(21) Appl. No.: **16/222,086**

(22) Filed: **Dec. 17, 2018**

(65) **Prior Publication Data**

US 2019/0110900 A1 Apr. 18, 2019

Related U.S. Application Data

(63) Continuation-in-part of application No. 15/707,756, filed on Sep. 18, 2017, now Pat. No. 10,596,010.

(51) **Int. Cl.**

A61F 2/44	(2006.01)
A61F 2/30	(2006.01)
A61F 2/46	(2006.01)

(52) **U.S. Cl.**

CPC ***A61F 2/4425*** (2013.01); ***A61F 2/447*** (2013.01); ***A61F 2/4455*** (2013.01); *A61F 2/4611* (2013.01); *A61F 2002/30373* (2013.01); *A61F 2002/30471* (2013.01); *A61F 2002/30492* (2013.01); *A61F 2002/30507* (2013.01); *A61F 2002/30538* (2013.01); *A61F 2002/30593* (2013.01); *A61F 2002/30904* (2013.01)

(58) **Field of Classification Search**

CPC A61F 2/44; A61F 2/447

See application file for complete search history.

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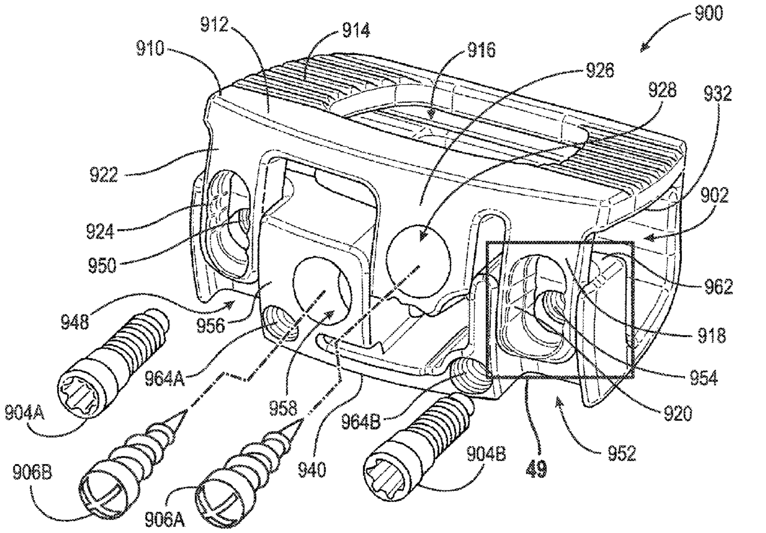
Primary Examiner — Christopher J Beccia

(74) *Attorney, Agent, or Firm* — Simpson & Simpson, PLLC

(57) **ABSTRACT**

An expandable interbody spinal fusion device, including an inferior component including at least one hole, a superior component connected to the inferior component, the superior component including a plurality of catches operatively arranged to align with the at least one hole, and a locking screw operatively arranged to engage the plurality of catches and the at least one hole to lock the superior component with respect to the inferior component.

20 Claims, 32 Drawing Sheets



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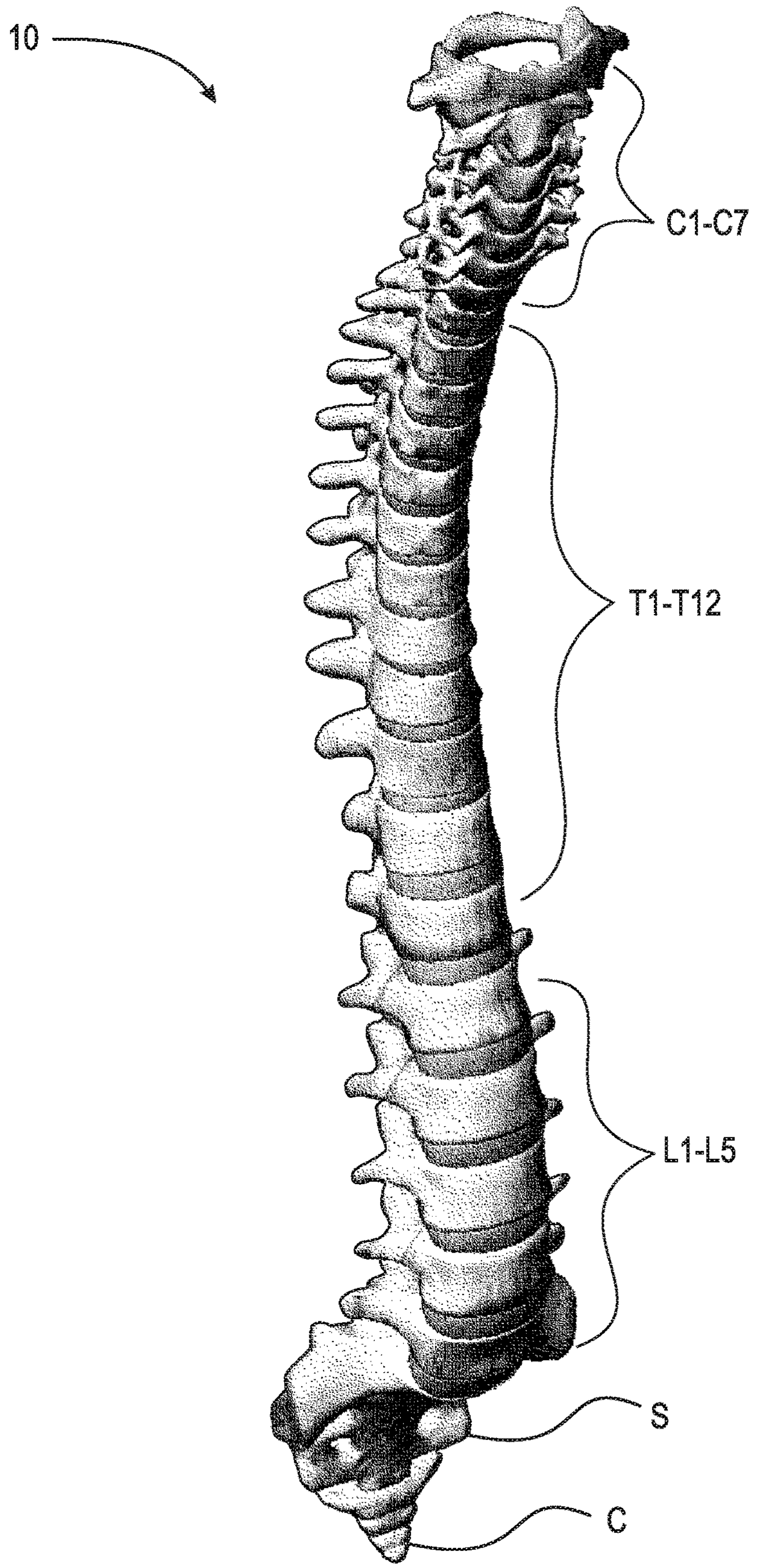

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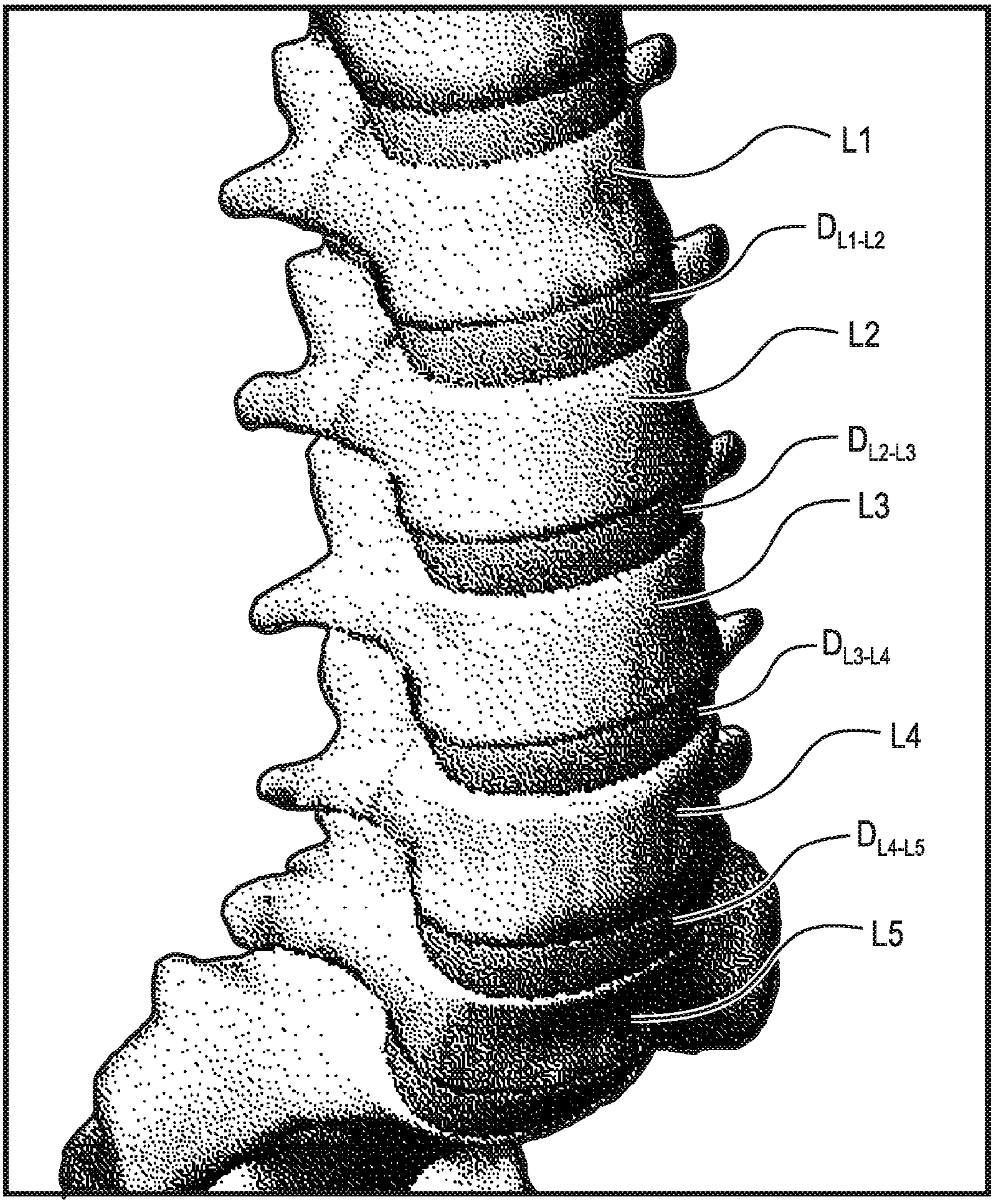
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D_{L4-L5}
L5

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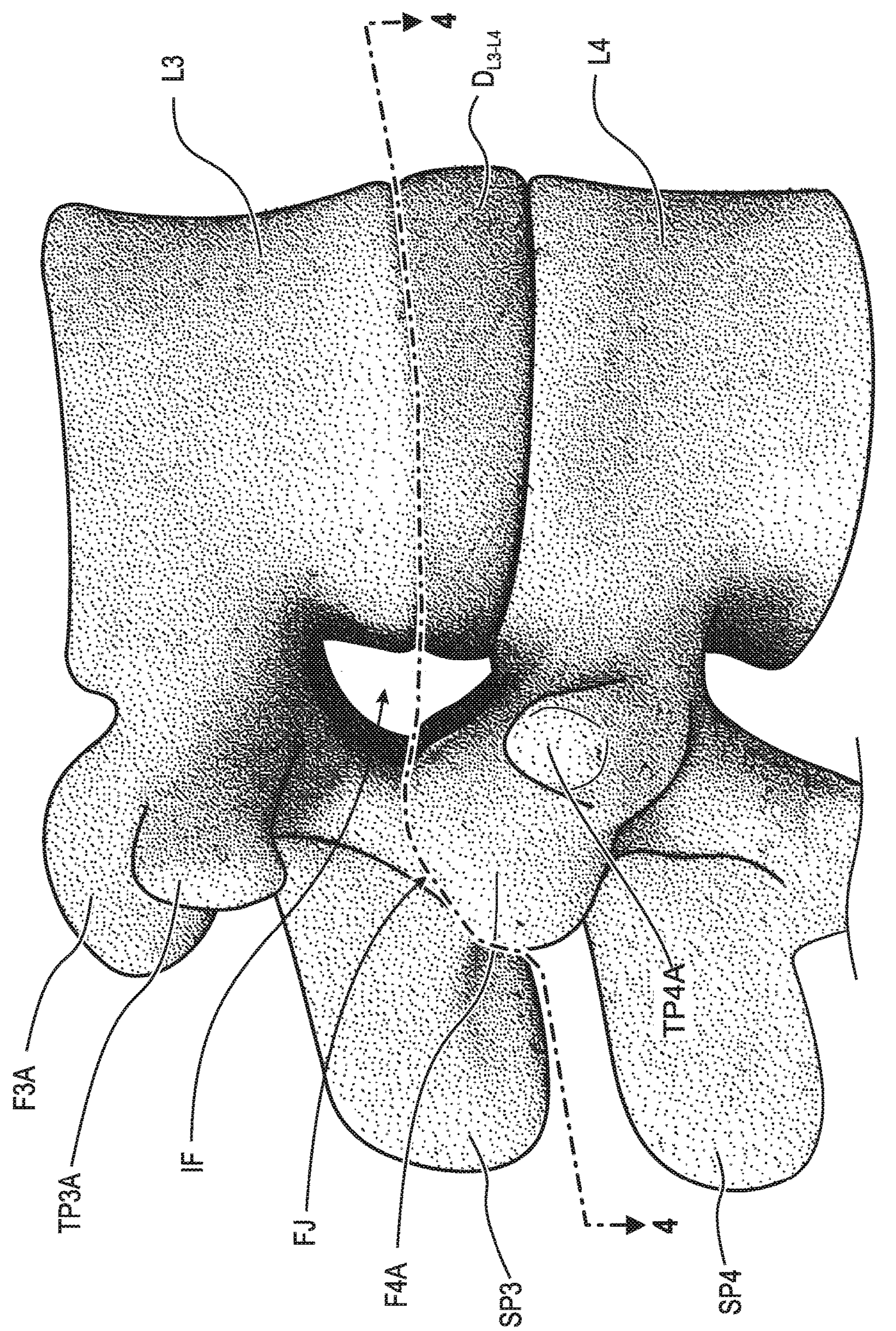

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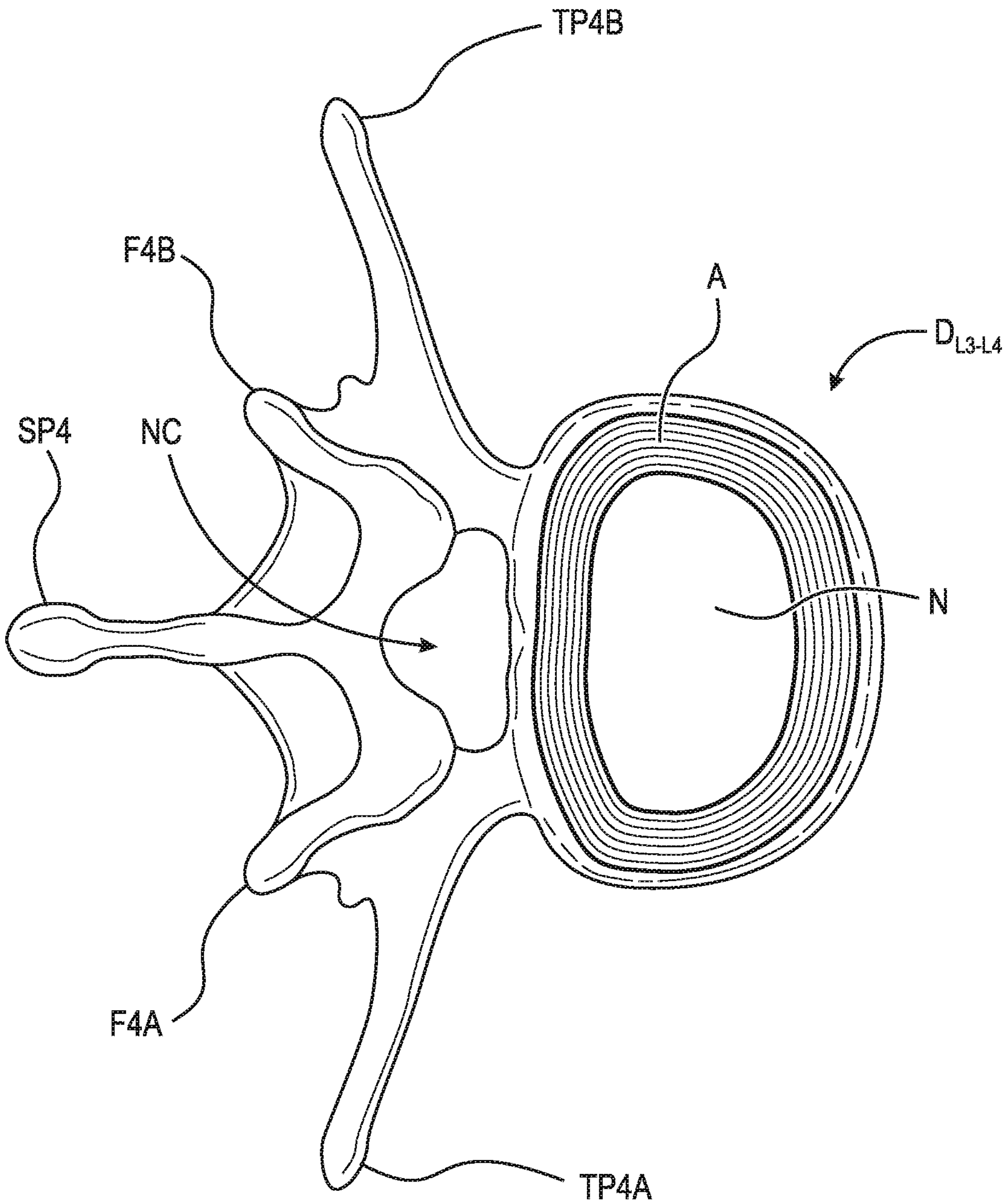

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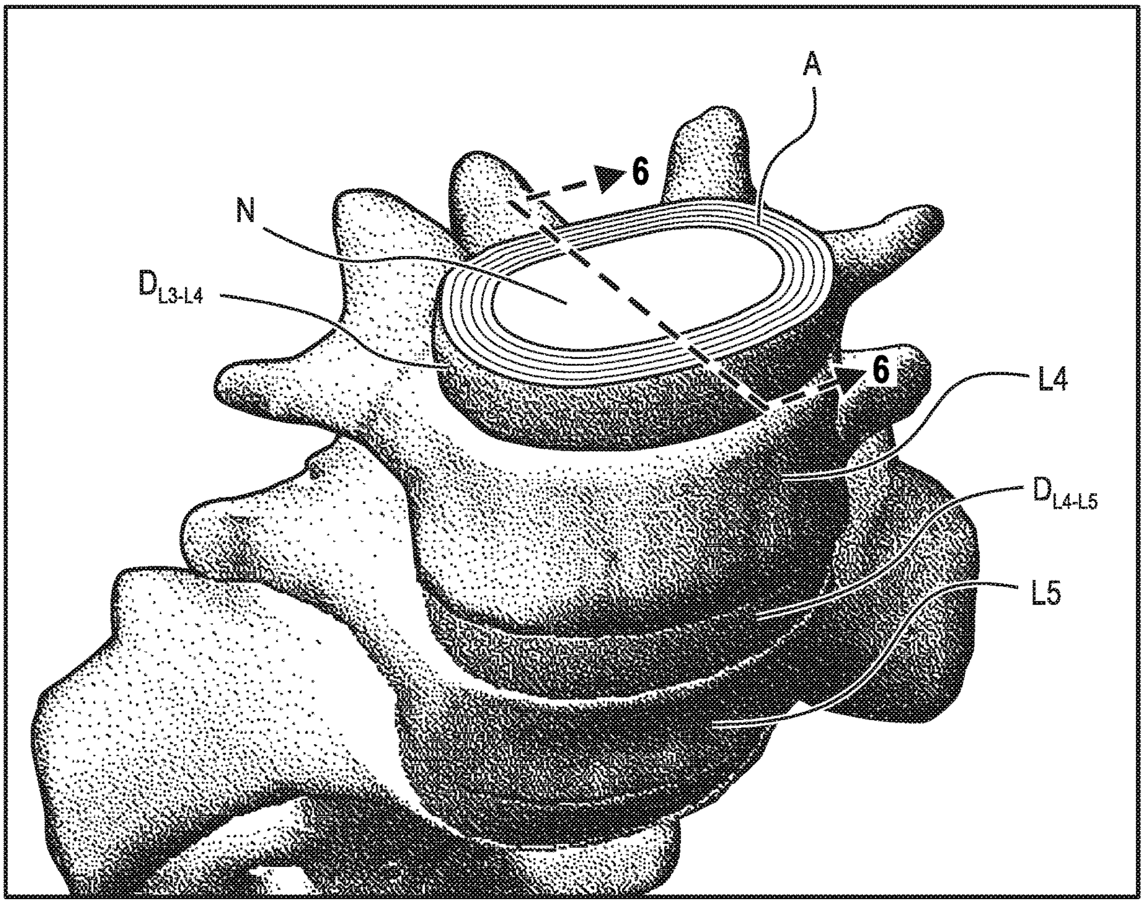

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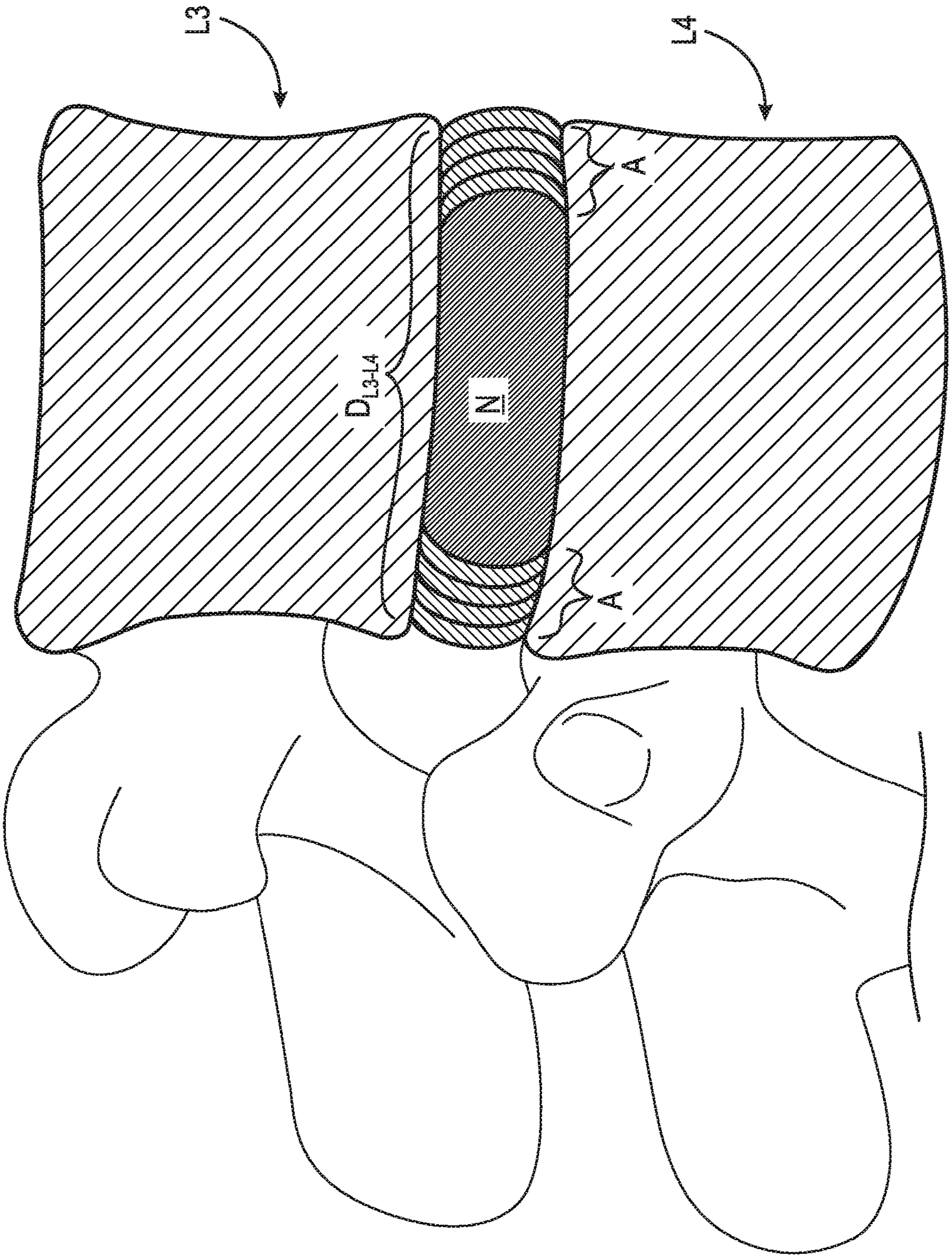

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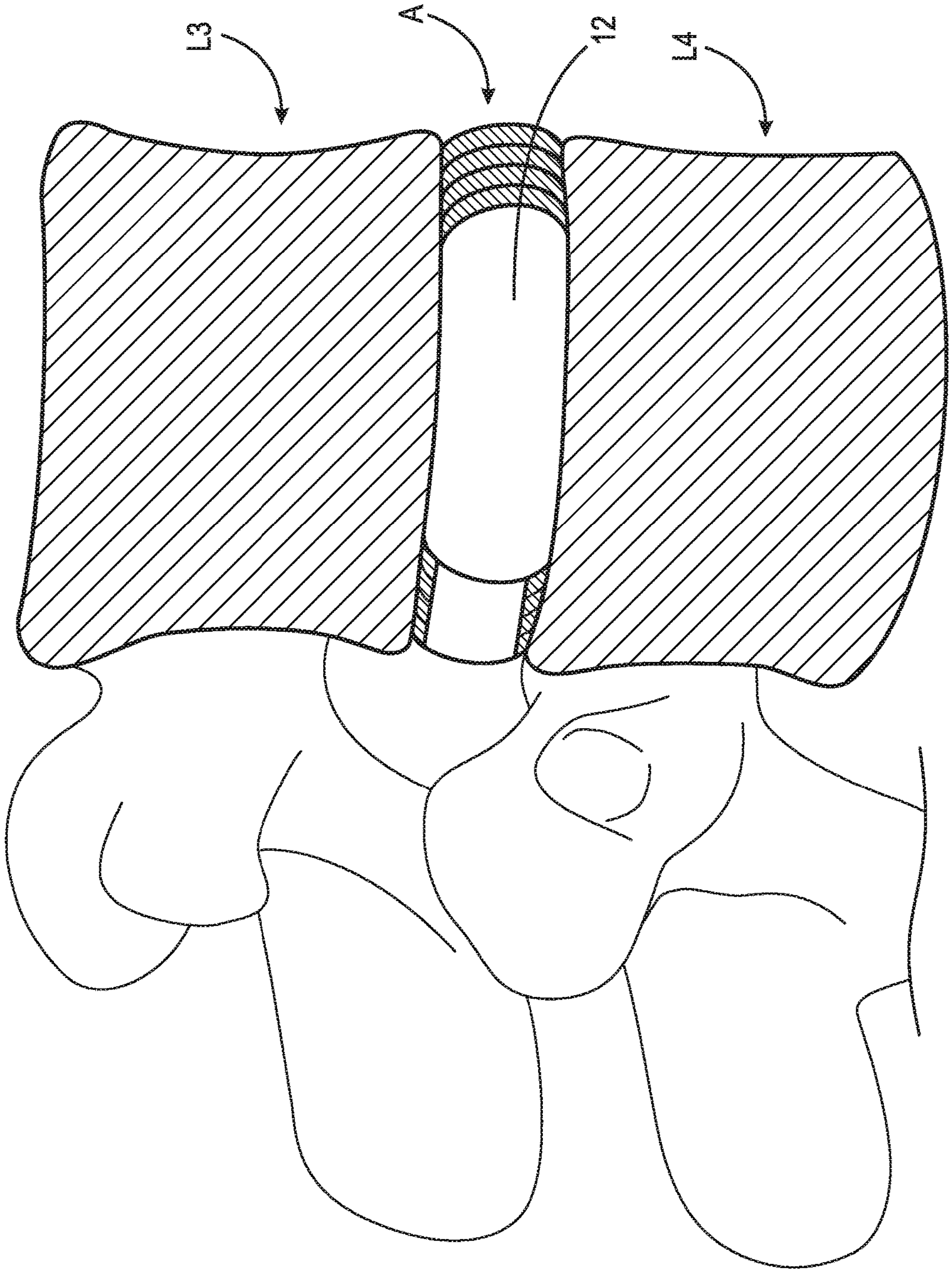

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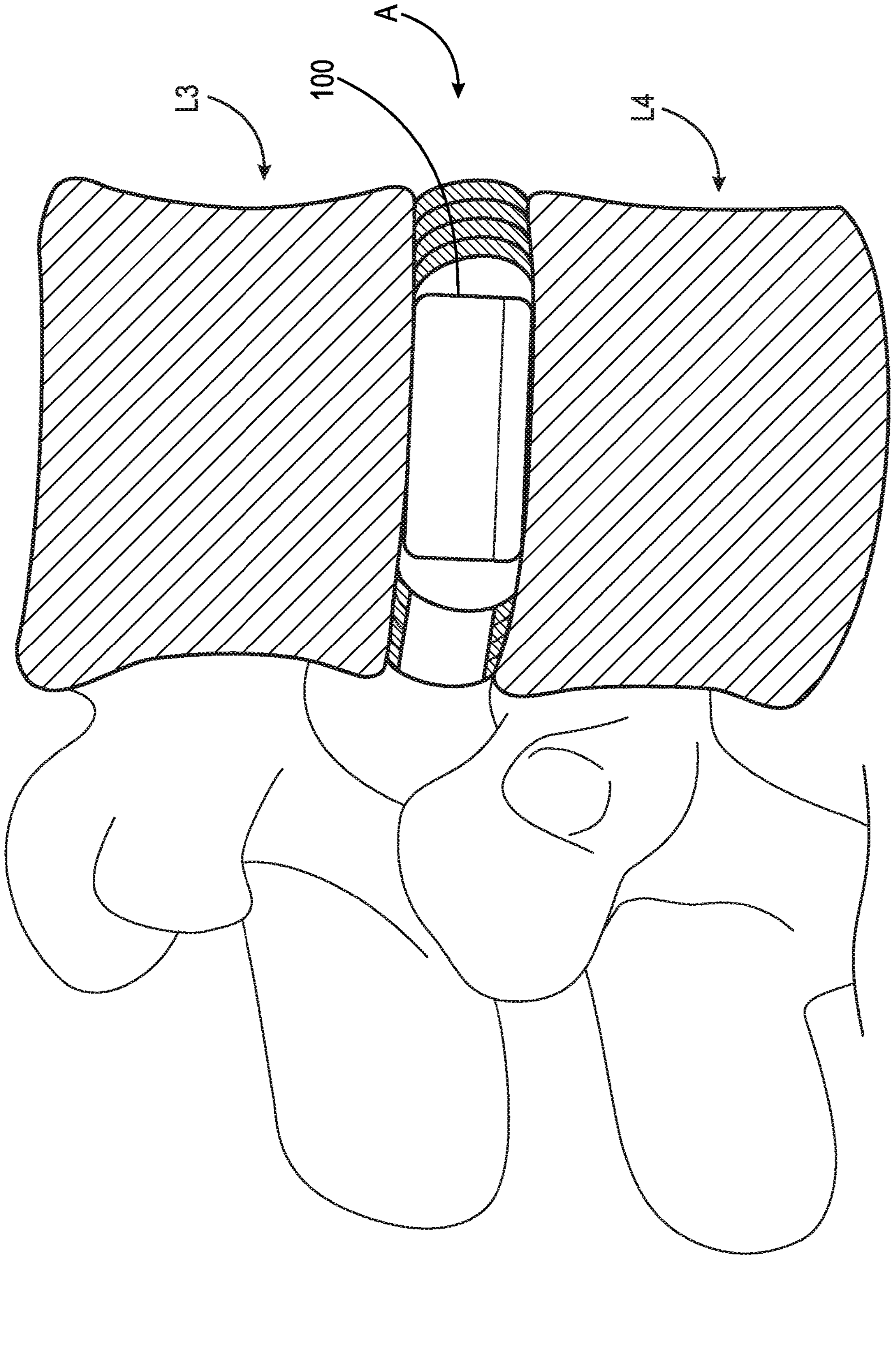

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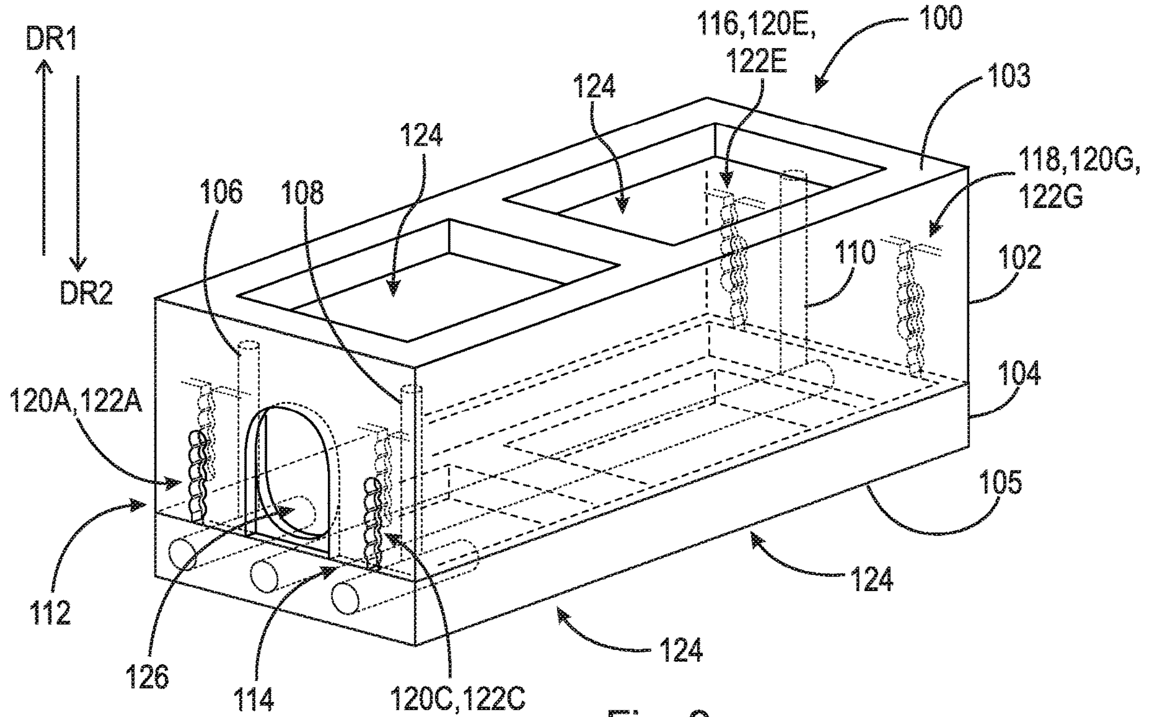
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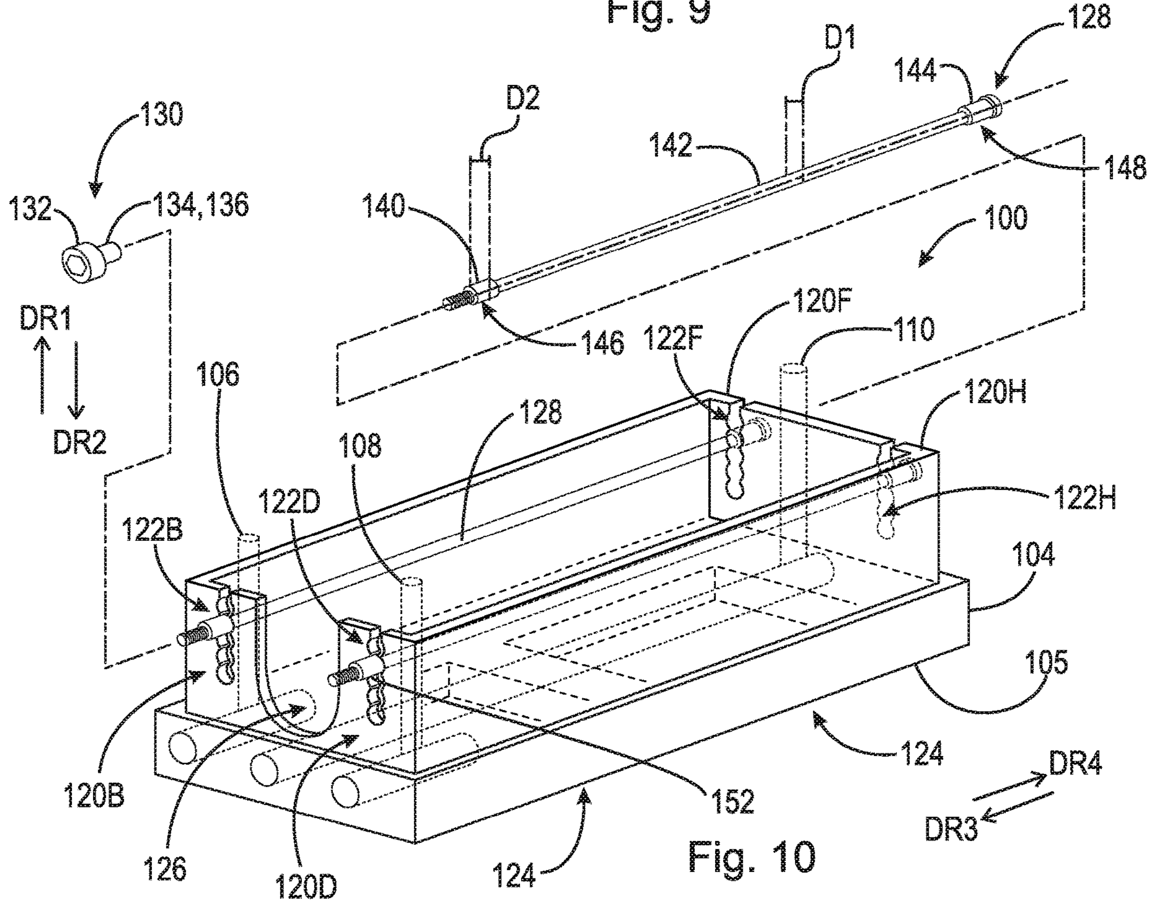
114
120C,122C

Fig. 9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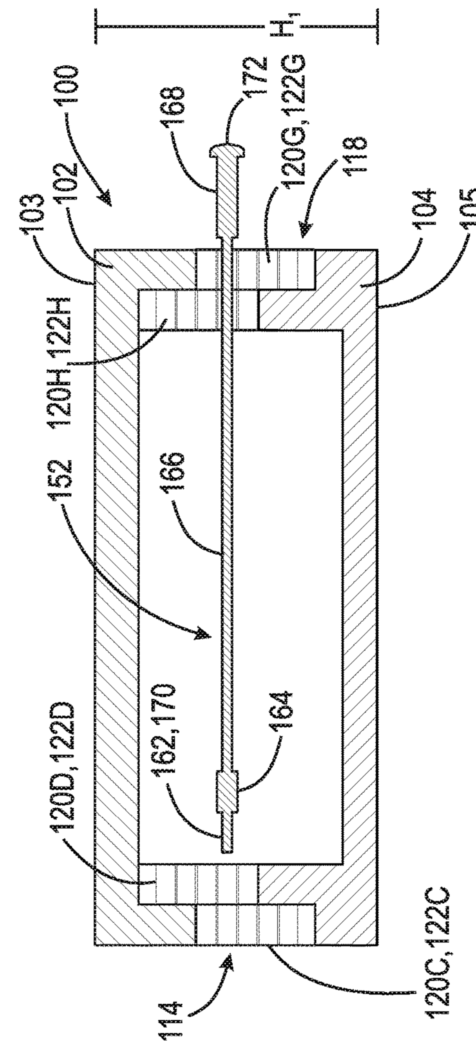
DR3

Fig. 10



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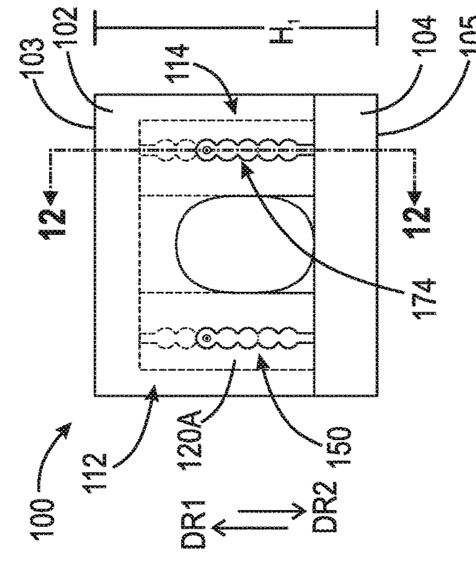

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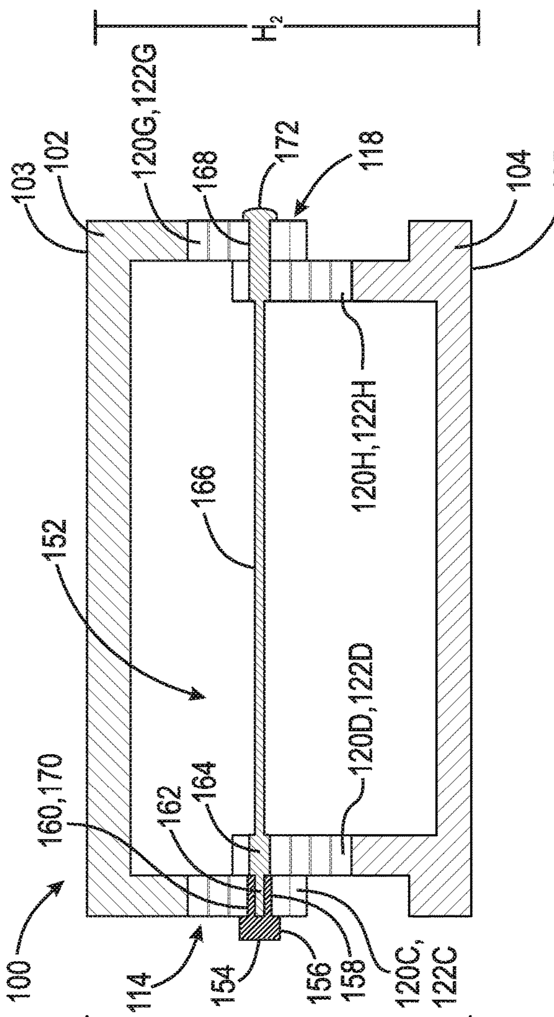

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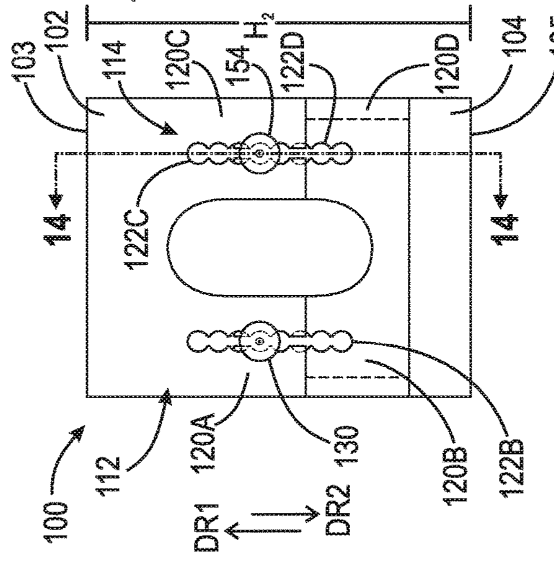

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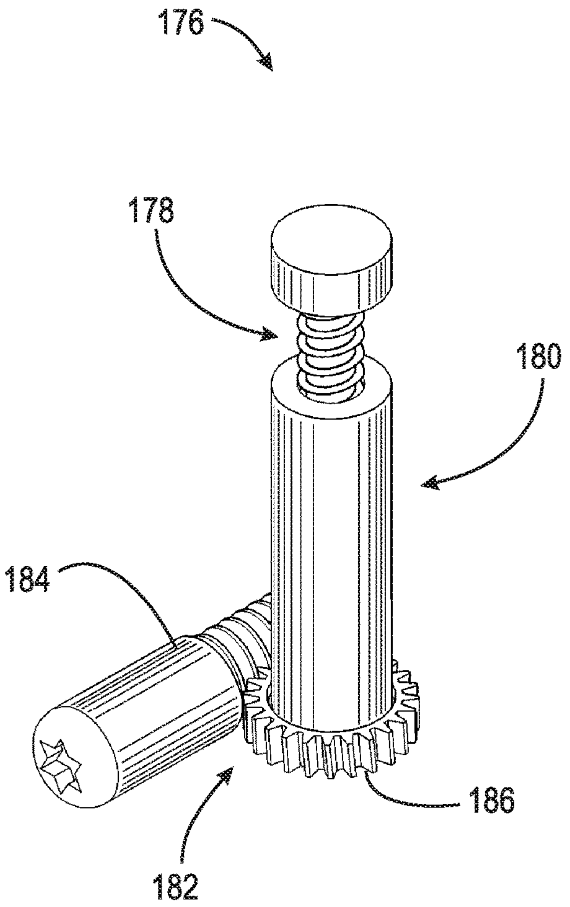

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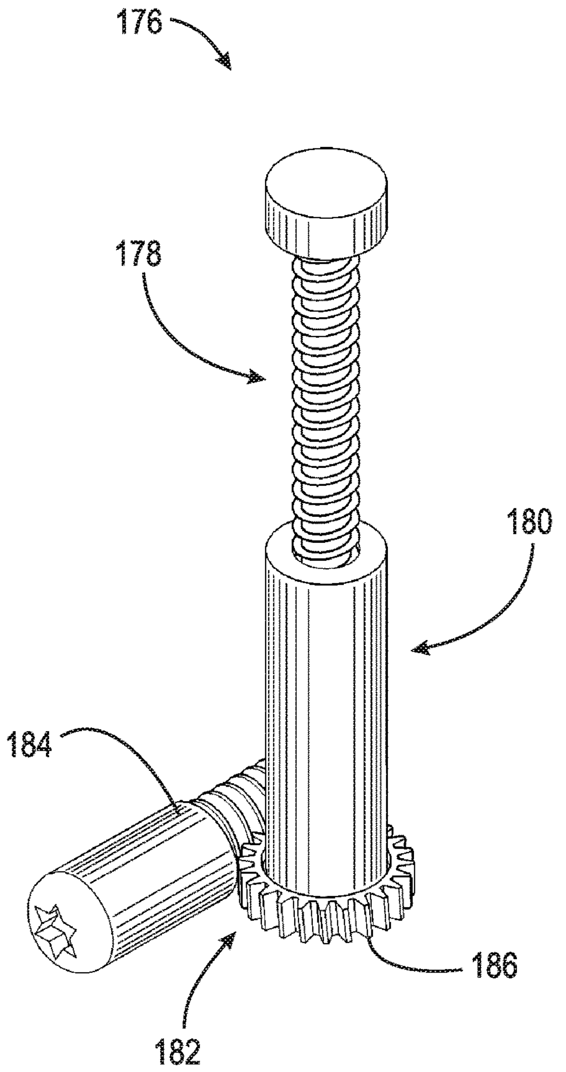

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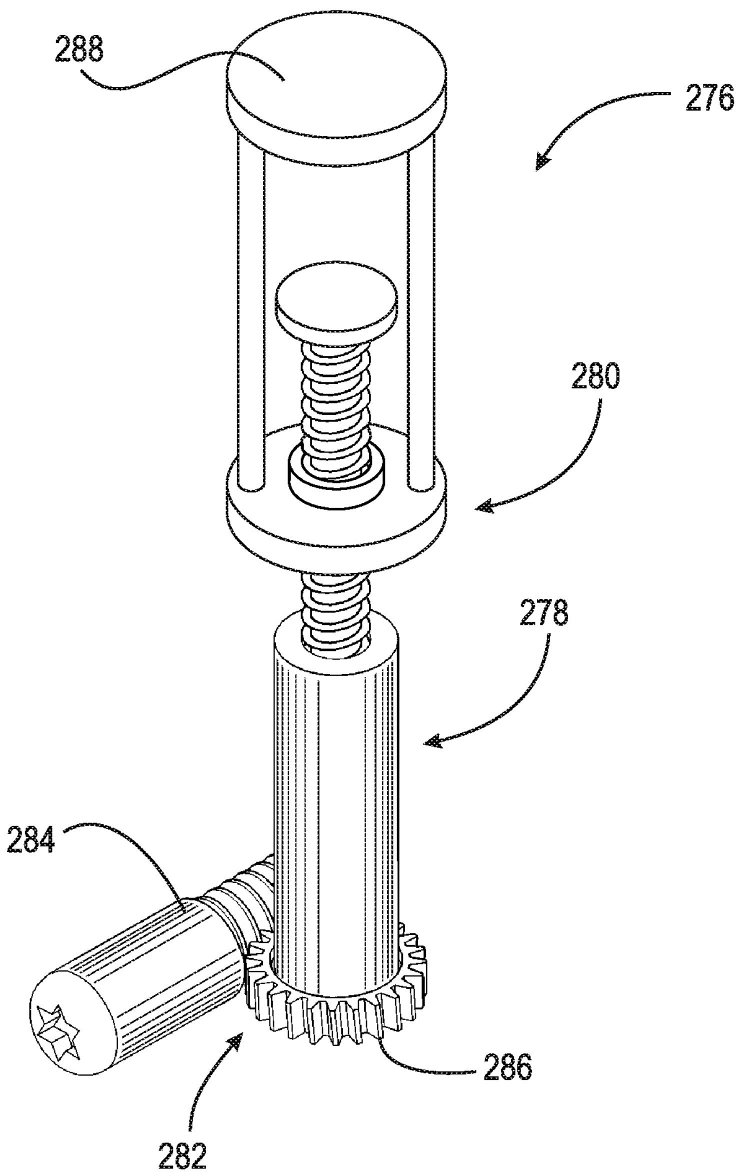

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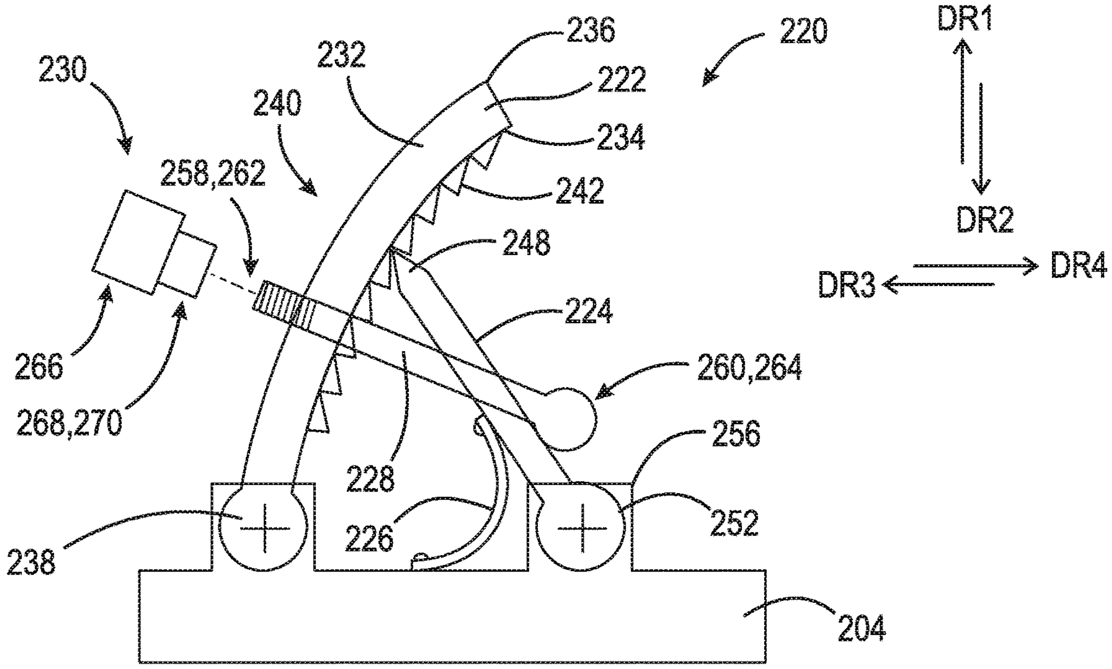
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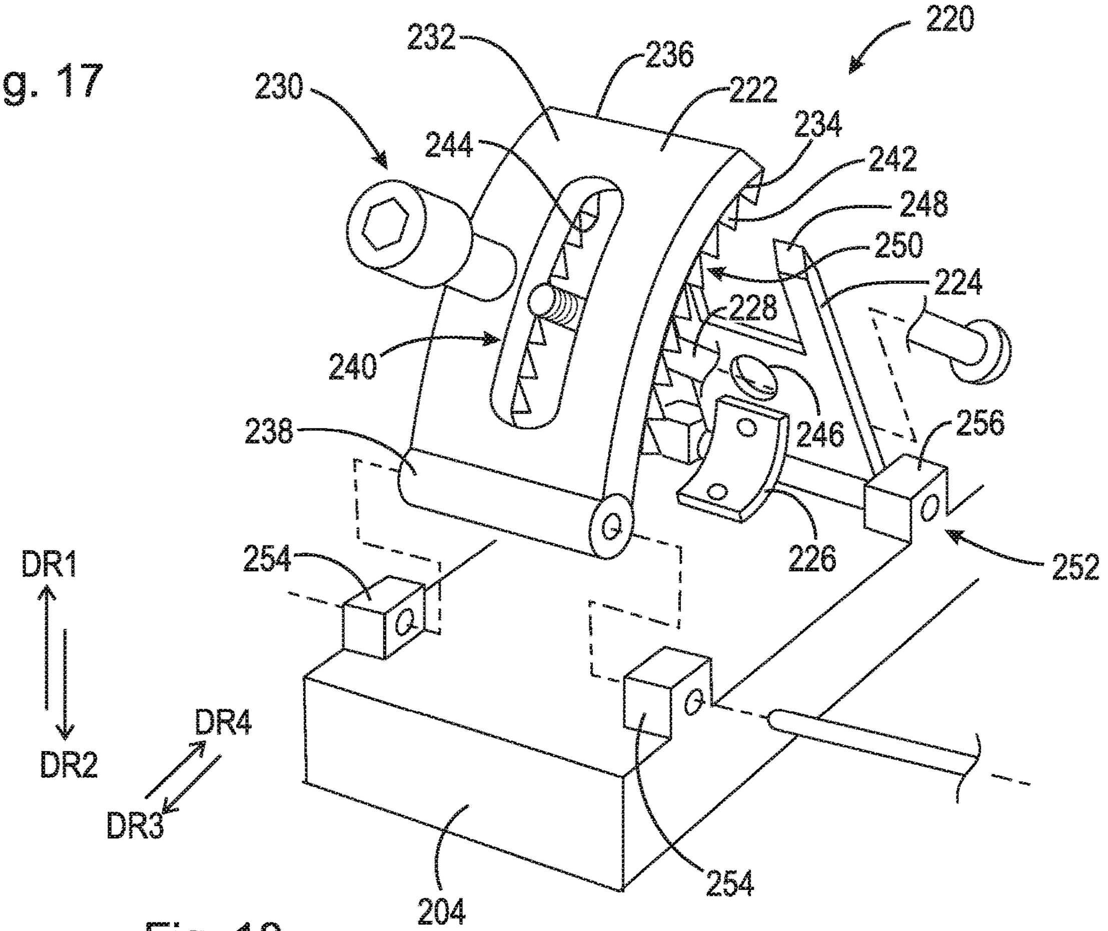
DR1
DR2
DR3
DR4

Fig. 17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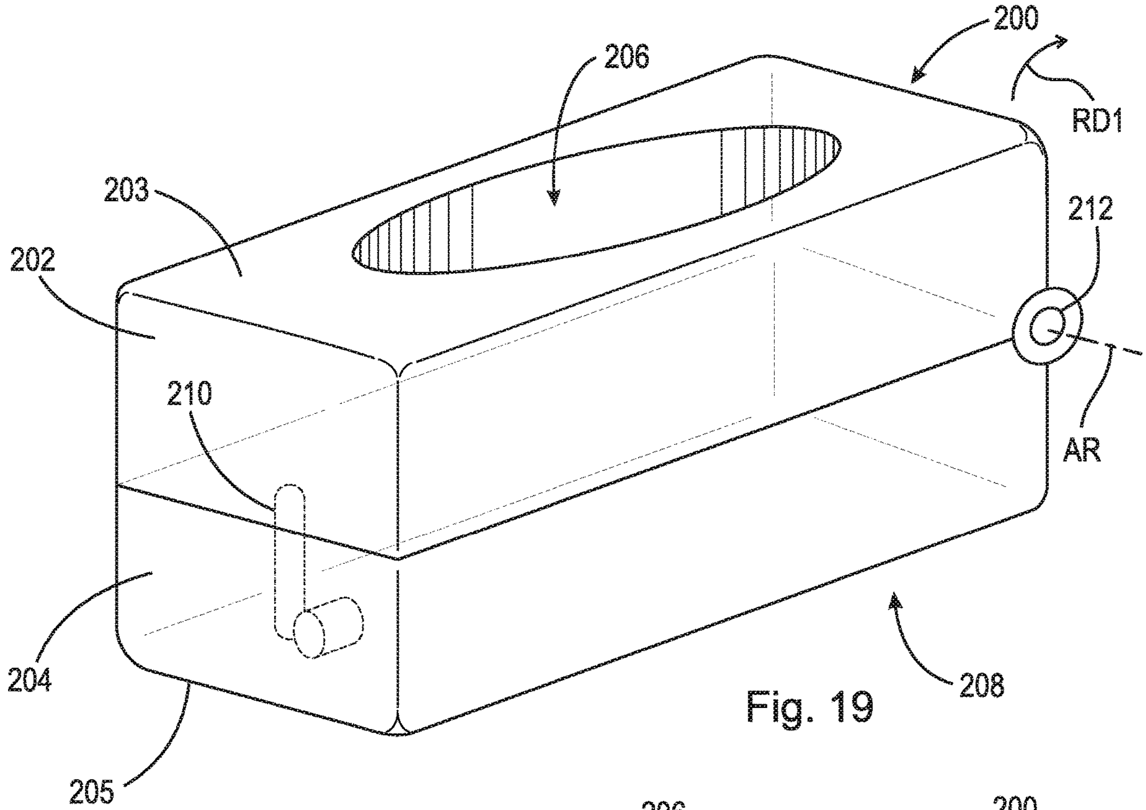
DR3

Fig. 18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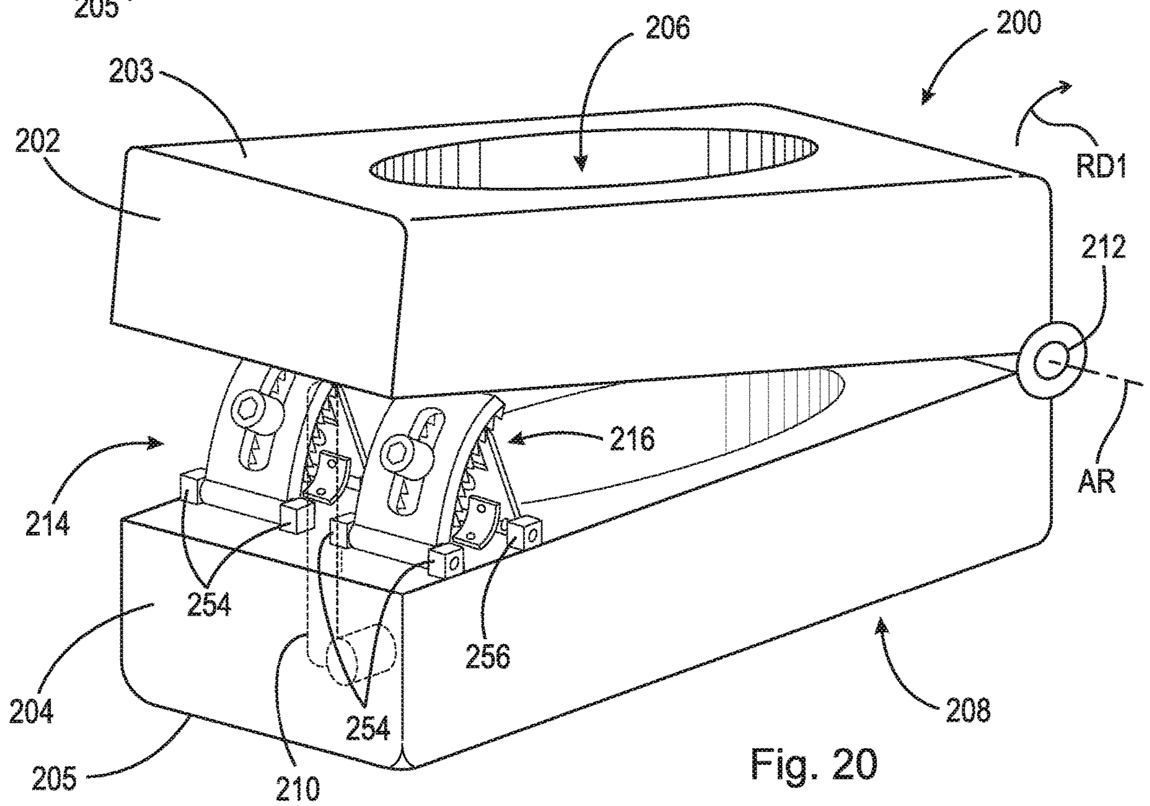
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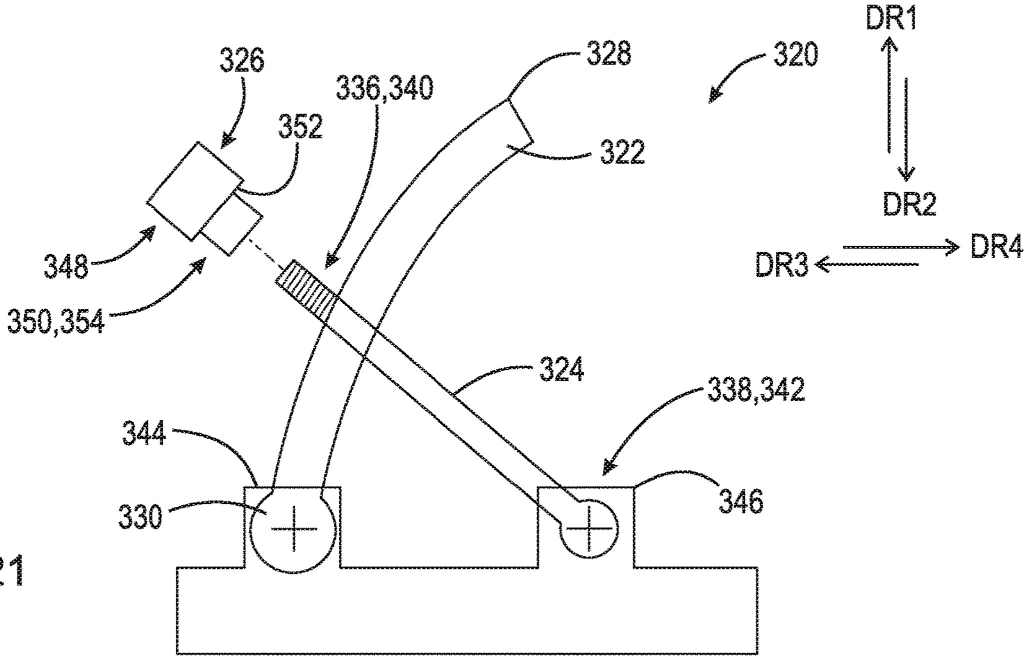

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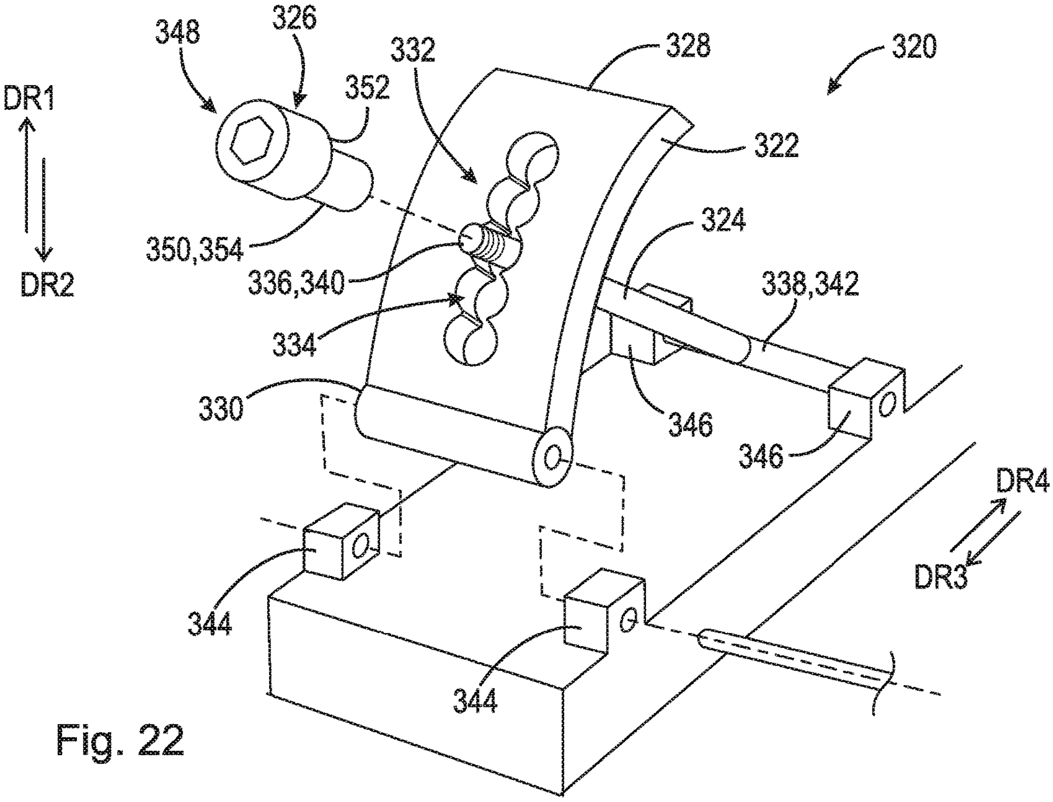
DR1
DR2
DR3
DR4

Fig. 21



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DR2
DR3
DR4

Fig. 22

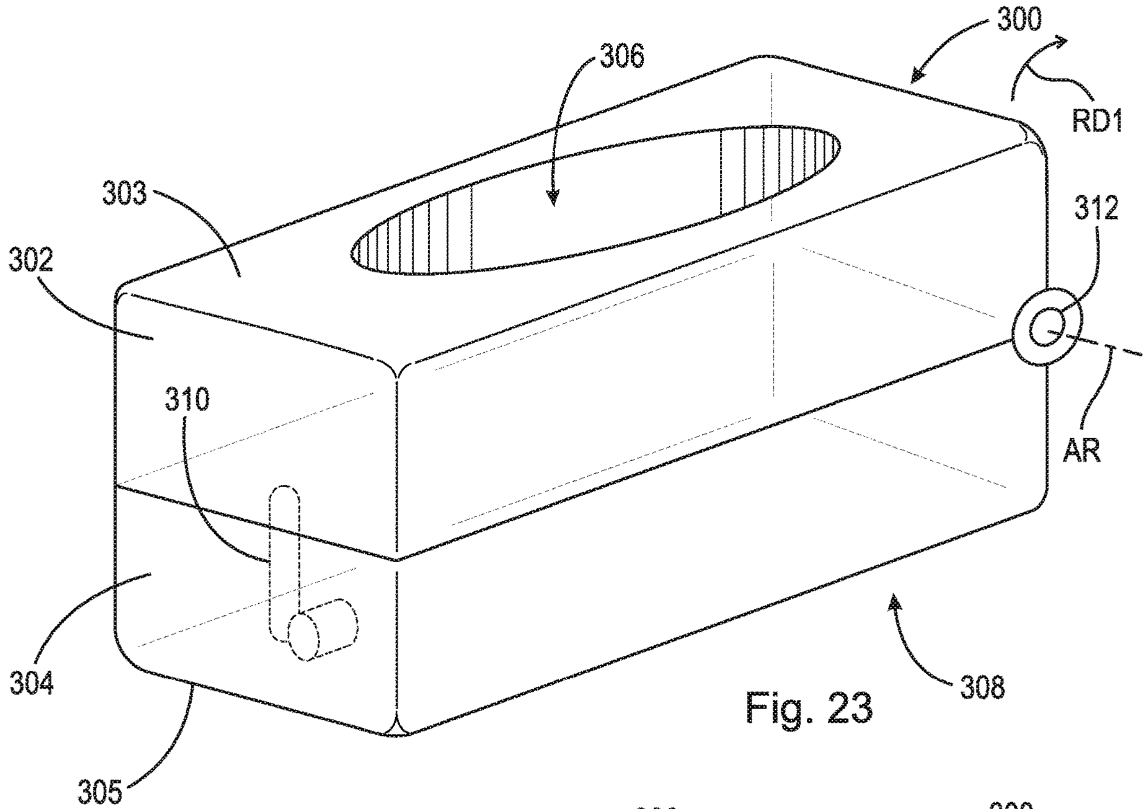
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Fig. 23

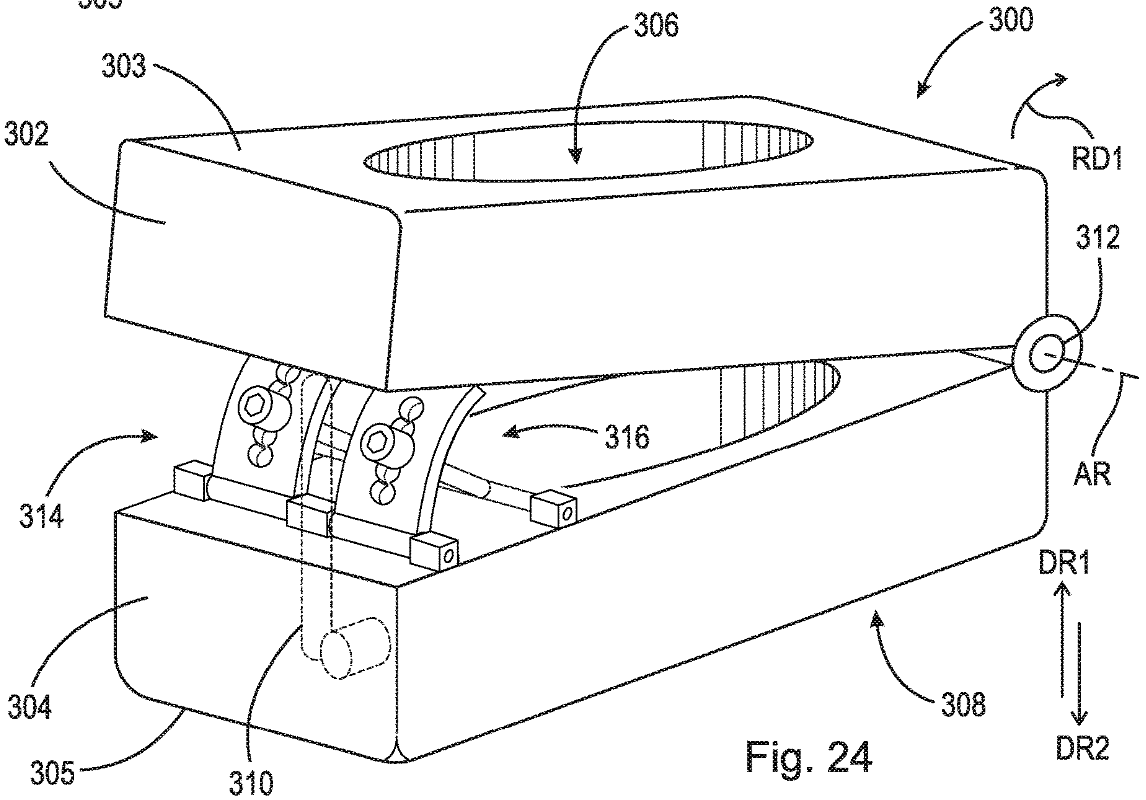
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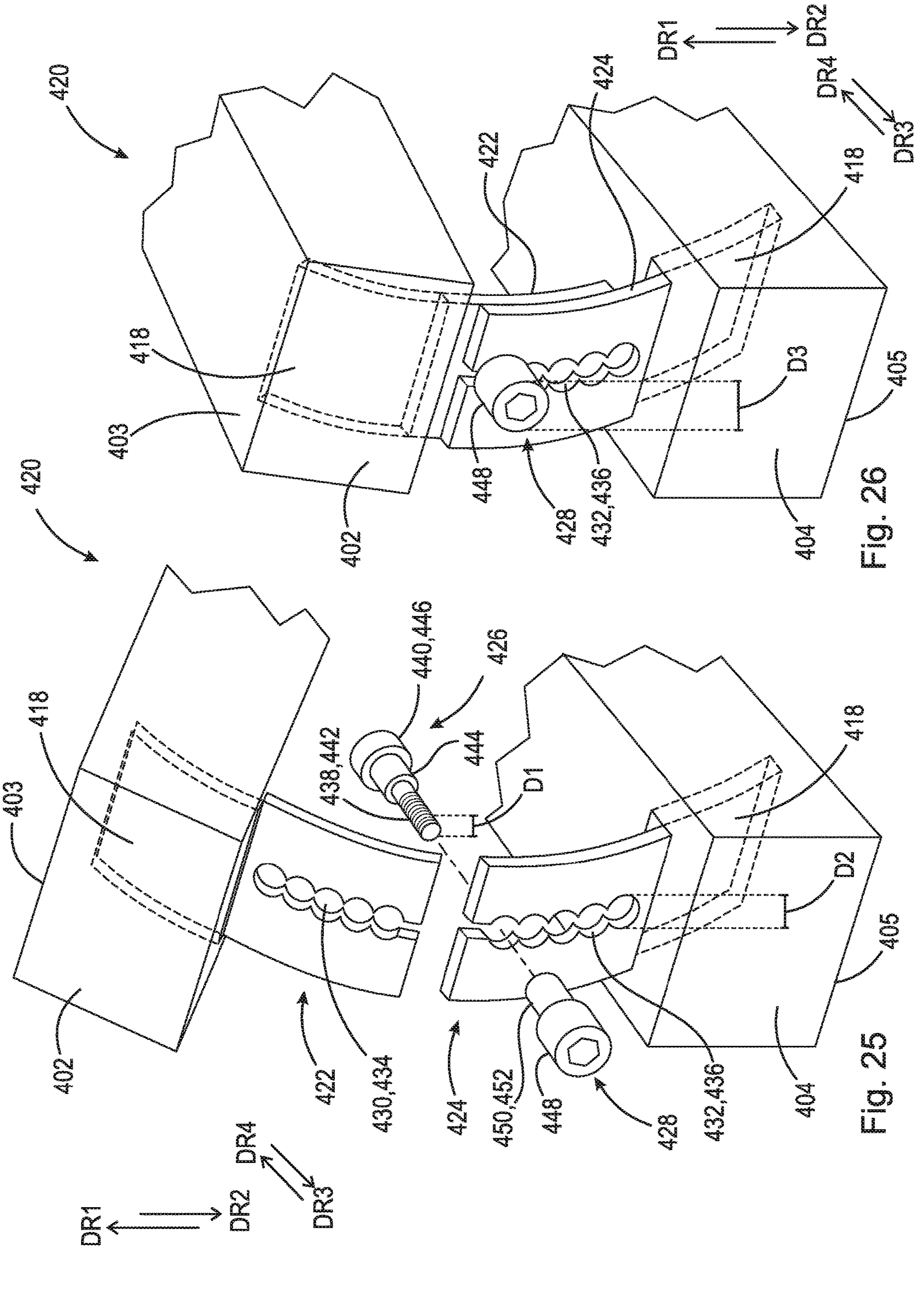
Fig. 24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D1
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402
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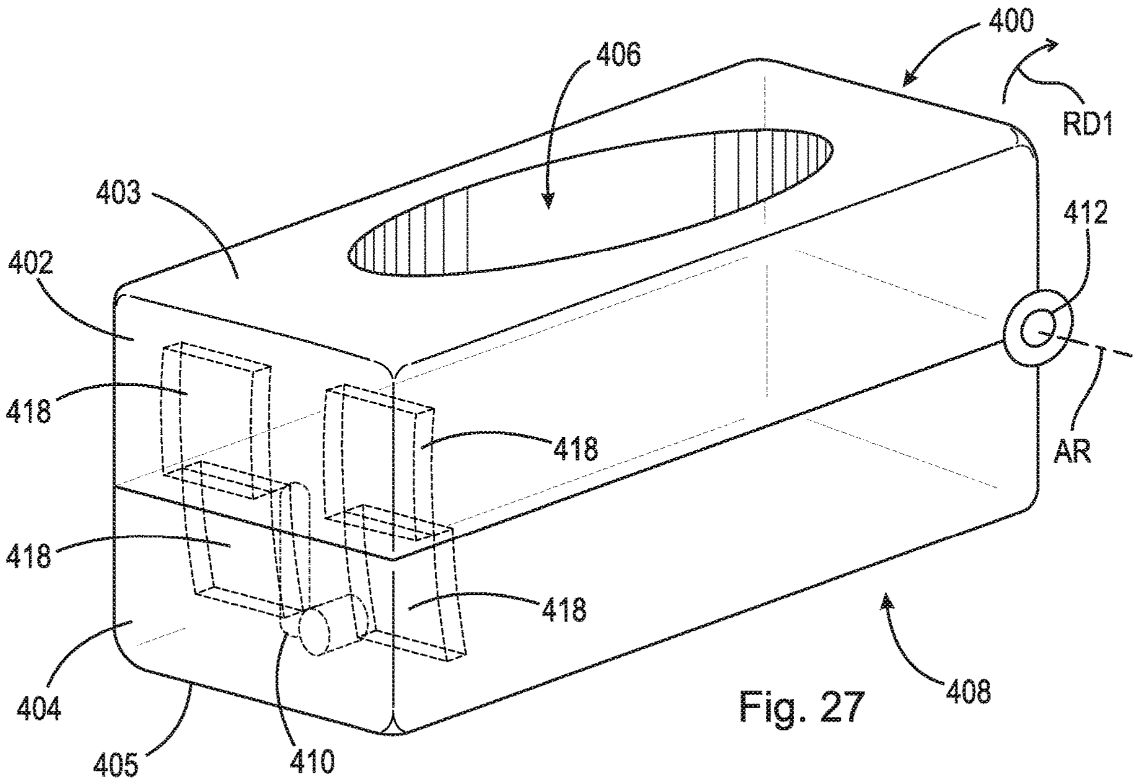
D2
DR4
DR3
DR1
DR2

Fig. 26

Fig. 25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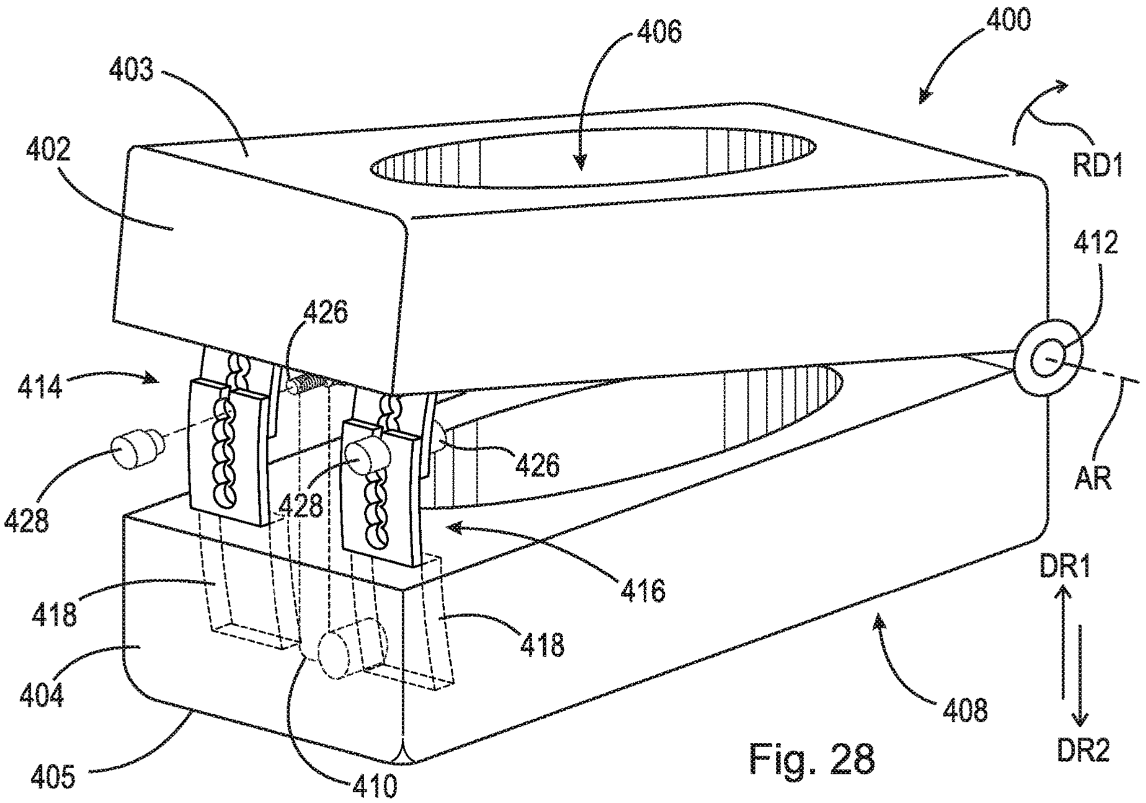
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Fig. 28

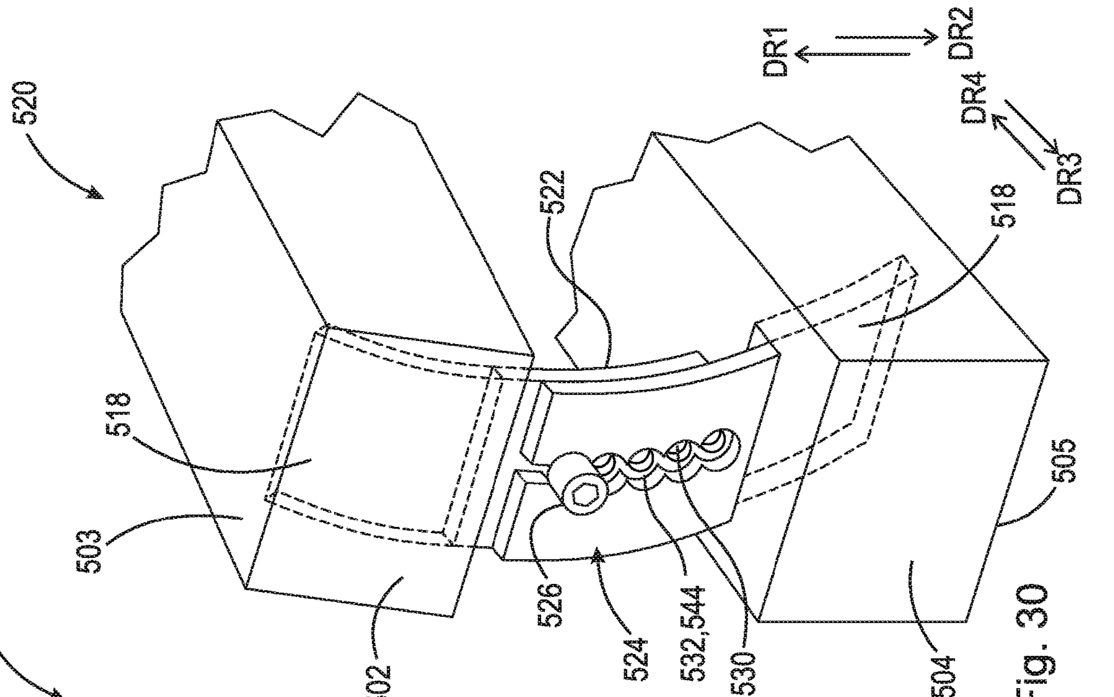

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Fig. 30

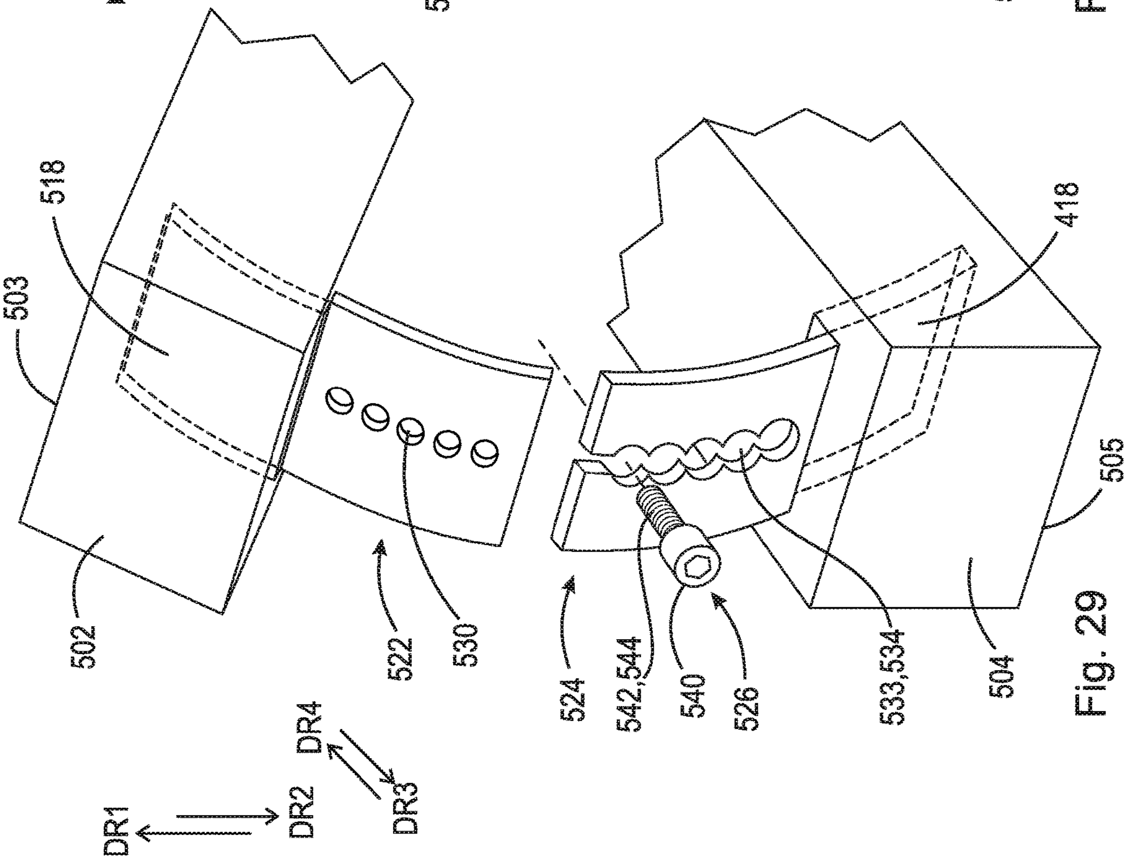

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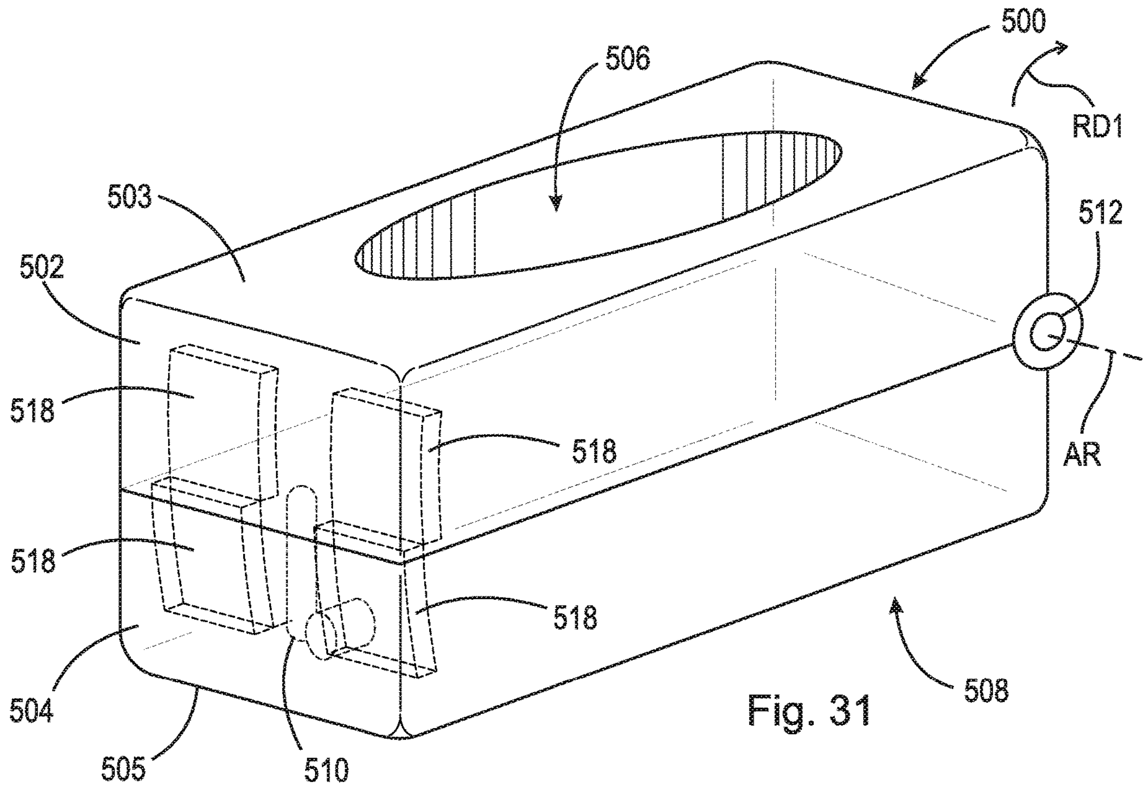
Fig. 29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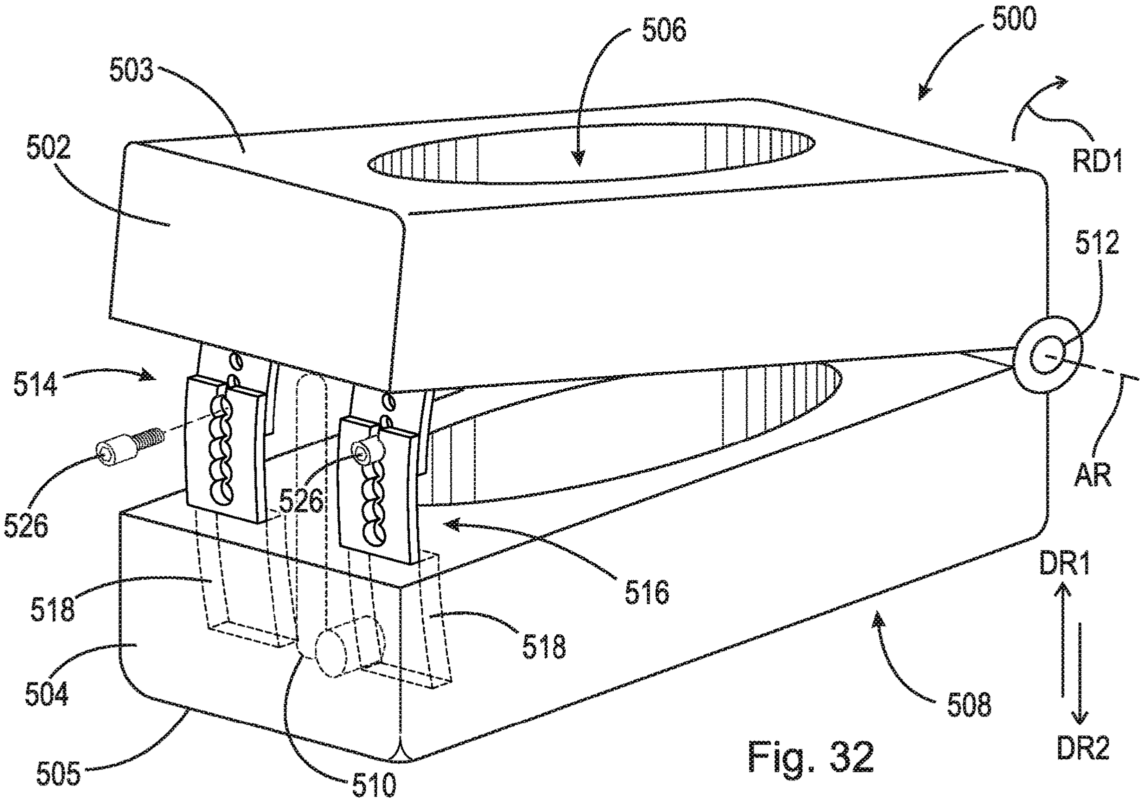
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Fig. 32

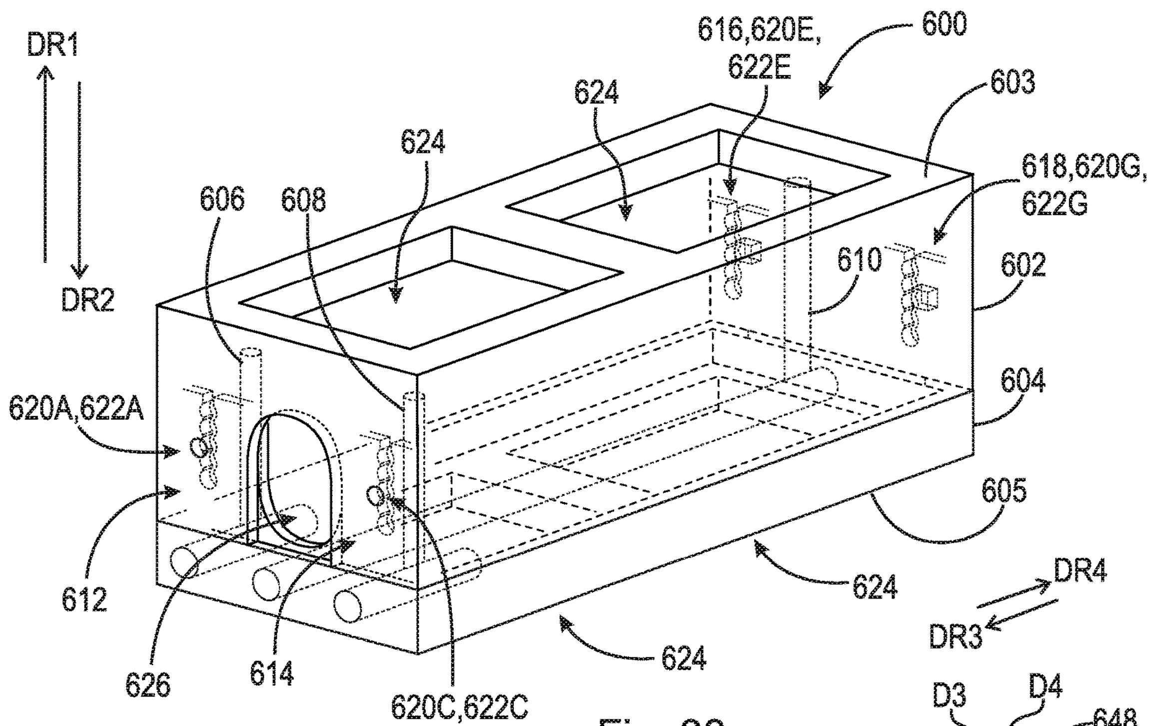
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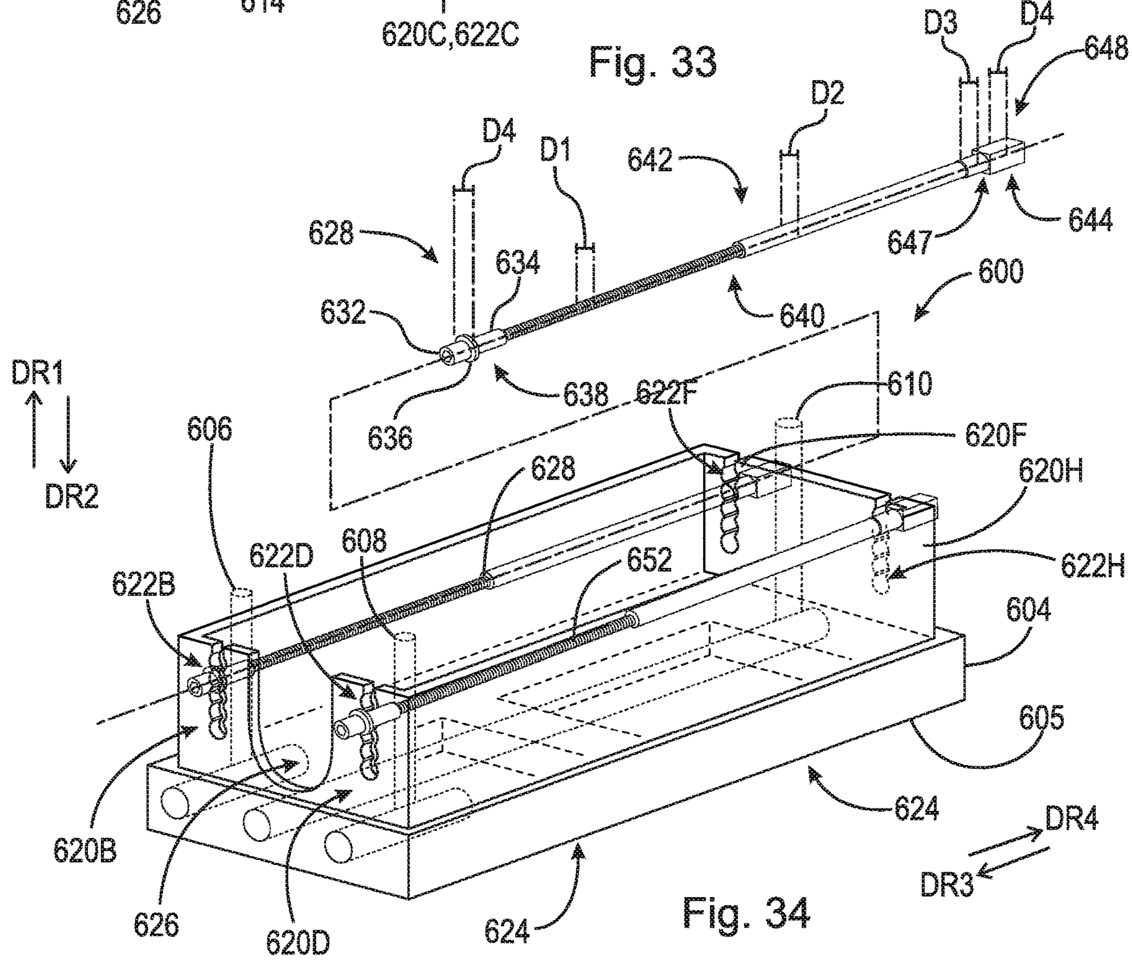
Fig. 33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620F
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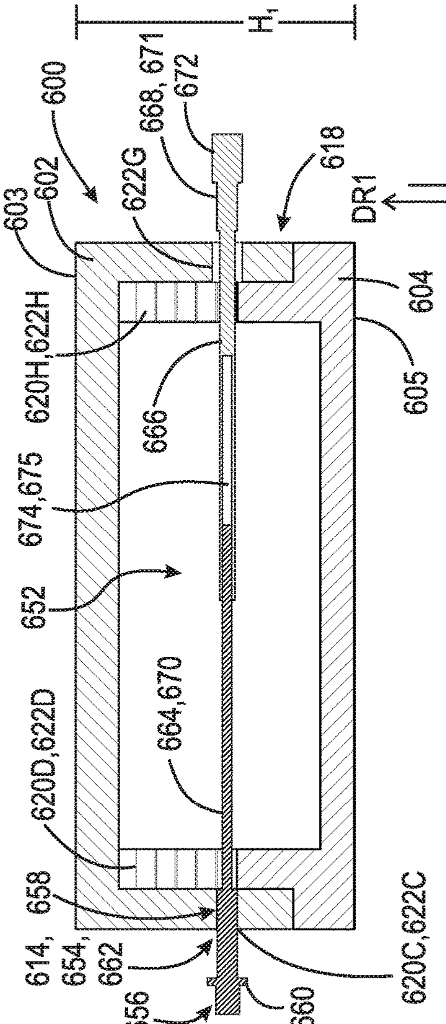
Fig. 34



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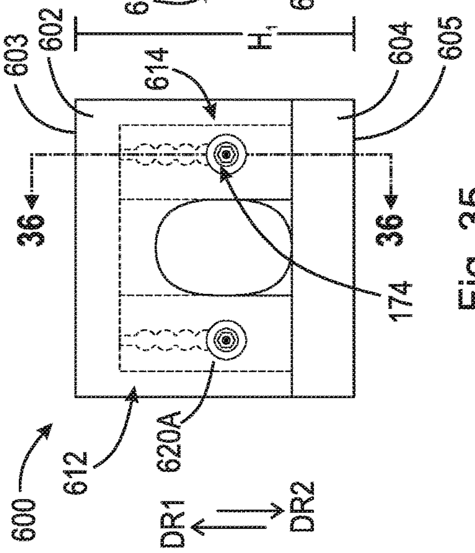

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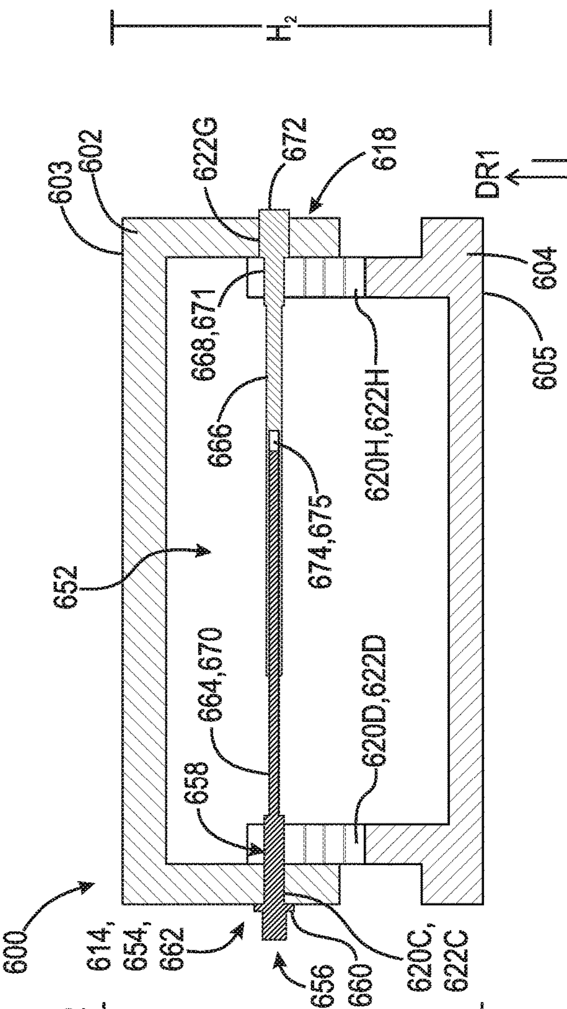
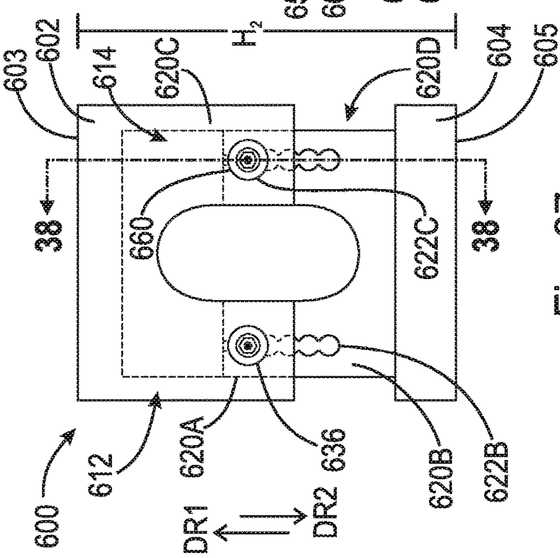


Fig. 38



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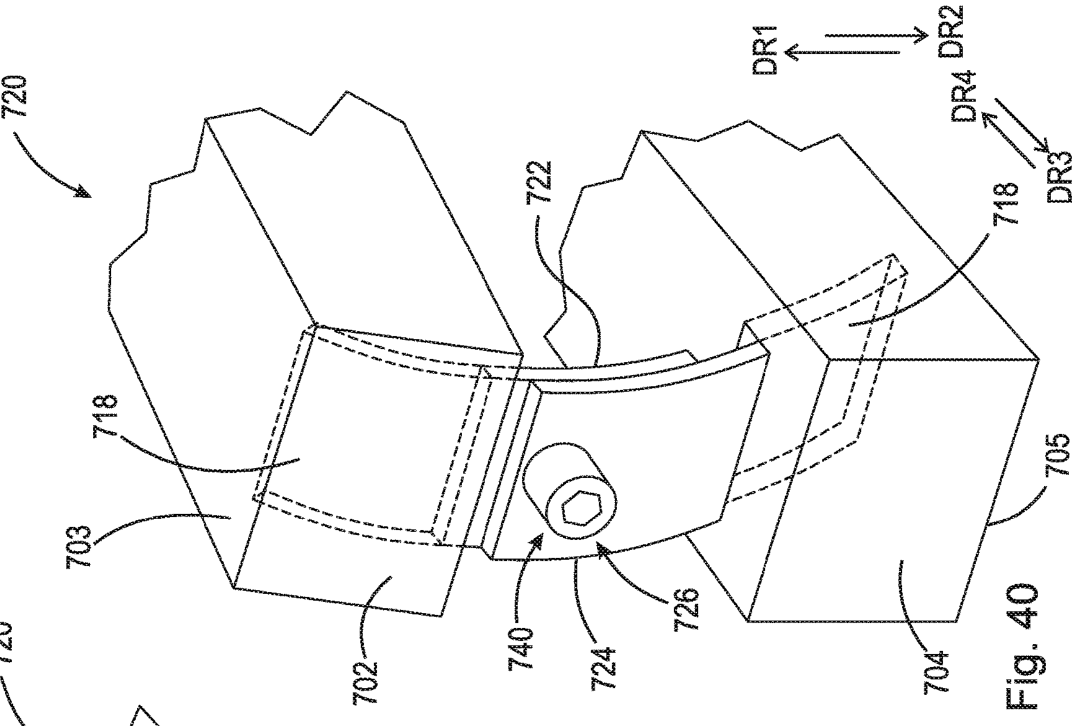
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DR1
DR2
DR4
DR3

Fig. 40

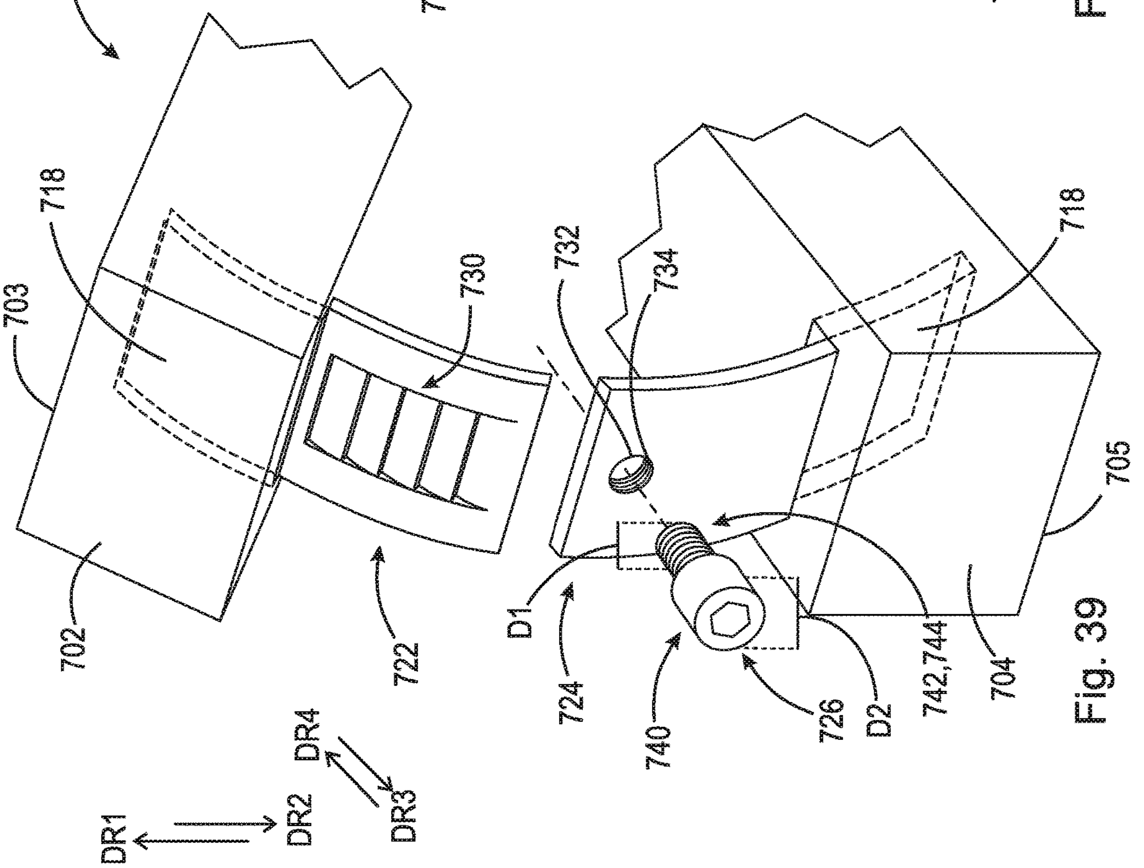

720
703
718
730
732
734
718
702
722
724
D1
740
726
D2
742,744
704
705
DR1
DR2
DR4
DR3

Fig. 39

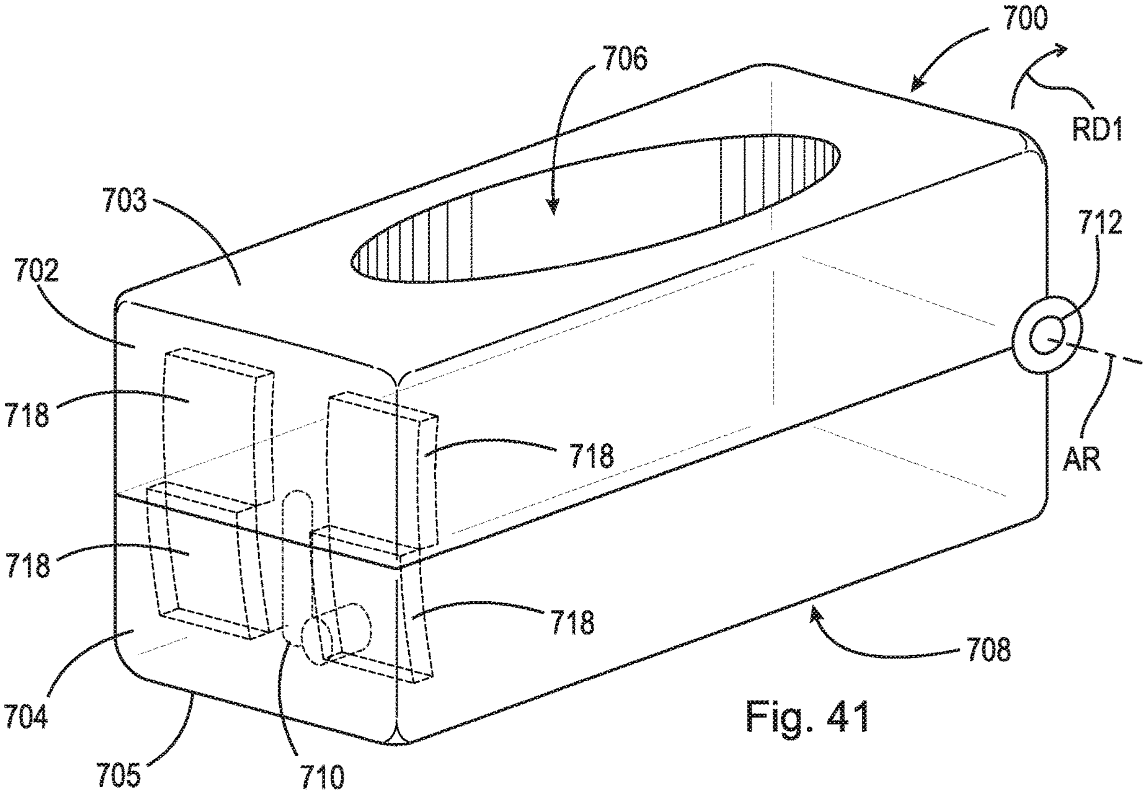

700
706
RD1
703
712
702
718
718
AR
718
718
708
704
705
710

Fig. 41

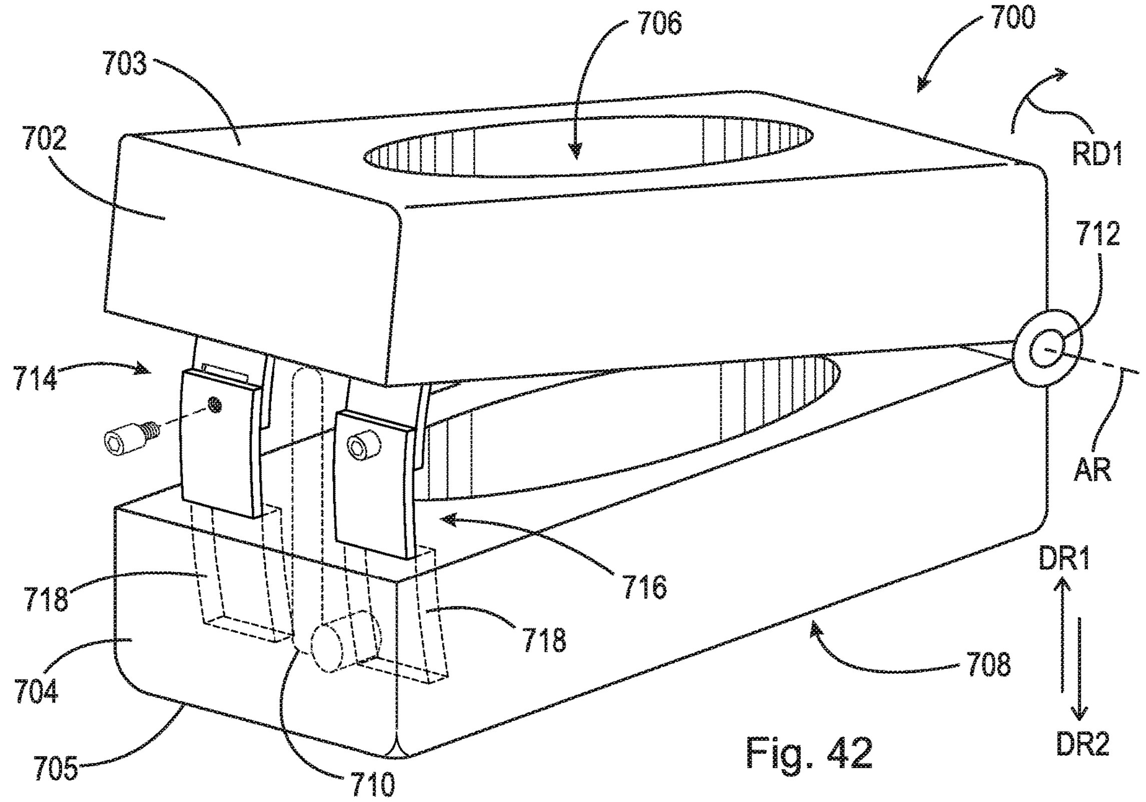

706
700
703
RD1
702
712
714
AR
716
DR1
718
718
704
708
DR2
705
710

Fig. 42

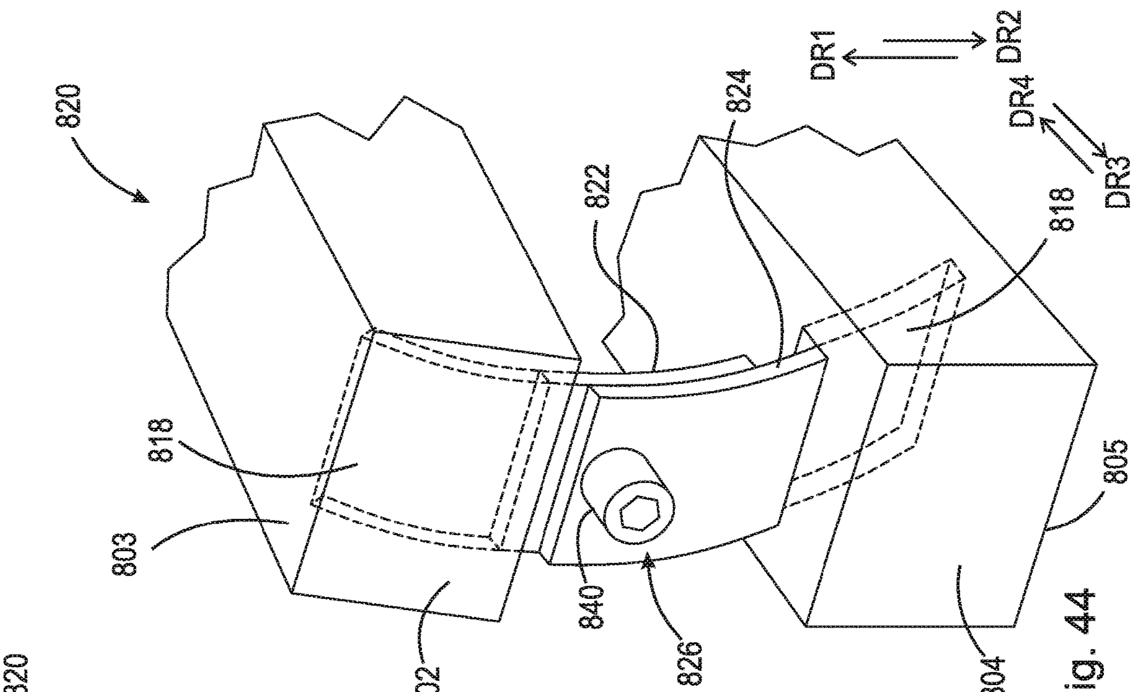
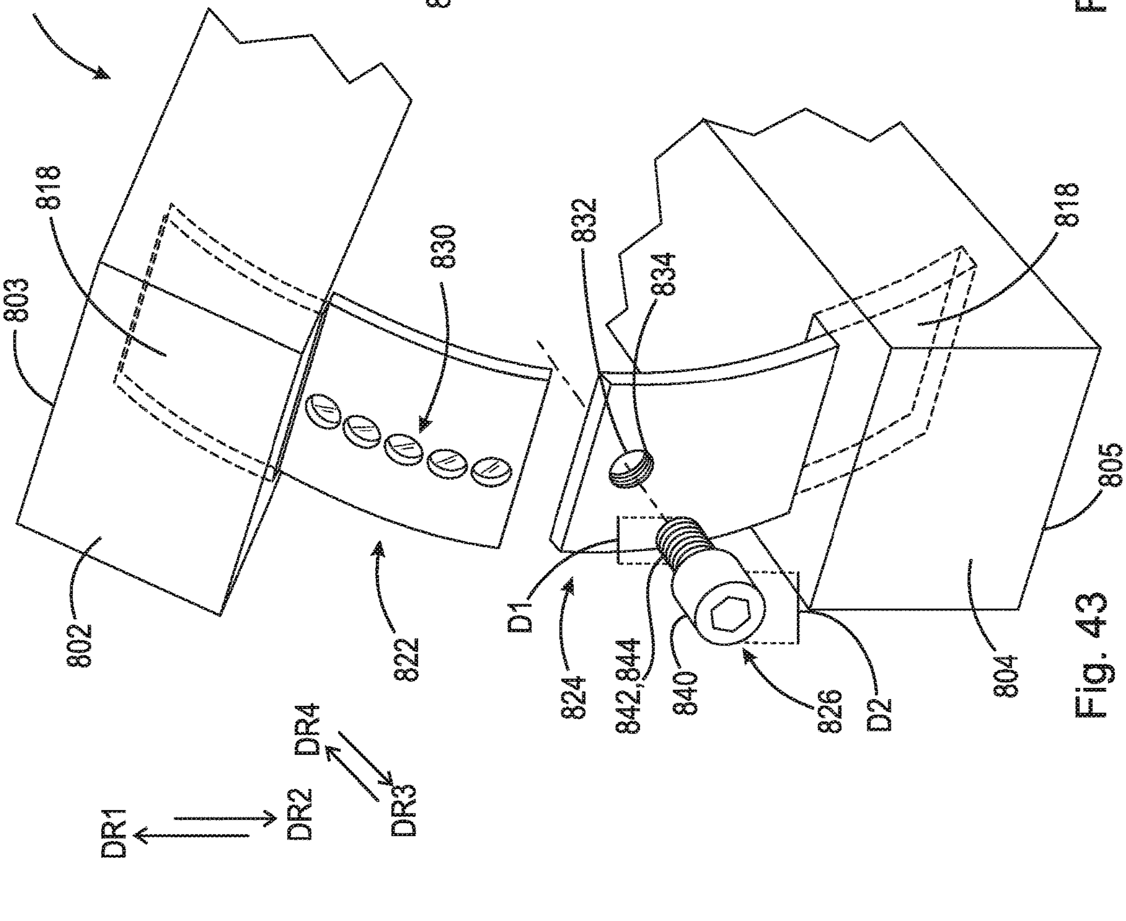

820
818
803
802
822
824
840
826
818
805
804
DR1
DR2
DR4
DR3

Fig. 44


820
803
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830
822
832
834
D1
824
842,844
840
826
D2
818
805
804
DR1
DR2
DR4
DR3

Fig. 43

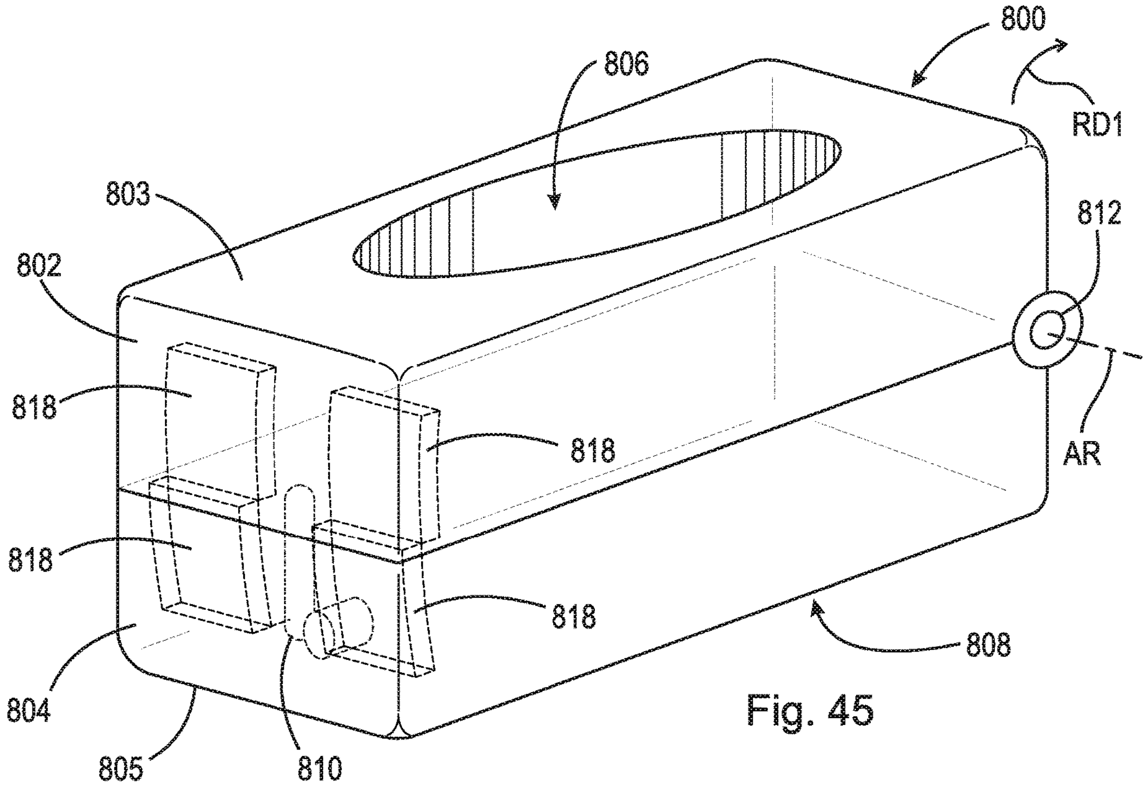

800
806
RD1
803
802
812
818
818
AR
818
818
808
804
805
810

Fig. 45

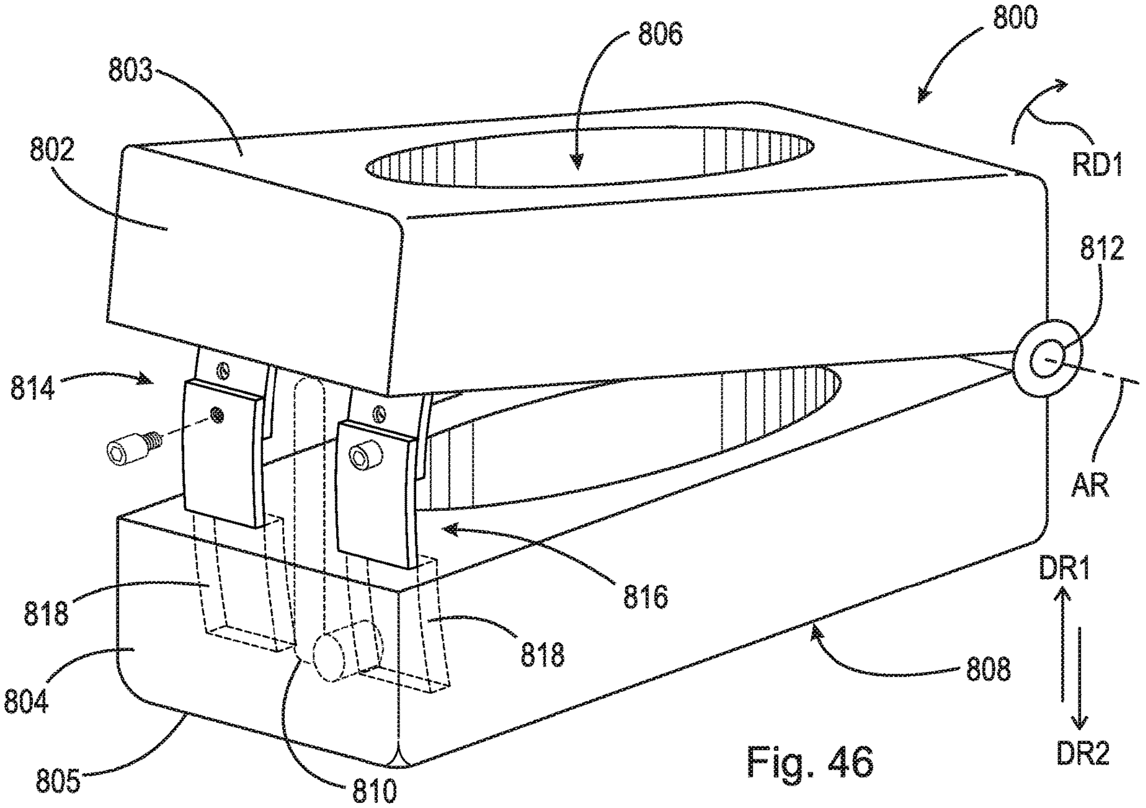

806
800
803
RD1
802
812
814
AR
816
DR1
818
818
808
804
DR2
805
810

Fig. 46

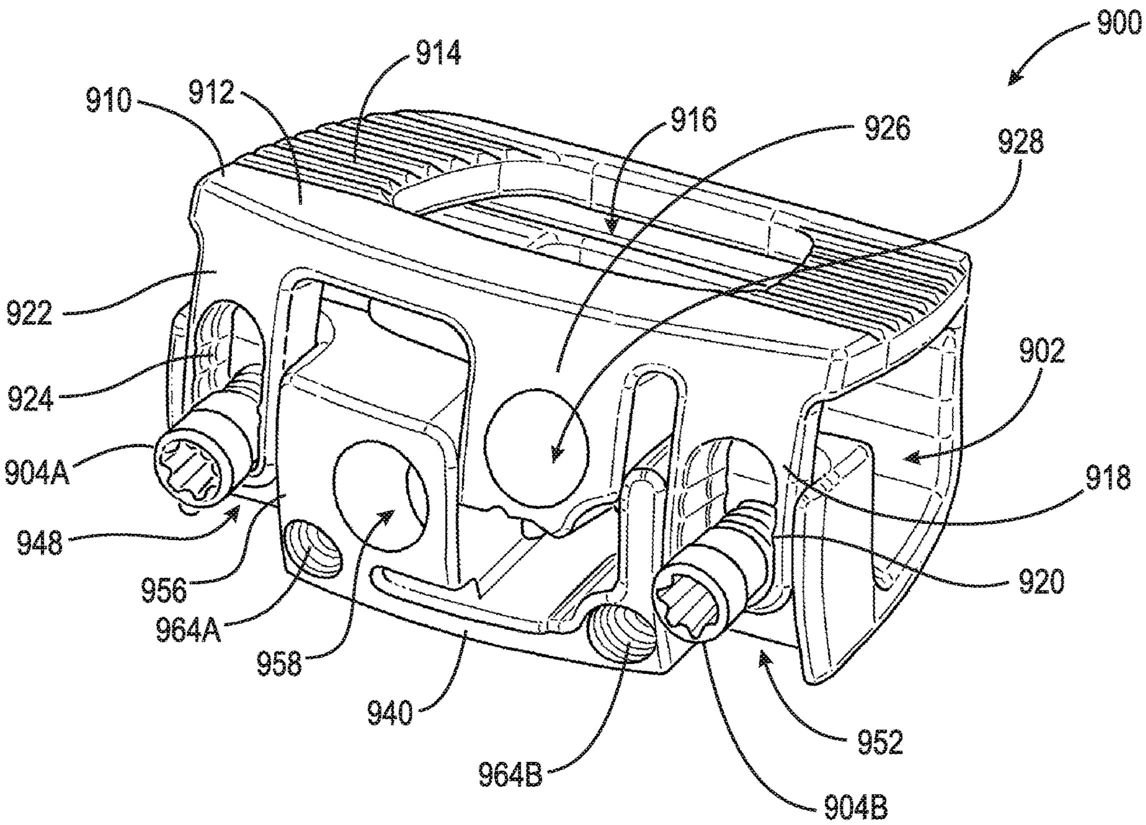
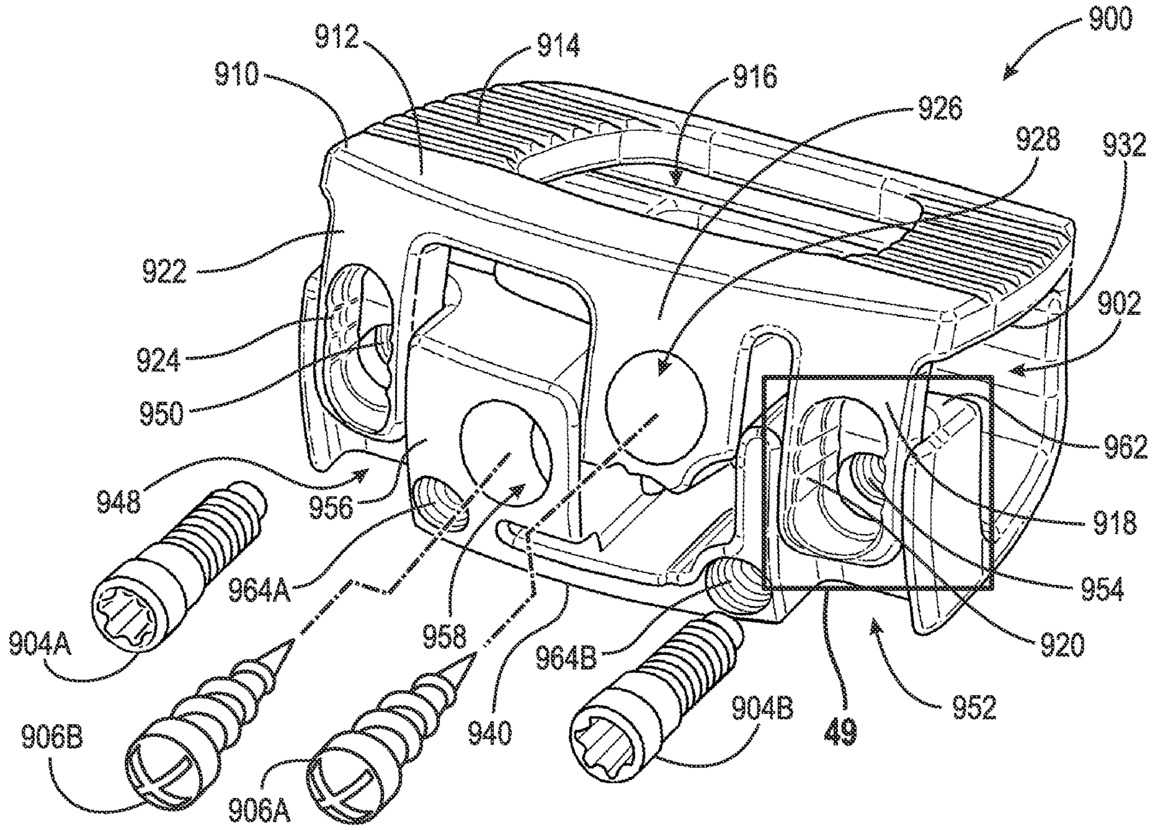

900
914
910
912
916
926
928
922
902
924
904A
918
948
920
956
964A
958
940
952
964B
904B

Fig. 47


900
912
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910
916
926
928
932
922
902
924
950
962
948
956
918
964A
954
958
920
904A
964B
940
49
952
906B
904B
906A

Fig. 48

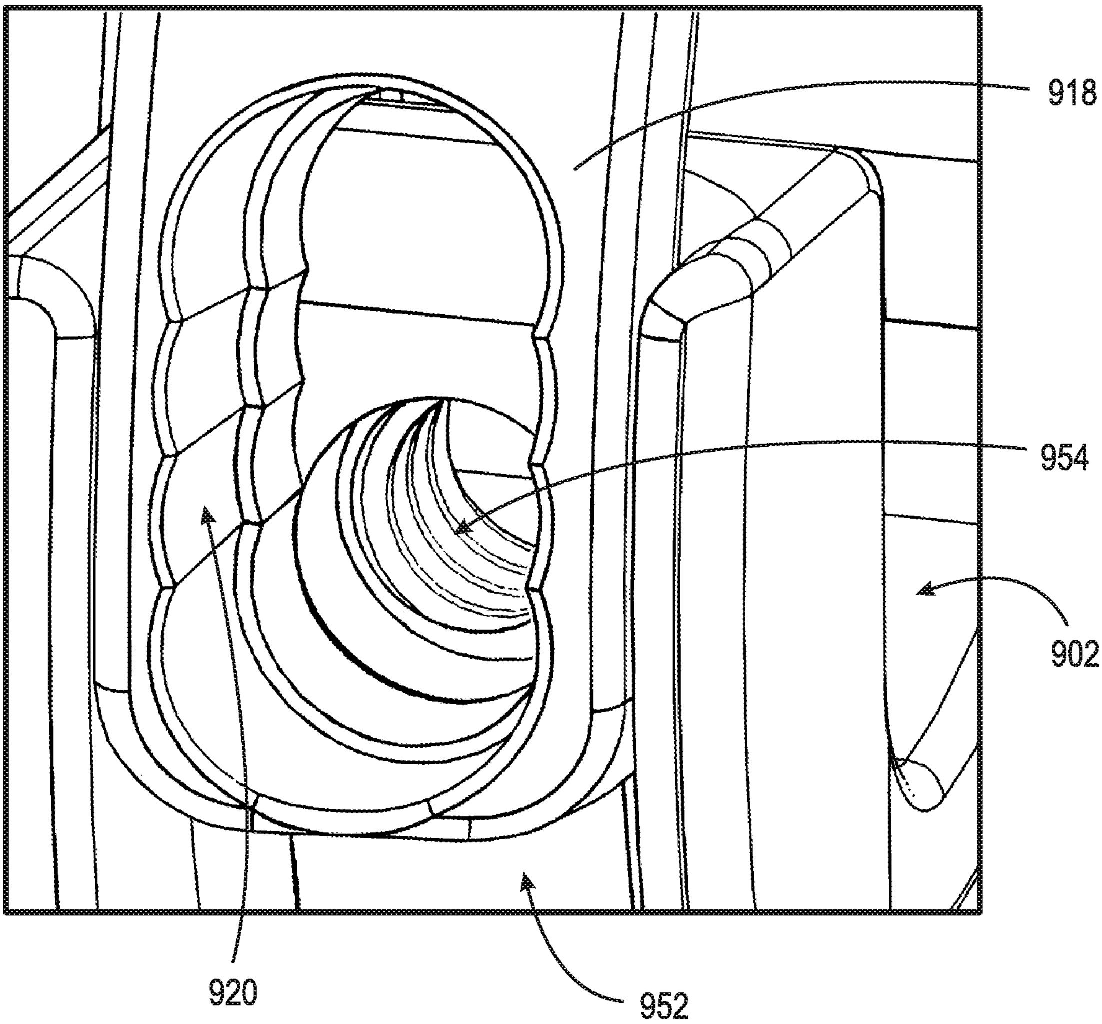

Fig. 49

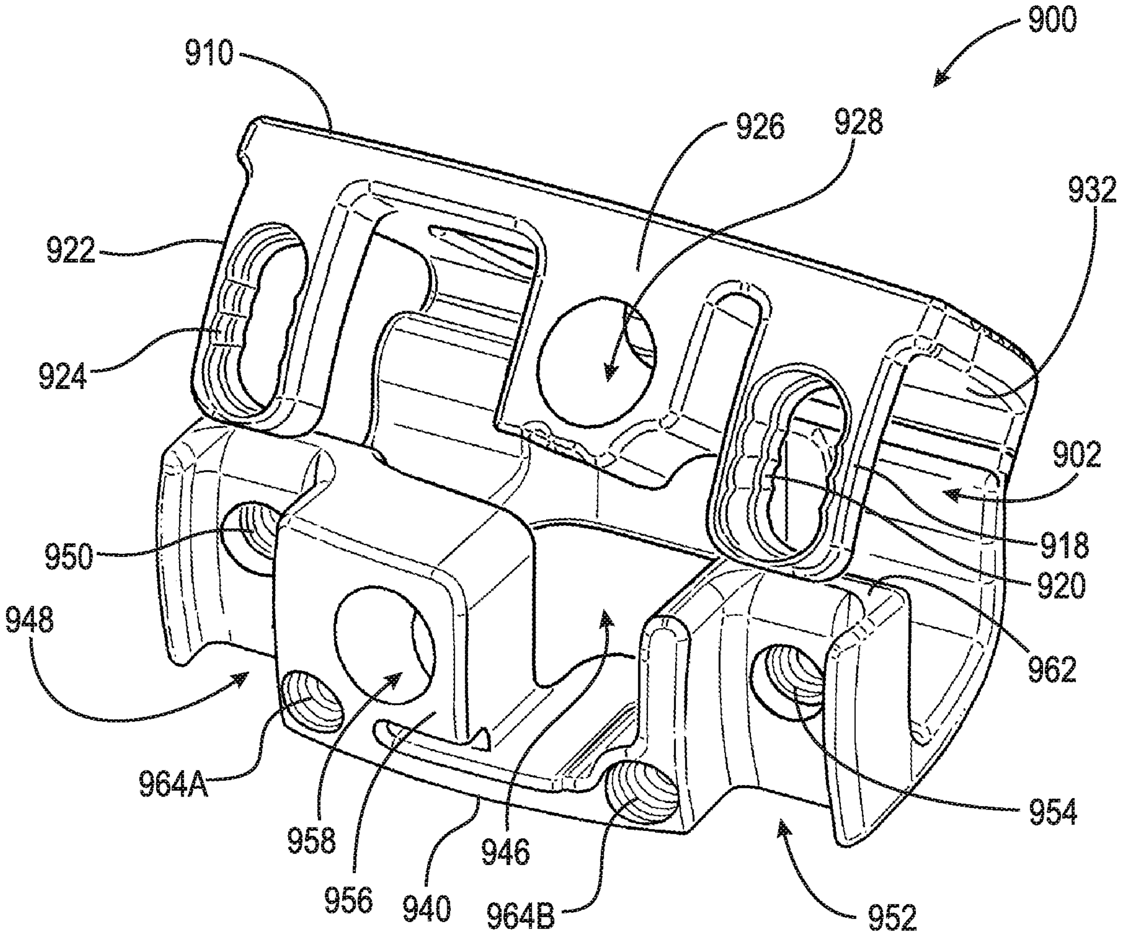
900
910
926
928
932
922
924
902
918
920
950
948
962
954
964A
958
956
940
946
964B
952

Fig. 50A

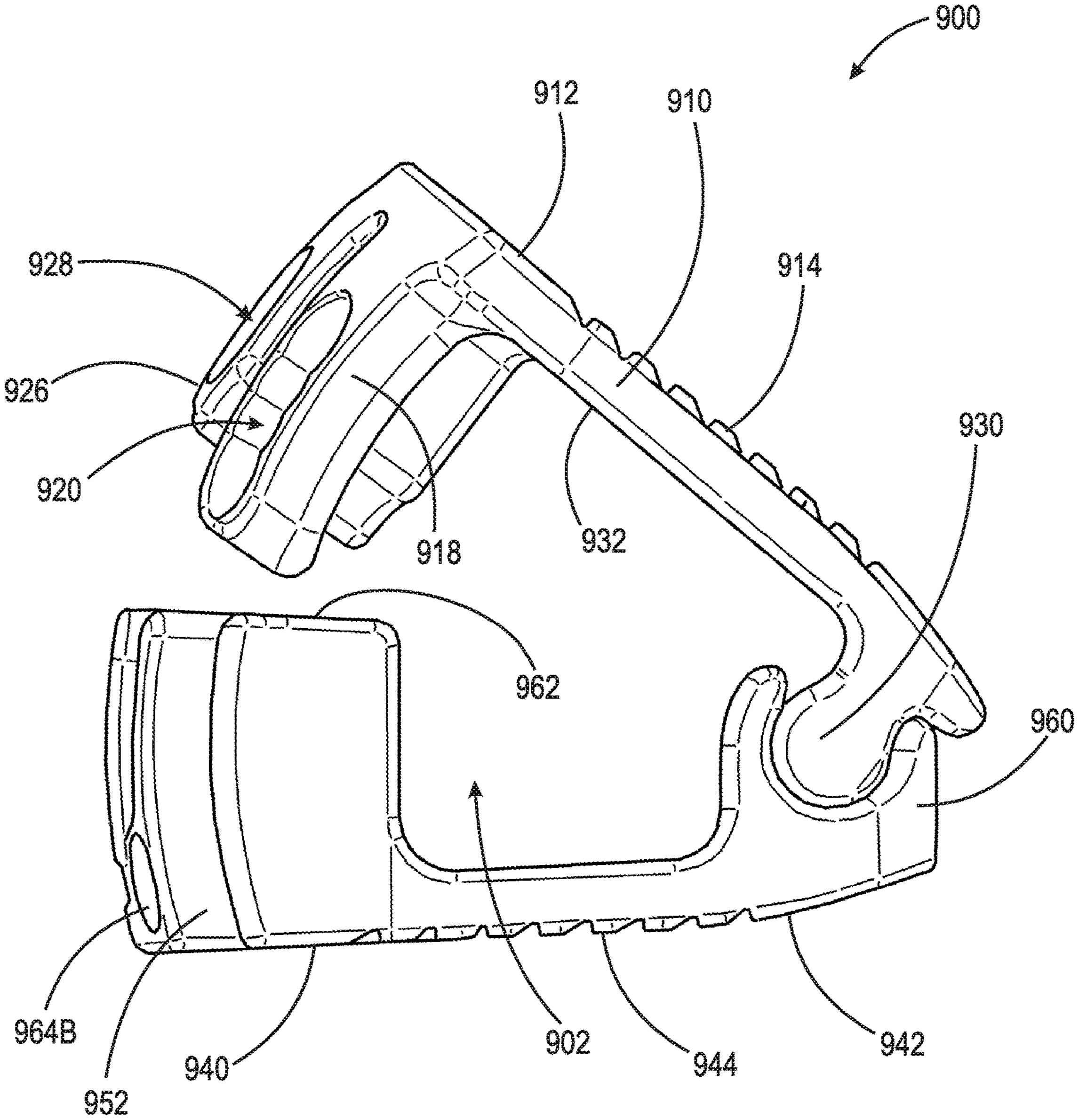
900
912
910
928
914
926
930
920
918
932
962
960
964B
952
940
902
944
942

Fig. 50B

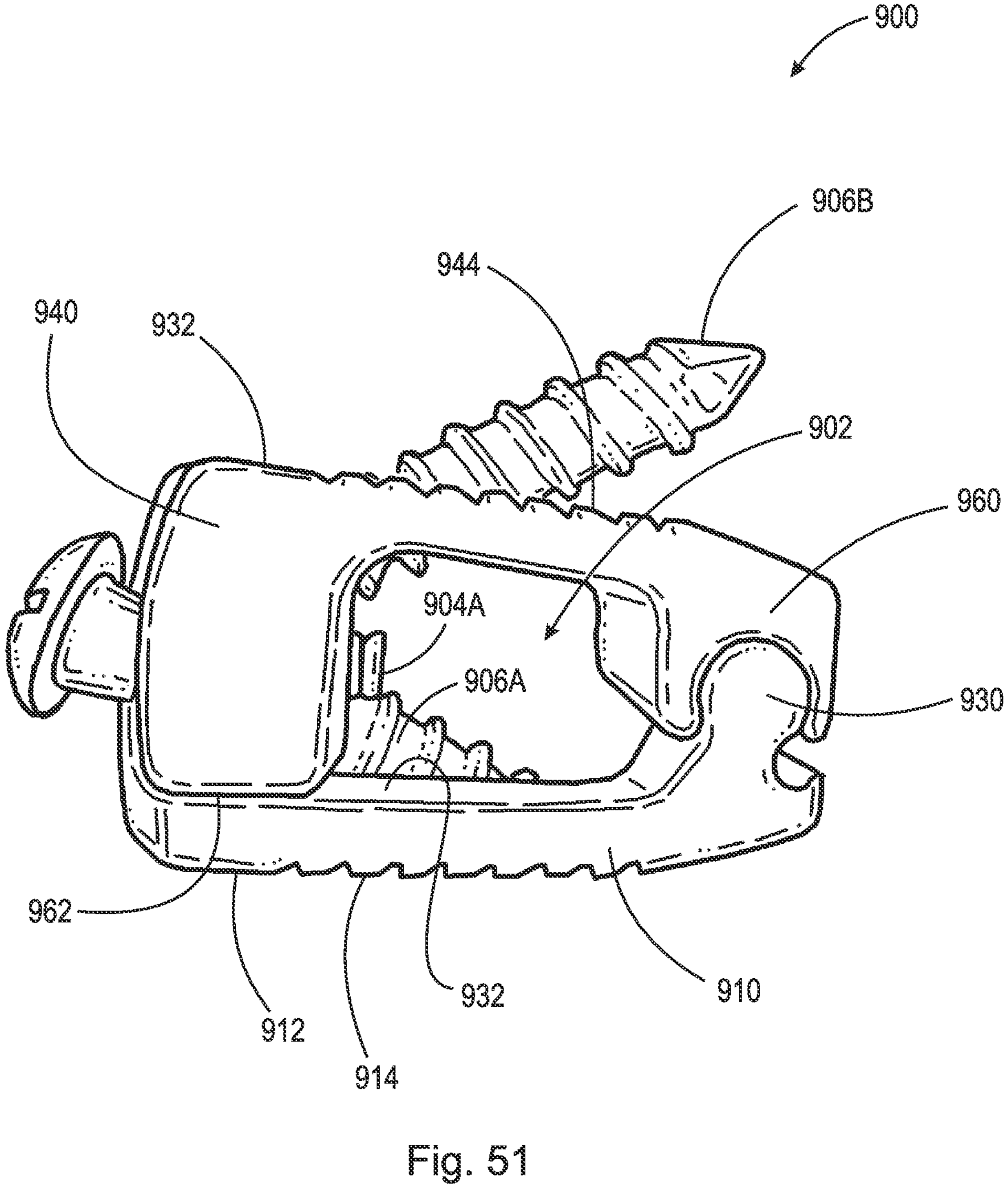

Fig. 51

STAND-ALONE EXPANDABLE INTERBODY SPINAL FUSION DEVICE WITH LOCKING MECHANISM

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is filed under 35 U.S.C. § 120 as a continuation-in-part of U.S. patent application Ser. No. 15/707,756, filed on Sep. 18, 2017, which application is hereby incorporated by reference in its entirety.

FIELD

The disclosure relates to spinal surgery, more particularly to intervertebral prosthesis, and, even more specifically, to a stand-alone expandable interbody spinal fusion device with a locking mechanism.

BACKGROUND

The spinal column, or backbone, is one of the most important parts of the body. It provides the main support, allowing us to stand upright, bend, and twist. As shown in FIG. **1**, thirty three (33) individual bones interlock with each other to form the spinal column. The vertebrae are numbered and divided into regions. The cervical vertebrae (C1-C7) form the neck, support the head and neck, and allow nodding and shaking of the head. The thoracic vertebrae (T1-T12) join with the ribs to form the rib cage. The five lumbar vertebrae (L1-L5) carry most of the weight of the upper body and provide a stable center of gravity when a person moves. Five vertebrae of the sacrum S and four of the coccyx C are fused. This comprises the back wall of the pelvis. Intervertebral discs are located between each of the mobile vertebra. Intervertebral discs comprise a thick outer layer with a crisscrossing fibrous structure annulus A that surrounds a soft gel-like center, the nucleus N. Discs function like shock-absorbing springs. The annulus pulls the vertebral bodies together against the elastic resistance of the gel-filled nucleus. When we bend, the nucleus acts like a ball bearing, allowing the vertebral bodies to roll over the incompressible gel. Each disc works in concert with two facet joints, forming a spinal motion segment. The biomechanical function of each pair of facet joints is to guide and limit the movement of the spinal motion segment. The surfaces of the joint are coated with cartilage that helps each joint move smoothly. Directly behind the discs, the ring-like vertebral bodies create a vertical tunnel called the spinal canal or neuro canal. The spinal cord and spinal nerves pass through the spinal canal, which protects them from injury. The spinal cord is the major column of nerve tissue that is connected to the brain and serves as an information superhighway between the brain and the body. The nerves in the spinal cord branch off to form pairs of nerve roots that travel through the small openings between the vertebrae and the intervertebral foramens.

The repetitive forces which act on these intervertebral discs during repetitive day-to-day activities of bending, lifting and twisting cause them to break down or degenerate over time. Overt trauma or covert trauma occurring in the course of repetitive activities disproportionately affect the more highly mobile areas of the spine. Disruption of a disc's internal architecture leads to bulging, herniation or protrusion of pieces of the disc and eventual disc space collapse. Resulting mechanical and chemical irritation of surrounding neural elements cause pain, attended by varying degrees of

disability. In addition, loss of disc space height relaxes tension on the longitudinal ligaments, thereby contributing to varying degrees of spinal instability such as spinal curvature.

Neural irritation and instability resulting from severe disc damage has been treated by removing the damaged disc and fusing adjacent vertebral elements. Removal of the disc relieves the mechanical and chemical irritation of neural elements, while osseous union solves the problem of instability. For example, in one surgical procedure, known as a discectomy (or diskectomy) with interbody fusion, the surgeon removes the nucleus of the disc and replaces it with an implant. As shown in FIG. **2**, it may be necessary, for example, for the surgeon to remove the nucleus of the disc between the L3 and L4 vertebrae. Disc D_{L3-L4} is shown in an enlarged view in FIG. **3**. This figure also shows various anatomical structures of the spine, including facets F**3**A and F**4**A, facet joint FJ, spinous processes SP**3** and SP**4**, transverse processes TP**3**A and TP**4**A, and intervertebral foramen IF. FIG. **4** is a top view of the section of the spinal column shown in FIG. **3**, with the L3 vertebra removed to expose annulus A and nucleus N of disc D_{L3-L4}. Neural canal NC is also shown. FIG. **5** is an anterior perspective view of the section of the spinal column shown in FIG. **4**. FIG. **6** is a partial cross-sectional view of the section of the spinal column shown in FIG. **5**, but with vertebra L3 in place atop disc D_{L3-L4}.

While cancellous bone appears ideal to provide the biologic components necessary for osseous union to occur, it does not initially have the strength to resist the tremendous forces that may occur in the intervertebral disc space, nor does it have the capacity to adequately stabilize the spine until long term bony union occurs. For these reasons, many spinal surgeons have found that interbody fusion using bone alone has an unacceptably high rate of bone graft migration or even expulsion or nonunion due to structural failure of the bone or residual degrees of motion that retard or prohibit bony union.

Intervertebral prosthesis in various forms have therefore been used to provide immediate stability and to protect and preserve an environment that fosters growth of grafted bone such that a structurally significant bony fusion can occur.

After insertion, and shortly after the conclusion of the surgical process, these interbody devices experience the full weight of the patient's upper body, originally experienced by the disc prior to replacement. This weight may be sufficient to cause expandable intervertebral implants such as the implants disclosed in U.S. patent application Ser. No. 15/416,270 filed Jan. 26, 2017, which application is herein incorporated by reference in its entirety, to collapse from their expanded state to their unexpanded height, thereby negatively affecting the quality of bone fusion.

Thus, there is a long-felt need for a stand-alone expandable interbody spinal fusion device with a locking mechanism operatively arranged to prevent collapse of an interbody device after insertion.

SUMMARY

According to aspects illustrated herein, there is provided an expandable interbody spinal fusion device, comprising an inferior component including at least one hole, a superior component connected to the inferior component, the superior component including a plurality of catches operatively arranged to align with the at least one hole, and a locking screw operatively arranged to engage the plurality of catches

and the at least one hole to lock the superior component with respect to the inferior component.

According to aspects illustrated herein, there is provided an expandable interbody spinal fusion device, comprising an inferior component including a first surface and at least one hole, a superior component hingedly connected to the inferior component, the superior component including a second surface and a plurality of catches operatively arranged to align with the at least one hole, a cavity formed between the inferior component and the superior component, and a locking screw operatively arranged to engage the plurality of catches and the at least one hole to lock the superior component with respect to the inferior component.

According to aspects illustrated herein, there is provided a stand-alone expandable interbody spinal fusion device including a superior component, an inferior component, an expansion mechanism operatively arranged to displace the superior component in a first direction relative to the inferior component about a first hinge, and a locking mechanism. The locking mechanism including a plate operatively arranged to pivot about a second hinge, the plate further comprising a first through-bore and a first plurality of teeth, a pawl operatively arranged to pivot about a third hinge, the pawl further comprising a second through-bore, and a post operatively arranged to pass through the second and third through-bores such that after the superior component is displaced in the first direction, the locking mechanism prevents displacement of the superior component in a second direction, opposite the first direction.

According to aspects illustrated herein, there is provided a stand-alone expandable interbody spinal fusion device including a superior component, an inferior component, an expansion mechanism operatively arranged to displace the superior component in a first direction relative to the inferior component about a hinge, and a locking mechanism. The locking mechanism including a first plate fixedly secured to the superior component, the first plate further comprising a first through-bore, a second plate fixedly secured to the inferior component, the second plate further comprising a second through-bore, a post having a first end and a second end such that after the superior component is displaced in the first direction, the locking mechanism prevents displacement of the superior component in a second direction, opposite the first direction.

According to aspects illustrated herein, there is provided a stand-alone expandable interbody spinal fusion device including a superior component, an inferior component, an expansion mechanism operatively arranged to displace the superior component in a first direction relative to the inferior component, and a locking mechanism. The locking mechanism including a first plate fixedly secured to the superior component, the first plate further comprising a first through-bore, a second plate fixedly secured to the inferior component, the second plate further comprising a second through-bore, a third plate fixedly secured to the superior component, the third plate further comprising a third through-bore, a fourth plate fixedly secured to the inferior component, the fourth plate further comprising a fourth through-bore, and, a post arranged to engage with the first through-bore, the second through-bore, the third through-bore, and the fourth through-bore, such that after the superior component is displaced in the first direction, the locking mechanism prevents displacement of the superior component in a second direction, opposite the first direction.

These and other objects, features, and advantages of the present disclosure will become readily apparent upon a review of the following detailed description of the disclosure, in view of the drawings and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Various embodiments are disclosed, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate corresponding parts, in which:

FIG. **1** is an anterior perspective view of spinal column **10**;

FIG. **2** is an anterior perspective view of the lumbar section of spinal column **10**;

FIG. **3** is a lateral perspective view of L3, L4 vertebrae and disc D_{L3-L4} and related spinal anatomy;

FIG. **4** is a top view of a section of the spinal column, taken generally along line **4-4** in FIG. **3**;

FIG. **5** is an enlarged anterior perspective view of the spinal column shown in FIG. **2**, except with vertebra L3 and all other structure above L3 removed;

FIG. **6** is a partial cross-sectional view of the L4 vertebra and D_{L3-L4} disc shown in FIG. **5**, including L3 in cross-section;

FIG. **7** is a partial cross-sectional view of the L4 vertebra and D_{L3-L4} disc shown in FIG. **5**, showing the removal of the disc nucleus post-discectomy including L3 in cross-section;

FIG. **8** illustrates the introduction of the stand-alone expandable interbody spinal fusion device into the disc space in an unexpanded state;

FIG. **9** is a perspective view of a first embodiment of a stand-alone expandable interbody spinal fusion device, in an unexpanded state;

FIG. **10** is a partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with a first embodiment of a locking mechanism, in an expanded state;

FIG. **11** is a front view of a stand-alone expandable interbody spinal fusion device with a first embodiment of a locking mechanism, in an unexpanded state;

FIG. **12** is a cross-sectional view of a stand-alone expandable interbody spinal fusion device with a first embodiment of a locking mechanism, in an unexpanded state, taken generally along line **12-12** in FIG. **11**;

FIG. **13** is a front view of a stand-alone expandable interbody spinal fusion device with a first embodiment of a locking mechanism, in an expanded state;

FIG. **14** is a cross-sectional view of a stand-alone expandable interbody spinal fusion device with a first embodiment of a locking mechanism, in an expanded state, taken generally along line **14-14** in FIG. **13**;

FIG. **15**A is a perspective view of an expansion mechanism in an unexpanded state;

FIG. **15**B is a perspective view an expansion mechanism in an expanded state;

FIG. **16** is a perspective view of an expansion mechanism;

FIG. **17** is a side view of a second embodiment of a locking mechanism;

FIG. **18** is a front perspective partially exploded view of a second embodiment of a locking mechanism;

FIG. **19** is a front perspective view of a stand-alone expandable interbody spinal fusion device with a second embodiment of a locking mechanism, in an unexpanded state;

FIG. **20** is a front perspective view of a stand-alone expandable interbody spinal fusion device with a second embodiment of a locking mechanism, in an expanded state;

FIG. **21** is a side view of a third embodiment of a locking mechanism;

FIG. **22** is a front perspective partially exploded view of a third embodiment of a locking mechanism;

FIG. **23** is a front perspective view of a stand-alone expandable interbody spinal fusion device with a third embodiment of a locking mechanism, in an unexpanded state;

FIG. **24** is a front perspective view of a stand-alone expandable interbody spinal fusion device with a third embodiment of a locking mechanism, in an expanded state;

FIG. **25** is a front perspective partial view of a fourth locking mechanism in an unlocked state;

FIG. **26** is a front perspective partial view of a fourth locking mechanism in a locked state;

FIG. **27** is a front partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with a fourth embodiment of a locking mechanism in an unexpanded state;

FIG. **28** is a front perspective view of a stand-alone expandable interbody spinal fusion device with a fourth embodiment of a locking mechanism in an expanded state;

FIG. **29** is a front perspective partial view of a fifth locking mechanism in an unlocked state;

FIG. **30** is a front perspective partial view of a fifth locking mechanism in a locked state;

FIG. **31** is a front partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with a fifth embodiment of a locking mechanism in an unexpanded state;

FIG. **32** is a front partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with a fifth embodiment of a locking mechanism in an expanded state;

FIG. **33** is a perspective view of a sixth embodiment of a stand-alone expandable interbody spinal fusion device, in an unexpanded state;

FIG. **34** is a partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with a sixth embodiment of a locking mechanism, in an expanded state;

FIG. **35** is a front view of a stand-alone expandable interbody spinal fusion device with a sixth embodiment of a locking mechanism, in an unexpanded state;

FIG. **36** is a cross-sectional view of a stand-alone expandable interbody spinal fusion device with a sixth embodiment of a locking mechanism, in an unexpanded state, taken generally along line **36-36** in FIG. **35**;

FIG. **37** is a front view of a stand-alone expandable interbody spinal fusion device with a sixth embodiment of a locking mechanism, in an expanded state;

FIG. **38** is a cross-sectional view of a stand-alone expandable interbody spinal fusion device with a sixth embodiment of a locking mechanism, in an expanded state, taken generally along line **38-38** in FIG. **37**;

FIG. **39** is a front perspective partial view of a seventh embodiment of a locking mechanism in an unlocked state;

FIG. **40** is a front perspective partial view of a seventh embodiment of a locking mechanism in a locked state;

FIG. **41** is a front partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with a seventh embodiment of a locking mechanism in an unexpanded state;

FIG. **42** is a front perspective view of a stand-alone expandable interbody spinal fusion device with a seventh embodiment of a locking mechanism in an expanded state;

FIG. **43** is a front perspective partial view of an eighth embodiment of a locking mechanism in an unlocked state;

FIG. **44** is a front perspective partial view of an eighth embodiment of a locking mechanism in a locked state;

FIG. **45** is a front partially-exploded perspective view of a stand-alone expandable interbody spinal fusion device with an eighth embodiment of a locking mechanism in an unexpanded state;

FIG. **46** is a front perspective view of a stand-alone expandable interbody spinal fusion device with an eighth embodiment of a locking mechanism in an expanded state;

FIG. **47** is a front perspective view of a stand-alone expandable interbody spinal fusion device in an expanded state;

FIG. **48** is a partial exploded view of the stand-alone expandable interbody spinal fusion device shown in FIG. **47**;

FIG. **49** is a detail view of the stand-alone expandable interbody spinal fusion device taken generally along detail **49** in FIG. **48**;

FIG. **50**A is a front perspective view of the stand-alone expandable interbody spinal fusion device shown in FIG. **47**;

FIG. **50**B is a side elevational view of the stand-alone expandable interbody spinal fusion device shown in FIG. **50**A; and,

FIG. **51** is a side elevational view of the stand-alone expandable interbody spinal fusion device shown in FIG. **47** in a collapsed state.

DETAILED DESCRIPTION

At the outset, it should be appreciated that like drawing numbers on different drawing views identify identical, or functionally similar, structural elements. It is to be understood that the claims are not limited to the disclosed aspects.

Furthermore, it is understood that this disclosure is not limited to the particular methodology, materials and modifications described and as such may, of course, vary. It is also understood that the terminology used herein is for the purpose of describing particular aspects only, and is not intended to limit the scope of the claims.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which this disclosure pertains. It should be understood that any methods, devices or materials similar or equivalent to those described herein can be used in the practice or testing of the example embodiments. The assembly of the present disclosure could be driven by hydraulics, electronics, pneumatics, and/or springs.

It should be appreciated that the term "substantially" is synonymous with terms such as "nearly," "very nearly," "about," "approximately," "around," "bordering on," "close to," "essentially," "in the neighborhood of," "in the vicinity of," etc., and such terms may be used interchangeably as appearing in the specification and claims. It should be appreciated that the term "proximate" is synonymous with terms such as "nearby," "close," "adjacent," "neighboring," "immediate," "adjoining," etc., and such terms may be used interchangeably as appearing in the specification and claims. The term "approximately" is intended to mean values within ten percent of the specified value.

The term "superior component" as used in the present disclosure is intended to mean the component of the body of the implant located in the highest position relative to the other components in first direction DR**1**.

The term "inferior component" as used in the present disclosure is intended to mean the component of the body of the implant located in the lowest position relative to the other components in first direction DR**1**.

The term "gear shaft" as used in the present disclosure is intended to mean any gear currently understood in the art that has been elongated such that it is substantially cylindrical in shape.

The term "pawl" as used in the present disclosure is intended to mean a plate or bar having one end arranged to engage the teeth of a ratchet and place pressure on the ratchet in a first direction such that the ratchet can only be disengaged from the teeth by motion in a second direction, opposite the first direction.

Adverting now to the Figures, and as described previously, FIGS. **1-6** depict various parts and sections of spinal anatomy. FIG. **7** illustrates a partial cross-sectional view of the L3 and L4 vertebra with disc D_{L3-L4} removed (post discectomy) and able to receive stand-alone expandable interbody spinal fusion device **100**.

FIG. **8** illustrates a partial cross-sectional view of the L3 and L4 vertebra with stand-alone expandable interbody spinal fusion device **100** in place within disc space **12** in an unexpanded state.

FIG. **9** is a perspective view of stand-alone expandable interbody spinal fusion device **100**, in an unexpanded state. Device **100** comprises superior component **102**, inferior component **104**, and expansion mechanisms **106**, **108**, and **110** (described infra) arranged to displace superior component **102** in a first direction DR**1** relative to inferior component **104**, giving device **100** an expanded height H_2 greater than unexpanded height H_1 (shown in FIGS. **11** and **13**). Device **100** also comprises locking mechanisms **112**, **114**, **116**, and **118** arranged between superior component **102** and inferior component **104** (locking mechanisms **116** and **118** are shown in FIG. **10**).

Locking mechanism **112** comprises plates **120**A (shown in FIG. **9**) and **120**B (shown in FIG. **10**). Locking mechanism **114** comprises plates **120**C (shown in FIG. **9**) and **120**D (shown in FIG. **10**). Locking mechanism **116** comprises plates **120**E (shown in FIG. **9**) and **120**F (shown in FIG. **10**). Locking mechanism **118** comprises plates **120**G (shown in FIG. **9**) and **120**H (shown in FIG. **10**). Each of plates **120**A-**120**H further include a plurality of through-bores, i.e., plurality of through-bores **122**A-**122**H, respectively. It should be appreciated that, although plates **120**A-**120**H are shown as integral within superior component **102** and inferior component **104**, plates **120**A-**120**H could also be discrete plates, fixedly secured to superior component **102** and inferior component **104**.

Superior component **102** and inferior component **104** further comprise at least one first aperture **124** arranged to allow fusion between bone fusing material and the adjacent vertebra and a second aperture **126** located on the front face of device **100** and arranged to allow the introduction of bone fusing material into device **100**. Second aperture **126** is illustrated as an arched slot as a non-limiting example, however, it should be appreciated that second aperture **126** could be an aperture of any suitable shape, e.g., triangular, circular, rectangular, elliptical, etc., that would allow for the introduction of bone fusing material into device **100**. Superior component **102** has a first surface **103** and inferior component **104** has a first surface **105**.

FIG. **10** is a perspective view of stand-alone expandable interbody spinal fusion device **100**, in an expanded state. It should be appreciated that FIG. **10** is a partial view, i.e., superior component **102** has been removed for clarity. During surgery and after device **100** is implanted in disc space **12**, a surgeon can apply torque to expansion mechanisms **106**, **108**, and **110** via any device that imparts rotational force upon expansion mechanisms **106**, **108**, and **110** (e.g., a screw driver or impact driver). Expansion mechanisms **106**, **108** and **110** are preferably the embodiment illustrated in FIGS. **15** and **16**, described infra. Furthermore, it should be appreciated that although expansion mechanisms **106**, **108**, and **110** are depicted within inferior component **104** in FIGS. **9-14**, expansion mechanisms **106**, **108**, and **110** could be arranged within superior component **102**. This rotational force causes expansion mechanisms **106**, **108**, and **110**, to displace superior component **102** in direction DR**1** relative to inferior component **104** giving device **100** an expanded height H_2, greater than H_1 (shown in FIGS. **11** and **13**). It should be appreciated that expansion mechanisms **106**, **108**, and **110** can be expanded to any height between unexpanded height H_1 and expanded height H_2. Device **100** further comprises post **128** and fastener **130**. Post **128** and fastener **130** are provided to secure locking mechanisms **112** and **116** in position once device **100** is expanded to its final height. Fastener **130** has a first end **132** and a second end **134**. First end **132** is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **130**, e.g., a drill. Second end **134** includes female threading **136**. Post **128** further includes four sections, i.e., section **138**, section **140**, section **142**, and section **144**. Section **138** comprises male threading **146** operatively arranged to engage with female threading **136**. Section **144** comprises stopping element **148**. It should be appreciated that, although stopping element **148** is depicted as a flanged member, other variations of stopping elements can be used, e.g., a spherical stopping element. Sections **138** and **142** have diameter D**1** and sections **140** and **144** have diameter D**2**, where D**2** is greater than D**1**. Prior to locking, sections **138** and **142** having diameter D**1** are loosely seated in longitudinal space **150** (shown in FIG. **11**) arranged between each through-bore in the plurality of through-bores **122**A, **122**B, **122**E, and **122**F. After device **100** has been inserted into disc space **12** and expanded to an appropriate height, a surgeon can apply torque to first end **132** of fastener **130**, pulling post **128** in direction DR**3** into the locked position. In the locked position, sections **140** and **144** are completely seated in one of the through-bores of plurality of through-bores **122**A, **122**B, **122**E, and **122**F, which correspond to the chosen device height. In this locked position, device **100** is prevented from collapsing in direction DR**2**.

Device **100** further comprises post **152** and fastener **154** (shown in FIG. **14**). Post **152** and fastener **154** are provided to secure locking mechanisms **114** and **118** in position once device **100** is expanded to its final height. Fastener **154** has a first end **156** and a second end **158**. First end **156** includes a recess operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **154**, e.g., a drill. Second end **158** includes female threading **160**. Post **152** includes four sections, i.e., section **162**, section **164**, section **166**, and section **168**. Section **162** comprises male threading **170** operatively arranged to engage with female threading **160** of fastener **154**. Section **168** comprises stopping element **172**. It should be appreciated that, although stopping element **172** is depicted as a flanged member, other variations of stopping elements can be used, e.g., a spherical stopping element. Sections **162** and **166** have diameter D**1** and sections **164** and **168** have diameter D**2** where D**2** is greater than D**1**. Prior to locking, sections **162** and **166**, having diameter D**1**, are loosely seated in longitudinal space **174** (shown in FIG. **11**) arranged between each through-bore in the plurality of through-bores **122**C, **122**D, **122**G, and **122**H. After device **100** has been inserted into disc space **12** and expanded to an appropriate height, a surgeon can apply torque to first end **156** of fastener **154**, pulling post **152** in direction DR**3** into the locked position. In the locked position, sections **164** and **168** are seated in one of the through-bores of plurality of through-bores **122**C, **122**D, **122**G, and **122**H, which corresponds to the chosen device height. In this locked position, device **100** is prevented from collapsing in direction DR2.

FIG. **11** is a front view of stand-alone expandable interbody spinal fusion device **100**, in an unexpanded state having an unexpanded height H_1. FIG. **12** is a cross-sectional view of stand-alone expandable interbody spinal fusion device **100**, in an unexpanded state having an unexpanded height H_1. FIG. **13** is a front view stand-alone expandable interbody spinal fusion device **100**, in an expanded state having an expanded height H_2, greater than H_1. FIG. **14** is a cross-sectional view of stand-alone expandable interbody spinal fusion device **100** in an expanded state having an expanded height H_2, greater than H_1. It should be appreciated that in FIGS. **12** and **14**, expansion mechanisms **106**, **108** and **110** have been removed for clarity. It should also be appreciated that, although pluralities of through-bores **122**A-**122**H are illustrated with a longitudinal space between each through-bore of each plurality of through-bores, it is also contemplated that plurality of through-bores **122**A-**122**H could include multiple discrete through-bores, separate and distinct from each other with no longitudinal space between them.

FIG. **15**A is a perspective view of expansion mechanism **176** in an unexpanded state. FIG. **15**B is a perspective view of an expansion mechanism **176** in an expanded state. Expansion mechanism **176** comprises threaded rod **178**, threaded sleeve **180**, and worm drive **182** having worm **184** and gear **186**. A portion of threaded rod **178** can be embedded within superior component **102** such that it is rotationally fixed; however, it should be appreciated that the frictional engagement between the top surface of threaded rod **178** and the inner surface of superior component **102** may be sufficient to prevent threaded rod **178** from freely rotating. During surgery and after device **100** is implanted in disc space **12**, a surgeon can apply torque to worm drive **182** via any device that imparts rotational force upon worm **184** (e.g., a screw driver or impact driver). Torque is transferred 90 degrees through worm drive **182**, via worm **184** and gear **186**. Rotation of gear **186** causes threaded sleeve **180** to rotate. As threaded sleeve **180** rotates, threaded rod **178** remains rotationally locked due to the portion embedded within superior component **102**, or frictional contact with the inner surface of superior component **102**. As threaded sleeve **180** rotates, the threads of the rotationally locked threaded rod **178** ride upward along the threads within threaded sleeve **180**, displacing threaded rod **178**, and subsequently superior component **102**, in direction DR**1**. Threaded rod **178** includes a stopping feature to prevent threaded rod **178** from being ejected from threaded sleeve **180**. For example, the lower portion of threaded rod **178** could be threadless (not shown in the figures), and therefore prevent threaded rod **178** from being ejected from threaded sleeve **180**. When threaded rod **178** reaches its maximum expansion, the unthreaded portion of threaded rod **178** remains within threaded sleeve **180**, preventing threaded rod **178** from being pushed out of threaded sleeve **180**. Alternatively, the stopping feature could be a flange on the recessed portion of threaded rod **178** arranged to engage with a retention shoulder (not shown in the figures) within threaded sleeve **180** in a fully expanded state. It should be appreciated that worm drive **182** could be arranged to transfer torque in other arrangements, i.e., 180 degrees, 270 degrees, or any desirable angle required by the arrangement of worm **184** and gear **186**. It should further be appreciated that although a gear **186** is depicted in the figures as a spur gear, other suitable gears may be selected, i.e., a bevel gear, a hypoid gear, a spiral gear, or a face gear.

FIG. **16** is a perspective view of expansion mechanism **276**. Expansion mechanism **276** comprises threaded rod **278**, lifting nut **280**, and worm drive **282** having worm **284** and gear **286**. Lifting nut **280** may be connected to superior component **102**. In some embodiments, lifting nut **280** comprises platform **288** connected thereto, wherein the platform **288** is connected to superior component **102** such that lifting nut **280** is rotationally fixed. Lifting nut **280** may be fixedly secured to superior component **102**; however, it should be appreciated that the frictional engagement between platform **288** and the inner surface of superior component **102** may be sufficient to prevent lifting nut **280** from freely rotating. During surgery and after device **100** is implanted in disc space **12**, a surgeon can apply torque to worm drive **282** via any device that imparts rotational force upon worm **284** (e.g., a screw driver or impact driver). Torque is transferred 90 degrees through worm drive **282**, via worm **284** and gear **126**. Rotation of gear **286** causes threaded rod **278** to rotate. Threaded rod **278** is non-rotatably connected to gear **286**. As threaded rod **278** rotates, lifting nut **280** remains rotationally locked due to platform **288** being embedded within superior component **102**, or frictional contact with the inner surface of superior component **102**. As threaded rod **278** rotates, the threads of the rotationally locked lifting nut **280** ride upward along the threads on threaded rod **278**, displacing lifting nut **280**, and subsequently superior component **102**, in direction DR1. Threaded rod **278** may include a stopping feature to prevent lifting nut **280** from being ejected from threaded rod **280**. For example, the top portion of threaded rod **278** could be threadless (not shown in the figures), and therefore prevent lifting nut **280** from being ejected from threaded rod **278**. When lifting nut **280** reaches its maximum expansion, the unthreaded portion of threaded rod **278** remains within lifting nut **280**, preventing lifting nut **280** from being pushed off of threaded rod **278**. Alternatively, the stopping feature could be a flange on the end of threaded rod **278** arranged to engage with lifting nut **280**, as shown. It should be appreciated that worm drive **182** could be arranged to transfer torque in other arrangements, i.e., 180 degrees, 270 degrees, or any desirable angle required by the arrangement of worm **184** and gear **186**. It should further be appreciated that although a gear **186** is depicted in the figures as a spur gear, other suitable gears may be selected, i.e., a bevel gear, a hypoid gear, a spiral gear, or a face gear.

FIG. **17** is a side view of locking mechanism **220**. Locking mechanism **220** comprises plate **222**, pawl **224**, biasing element **226**, post **228**, and fastener **230**. Plate **222** includes first surface **232**, second surface **234**, corner **236**, hinge **238**, and through-bore **240** operatively arranged to receive post **228** and fastener **230**. When in the locked position, corner **236** abuts superior component **102** to stop superior component **102** from being displaced in direction DR**2**. Second surface **234** comprises first plurality of teeth **242** and second plurality of teeth **244**. Pawl **224** includes through-bore **246**, first pawl head **248**, second pawl head **250**, and hinge **252**. Through-bore **246** is operatively arranged to accept post **228**. First and second pawl heads **248** and **250** taper to a point and are operatively arranged to engage with first and second plurality of teeth **242** and **244**, respectively, on second surface **234** of plate **222**. Prior to locking, plate **222** and pawl **224** are freely pivotable about hinges **238** and **252**, respectively. Hinges **238** and **252** are pivotably secured to first protrusion **254** and second protrusion **256** of inferior component **204** (discussed infra), respectively. It should be appreciated that although hinges **238** and **252** are illustrated as pivotably secured to first protrusion **254** and second protrusion **256**, respectively, hinges **238** and **252** could also be placed in a recess within inferior component **204**. Biasing element **226** is fixedly secured between inferior component **204** and pawl **224** and provides spring bias to pawl **224** in direction DR**1** and/or DR**4**. It should be appreciated that, although biasing element **226** is depicted in FIGS. **17**-**20** as a flat spring, other biasing elements known in the art can be used to bias pawl **224** in direction DR**1**. Post **228** includes first end **258** and second end **260**. First end **258** includes male threading **262**, and second end **260** includes a stopping element **264**. It should be appreciated that, although stopping element **264** is depicted as a spherical member, other variations of stopping elements can be used, e.g., a flanged stopping element. Fastener **230** includes first end **266** and second end **268**. First end **266** is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **230**, e.g., a drill. Second end **268** includes female threading **270** operatively arranged to engage with male threading **262** of post **228**.

After device **200** has been inserted into disc space **12** and expanded to an appropriate height, a surgeon can apply torque to first end **266** of fastener **230**, pulling post **228** in direction DR**3**. As post **228** is pulled in direction DR**3**, stopping element **264** of post **228** forces pawl **224** in direction DR**3** against biasing element **226** about hinge **252**. When sufficient force is applied, first and second pawl heads **248** and **250**, respectively, engage with first and second plurality of teeth **242** and **244** locking the plate **222** in place and preventing the collapse of device **200** (shown in FIGS. **19** and **20**) in direction DR**2**.

FIG. **19** is a front perspective view of device **200** having two locking mechanisms **214** and **216** in an unexpanded state. It should be appreciated that in an example embodiment locking mechanisms **214** and **216** are embodied as locking mechanism **220** discussed supra. Device **200** comprises superior component **202**, inferior component **204**, and expansion mechanism **210** arranged to displace superior component **202** in first direction DR**1** relative to inferior component **204**. Superior component **202** and inferior component **204** further comprise at least one first aperture **206** and at least one second aperture **208**, respectively, which are arranged to allow fusion between bone fusing material and the adjacent vertebra. Superior component **202** has a first surface **203** and inferior component **204** has a first surface **205**. Device **200** further comprises hinge **212** fixedly secured to superior component **202** and inferior component **204** and arranged to rotatably displace the superior component about axis of rotation AR. Expansion mechanism **210** is preferably expansion mechanism **176** described supra. Although FIGS. **19** and **20** depict expansion mechanism **210** fixedly secured within inferior component **204**, it should be appreciated that expansion mechanism **210** could also be fixedly secured within superior component **202**.

FIG. **20** is a front perspective view of device **200** having locking mechanisms **214** and **216** in an expanded state. After superior component **202** is displaced about axis of rotation AR, locking mechanisms **214** and **216** are engaged and locked as discussed supra. Once locked, superior component **202** is prevented from moving in direction DR**2**.

FIG. **21** is a side view of locking mechanism **320**. Locking mechanism **320** comprises plate **322**, post **324**, and fastener **326**. Plate **322** includes corner **328**, hinge **330**, and plurality of through-bores **332** operatively arranged to receive post **324** and fastener **326**. When in the locked position, corner **328** abuts superior component **102** to stop superior component **102** from being displaced in direction DR**2**. Post **324** includes first end **336** and second end **338**. First end **336** includes male threading **340**, and second end **338** includes hinge **342**. Plurality of through-bores **332** (illustrated in FIG. **22**) further includes longitudinal space **334** arranged to receive first end **336** of post **324**. Before locking, plate **322** and post **324** are freely pivotable about hinges **330** and **342**, respectively, and first end **336** of post **324** moves freely within longitudinal space **334** (shown in FIG. **22**) of plurality of through-bores **332**. Hinges **330** and **342** are pivotably secured to first protrusion **344** and second protrusion **346**, respectively, of inferior component **302** (discussed infra). It should be appreciated that although hinges **330** and **342** are illustrated as pivotably secured to first protrusion **344** and second protrusion **346**, respectively, hinges **330** and **342** could also be placed in a recess within inferior component **304**. Fastener **326** includes first end **348**, second end **350**, and flange **352**. First end **348** is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **326**, e.g., a drill. Second end **350** includes female threading **354** operatively arranged to engage with male threading **340** of post **324**. Flange **352** has diameter D1 and is operatively arranged to abut against the surface of plate **322** when second end **350** is seated within one of plurality of through-bores **332** of plate **322**.

After device **300** (shown in FIGS. **23** and **24**) has been inserted into disc space **12** and expanded to an appropriate height, a surgeon can apply torque to first end **348** of fastener **326**, pulling fastener **326** in direction DR**4**. As fastener **326** is pulled in direction DR**4**, flange **352** also moves in direction DR**4** until flange **352** abuts the surface of plate **322** while second end **350** of fastener **326** is seated within one of plurality of through-bores **332** of plate **322** locking plate **322** in place and preventing the collapse of device **300** (shown in FIGS. **23** and **24**) in direction DR**2**.

FIG. **23** is a front perspective view of device **300** with locking mechanisms **314** and **316**, in an unexpanded state. It should be appreciated that in an example embodiment, locking mechanisms **314** and **316** are embodied as locking mechanism **320** discussed supra. Device **300** comprises superior component **302**, inferior component **304**, and expansion mechanism **310** arranged to displace superior component **302** in a first direction DR**1** relative to inferior component **304**. Superior component **302** and inferior component **304** further comprise at least one first aperture **306** and at least one second aperture **308**, respectively, which are arranged to allow fusion between bone fusing material and the adjacent vertebra. Superior component **302** has a first surface **303** and inferior component **304** has a first surface **305**. Device **300** further comprises hinge **312** fixedly secured to superior component **302** and inferior component **304** and arranged to rotatably displace the superior component about axis of rotation AR. Although FIGS. **23** and **24** depict expansion mechanism **310** fixedly secured within inferior component **304**, it should be appreciated that expansion mechanism **310** could also be fixedly secured within superior component **302**.

FIG. **24** is a front perspective view device **300** with locking mechanisms **314** and **316**, in an expanded state. After superior component **302** is displaced about axis of rotation AR, locking mechanisms **314** and **316** are engaged and locked as discussed supra. Once locked, superior component **302** is prevented from moving in direction DR**2**.

FIG. **25** is a partial front perspective view of a locking mechanism **420** in an unlocked state. Locking mechanism **420** comprises plates **422** and **424**, post **426**, and fastener **428**. Plates **422** and **424** are fixedly secured to superior component **402** and inferior component **404** (discussed infra), respectively. Plates **422** and **424** include first plurality of through-bores **430** and second plurality of through-bores **432**, respectively. First plurality of through-bores **430** and second plurality of through-bores **432**, which have diameter D2, less than diameter D3, and greater than diameter D1. First plurality of through-bores **430** and second plurality of through-bores **432** are operatively arranged to receive post **426** and fastener **428**. First plurality of through-bores **430** includes longitudinal space **434**, and second plurality of through-bores **432** includes longitudinal space **436**. Post **426** includes a first end **438** and a second end **440**. First end **438** has diameter D1 and includes male threading **442**, and second end **440** includes shoulder **444** and stopping element **446**. Shoulder **444** has diameter D2 and is operatively arranged to engage with first plurality of through-bores **430**. Fastener **428** includes first end **448** and second end **450**. First end **448** has diameter D**3** (shown in FIG. **26**) and is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **428**, e.g., a drill. Second end **450** has diameter D2 and includes female threading **452** operatively arranged to engage with male threading **442** of post **426**.

Before locking, post **426** is freely moveable within longitudinal spaces **434** and **436**. During surgery, and after device **400** (discussed infra) has been expanded to its final height, a surgeon imparts rotational motion to fastener **428**. Female threading **452** of fastener **428** engages with male threading **442** of post **426** pulling post **426** in direction DR**3**. Post **426** is pulled in direction DR3 until shoulder **444** engages one of the through-bores of first plurality of through-bores **430** and second end **450** of fastener **428** engages one of the through-bores of the second plurality of through-bores **432**. When both second end **450** of fastener **428** and shoulder **444** of post **426** are engaged with the respective through-bores, device **400** is locked and is prevented from collapsing in direction DR2. It should be appreciated that, although not depicted in the figures, it is possible for shoulder **444** or second end **450** of fastener **428** to engage with both the first plurality of through-bores **430** and second plurality of through-bores **432** simultaneously. FIG. **26** is a partial front perspective view of a locking mechanism **420** in a locked state. When device **400** is in the fully collapsed state, plates **422** and **424** nest within recesses **418**.

FIG. **27** is a front perspective view of device **400** with locking mechanisms **414** and **416**, in an unexpanded state. Device **400** comprises superior component **402**, inferior component **404**, and expansion mechanism **410** arranged to displace superior component **402** in a first direction DR**1** relative to inferior component **404**. Superior component **402** and inferior component **404** further comprise at least one first aperture **406** and at least one second aperture **408**, which are arranged to allow fusion between bone fusing material and the adjacent vertebra. Superior component **402** has a first surface **403** and inferior component **404** has a first surface **405**. Device **400** further comprises hinge **412** fixedly secured to superior component **402** and inferior component **404** and arranged to rotatably displace the superior component about axis of rotation AR. Locking mechanisms **414** and **416** are preferably locking mechanism **420** described supra. Expansion mechanism **410** is preferably expansion mechanism **176** described supra. It should be noted that since plates **422** and **424** are fixedly secured to superior and inferior components **102** and **104**, respectively, recesses **418** are provided within which plates **422** and **424** can nest while device **400** is in a collapsed state. It should further be appreciated that plates **422** and **424** can be hingedly secured to superior component **402** and inferior component **404**, respectively. FIG. **28** is a front perspective view of device **400** with locking mechanisms **414** and **416** in an expanded state.

FIG. **29** is a partial front perspective view of a locking mechanism **520** in an unlocked state. Locking mechanism **520** comprises plates **522** and **524**, and fastener **426**. Plates **522** and **524** are fixedly secured to superior component **502** and inferior component **504** (discussed infra), respectively. Plate **522** includes first plurality of through-bores **530** and plate **524** includes second plurality of through-bores **532**. Each through-bore of first plurality of through-bores **530** has diameter D2. Each through-bore of the second plurality of through-bores **532** has diameter D**1** larger than D2. First plurality of through-bores **530** and second plurality of through-bores **532** are operatively arranged to fastener **526**. Second plurality of through-bores **532** further includes longitudinal space **534**. Fastener **526** includes first end **540** and second end **542**. First end **540** has diameter D2 and is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **526**, e.g., a drill. Second end **542** has diameter D1 and includes male threading **544** operatively arranged to engage with any of the through-bores of first plurality of through-bores **530**.

Before locking, fastener **526** is freely moveable within longitudinal space **534**. During surgery, and after device **500** (discussed infra) has been expanded to its final height, a surgeon imparts rotational motion to fastener **526**. Male threading **544** of fastener **526** engages any of the through-bores of first plurality of through-bores **530** which pulls fastener **526** in direction DR4. When first end **540** of fastener **526** is engaged with second plurality of through-bores **532** and second end **542** is engaged with first plurality of through-bores **530**, device **500** is locked and prevented from collapsing in direction DR2. FIG. **30** is a partial front perspective view of a locking mechanism **520** in a locked state. When device **500** is in the fully collapsed state, plates **522** and **524** nest within recesses **518**.

FIG. **31** is a front perspective view of device **500** with locking mechanisms **514** and **516**, in an unexpanded state. Device **500** comprises superior component **502**, inferior component **504**, and expansion mechanism **510** arranged to displace superior component **502** in a first direction DR**1** relative to inferior component **504**. Superior component **502** and inferior component **504** further comprise at least one first aperture **506** and at least one second aperture **508**, which are arranged to allow fusion between bone fusing material and the adjacent vertebra. Superior component **502** has a first surface **503** and inferior component **504** has a first surface **505**. Device **500** further comprises hinge **512** fixedly secured to superior component **502** and inferior component **504** and arranged to rotatably displace the superior component about axis of rotation AR. Locking mechanisms **514** and **516** are preferably locking mechanism **520** described supra. Expansion mechanism **510** is preferably expansion mechanism **176** described supra. It should be noted that since plates **522** and **524** are fixedly secured to superior and inferior components **502** and **504**, respectively, recesses **518** are provided within which plates **522** and **524** can nest while device **500** is in a collapsed state. It should further be appreciated that plates **522** and **524** can be hingedly secured to superior component **502** and inferior component **504**, respectively. FIG. **32** is a front perspective view of device **500** with locking mechanisms **514** and **516** in an expanded state.

FIG. **33** is a perspective view of stand-alone expandable interbody spinal fusion device **600**, in an unexpanded state. Device **600** comprises superior component **602**, inferior component **604**, and expansion mechanisms **606**, **608**, and **610** (described infra) arranged to displace superior component **602** in a first direction **DR1** relative to inferior component **604**, giving device **600** an expanded height H_2 greater than unexpanded height H_1 (shown in FIGS. **37** and **38**). Device **600** also comprises locking mechanisms **612**, **614**, **616**, and **618** arranged between superior component **602** and inferior component **604**.

Locking mechanism **612** comprises plate **620**A (shown in FIG. **33**) and **620**B (shown in FIG. **34**). Locking mechanism **614** comprises plates **620**C (shown in FIG. **33**) and **620**D (shown in FIG. **34**). Locking mechanism **616** comprises plates **620**E (shown in FIG. **33**) and **620**F (shown in FIG. **34**). Locking mechanism **618** comprises plates **620**G (shown in FIG. **33**) and **620**H (shown in FIG. **34**). Plates **620**A and **620**C further include through-bores **622**A and **622**C, respectively. Plates **620**E and **620**G further comprise square through-bores **622**E and **622**G, respectively. Plates **620**B, **620**D, **620**F, and **620**H further comprise a plurality of through-bores, i.e., plurality of through-bores **622**B, **622**D, **622**F, and **622**H, respectively. It should be appreciated that, although plates **620A-620**H are shown as integral within superior component **602** and inferior component **604**, plates **620A-620**H could also be discrete plates, fixedly secured to superior component **602** and inferior component **604**.

Superior component **602** and inferior component **604** further comprise at least one first aperture **624** arranged to allow fusion between bone fusing material and the adjacent vertebra and a second aperture **626** located on the front face of device **600** and arranged to allow the introduction of bone fusing material into device **600**. Second aperture **626** is illustrated as an arched slot as a non-limiting example, however, it should be appreciated that second aperture **626** could be an aperture of any suitable shape, e.g., triangular, circular, rectangular, elliptical, etc., that would allow for the introduction of bone fusing material into device **600**. Superior component **602** has a first surface **603** and inferior component **604** has a first surface **605**.

FIG. **34** is a perspective view of stand-alone expandable interbody spinal fusion device **600**, in an expanded state. It should be appreciated that FIG. **34** is a partial view, i.e., superior component **602** has been removed for clarity. During surgery and after device **600** is implanted in disc space **12**, a surgeon can apply torque to expansion mechanisms **606**, **608**, and **610** via any device that imparts rotational force upon expansion mechanisms **606**, **608**, and **610** (e.g., a screw driver or impact driver). Expansion mechanisms **606**, **608** and **610** are preferably the embodiment illustrated in FIGS. **15** and **16**, described supra. Furthermore, it should be appreciated that although expansion mechanisms **606**, **608**, and **610** are depicted within inferior component **604** in FIGS. **33-38**, expansion mechanisms **606**, **608**, and **610** could be arranged within superior component **602**. The rotational force causes expansion mechanisms **606**, **608**, and **610** to displace superior component **602** in direction **DR1** relative to inferior component **604** giving device **600** an expanded height H_2, greater than H_1 (shown in FIGS. **37** and **38**). It should be appreciated that expansion mechanisms **606**, **608**, and **610** can be expanded to any height between unexpanded height H_1 and expanded height H_2. Device **600** further comprises post **628**. Post **628** is provided to secure locking mechanisms **612** and **616** in position once device **600** is expanded to its final height. Post **628** comprises first section **638**, second section **640**, third section **642**, and fourth section **644**. First section **638** has a first end **632**, a second end **634**, and a flange **636**. First end **632** is operatively arranged to engage with any device known in the art that can impart rotational motion onto first section **638**, e.g., a drill. Second end **634** is arranged non-rotatably secure to second section **640**. Second section **640** includes external helical male threading **646**. Third section **642** includes a substantially hollow shaft with cavity **650**. Cavity **650** includes internal helical female threading **651** operatively arranged to engage with male threading **646**. Fourth section **644** includes cylindrical portion **647** non-rotatably secured to third section **642** and stopping element **648** which is embodied as a substantially rectangular member operatively arranged to abut the surface of plate **620**F and prevent movement of post **628** in direction DR3. Second section **640** has a diameter D**1**. Third section **642** has diameter D**2** larger than D**1**. Cylindrical portion **647** of fourth section **644** has diameter D**3** larger than D**2**, and stopping element **648** has diameter D**4** larger than D**3**. Flange **636** has diameter D**4** larger than D**3**.

Prior to locking, first end **632** of first section **638** is slidingly engaged with through-bore **622**A (shown in FIG. **33**); second section **640** is loosely seated in the longitudinal space formed between each through-bore of plurality of through-bores **622**B of plate **620**B; third section **642** is loosely seated in the longitudinal space formed between each through-bore of plurality of through-bores **622**F of plate **620**F; and cylindrical portion **647** of fourth section **644** is slidingly engaged with square through-bore **622**E of plate **620**E.

After device **600** has been inserted into disc space **12** and expanded to an appropriate height, a surgeon can apply torque to first end **632** of first section **638**. The torque is then transferred to second section **640** having male threading **646**. Second section **640** engages with female threading **651** in cavity **650** of third section **642**, pulling post **628** in direction DR3 into the locked position. In the locked position, flange **636** abuts the surface of plate **620**A preventing further displacement in direction DR4, and second end **634** of first section **638** is completely seated in one of the through-bores of plurality of through-bores **622**B which corresponds to the chosen device height. In this locked position, device **600** is prevented from collapsing in direction DR2. Additionally, in the locked position, cylindrical portion **647** of fourth section **644** is completely seated in one of the through-bores of plurality of through-bores **622**F of plate **620**F, and stopping element **648** abuts the outer surface of plate **620**F, thereby preventing further displacement of third section **642** and fourth section **644** in direction DR3.

Device **600** further comprises post **652** (shown in FIGS. **34**, **36**, and **38**). Post **652** is provided to secure locking mechanisms **614** and **618** in position once device **600** is expanded to its final height. Post **652** further comprises first section **662**, second section **644**, third section **666**, and fourth section **668**. First section **662** includes first end **656**, second end **658**, and flange **660**. First end **656** includes a recess operatively arranged to engage with any device known in the art that can impart rotational motion onto first section **662**, e.g., a drill. Second end **658** is non-rotatably secured to second section **664**. Second section **664** includes external helical male threading **670**. Third section **666** includes a substantially hollow shaft with cavity **674**. Cavity

674 includes internal helical female threading **675** operatively arranged to engage with male threading **670**. Fourth section **668** includes cylindrical portion **671** non-rotatably secured to third section **666** and stopping element **672**, which is embodied as a substantially rectangular member operatively arranged to abut the surface of plate **620**H and prevent movement of post **652** in direction DR3. Second section **664** has a diameter D1. Third section **666** has diameter D2 larger than D1. Cylindrical portion **671** of fourth section **668** has diameter D3 larger than D2, and stopping element **672** has diameter D4 larger than D3. Flange **660** has diameter D4 larger than D3.

After device **600** has been inserted into disc space **12** and expanded to an appropriate height, a surgeon can apply torque to first end **656** of first section **662**. The torque is then transferred to second section **664** having male threading **670**. Second section **664** engages with female threading **675** in cavity **674** of third section **666**, pulling post **652** in direction DR3 into the locked position. In the locked position, flange **660** abuts the surface of plate **620**C preventing further displacement in direction DR4, second end **658** of first section **662** is completely seated in one of the through-bores of plurality of through-bores **622**D which corresponds to the chosen device height. In this locked position, device **600** is prevented from collapsing in direction DR2. Additionally, in the locked position, cylindrical portion **671** of fourth section **668** is completely seated in one of the through-bores of plurality of through-bores **622**H of plate **620**H, and stopping element **672** abuts the outer surface of plate **620**F, thereby preventing further displacement of third section **642** and fourth section **644** in direction DR3.

FIG. **39** is a partial front perspective view of a locking mechanism **720** in an unlocked state. Locking mechanism **720** comprises plate **722**, plate **724**, and fastener **726**. Plates **722** and **724** are fixedly secured to superior component **702** and inferior component **704** (discussed infra), respectively. Plate **722** includes plurality of catches **730** and plate **724** includes through-bore **732**. Through-bore **732** has female threading **734**. Plurality of catches **730** is illustrated as a plurality of tapered depressions having a taper back section and a flat ridge similar to a ratchet mechanism, which is arranged to prevent motion in one direction while allowing motion in a second direction. Fastener **726** includes first end **740** and second end **742**. Second end **742** has diameter D1 and includes male threading **744** operatively arranged to engage with female threading **734** of through-bore **732**. First end **740** of fastener **726** has diameter D2 larger than D1. First end **740** is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **726**, e.g., a drill. Each catch of plurality of catches **730** has a width greater than or equal to diameter D2.

Before locking, fastener **726** is loosely engaged with female threading **734** of through-bore **732**. During surgery, and after device **700** (discussed infra) has been expanded to its final height, a surgeon imparts rotational motion to fastener **726**. Male threading **744** of fastener **726** further engages with female threading **734** of through-bore **732** which pulls fastener **726** in direction DR4. When second end **742** of fastener **726** is engaged with one of the catches of plurality of catches **730**, device **700** is locked and prevented from collapsing in direction DR2. FIG. **40** is a partial front perspective view of a locking mechanism **720** in a locked state. When device **700** is in the fully collapsed state, plates **722** and **724** nest within recesses **718**.

FIG. **41** is a front perspective view of device **700** with locking mechanisms **714** and **716**, in an unexpanded state. Device **700** comprises superior component **702**, inferior component **704**, and expansion mechanism **710** arranged to displace superior component **702** in a first direction DR1 relative to inferior component **704**. Superior component **702** and inferior component **704** further comprise at least one first aperture **706** and at least one second aperture **708**, which are arranged to allow fusion between bone fusing material and the adjacent vertebra. Superior component **702** has a first surface **703**, and inferior component **704** has a first surface **705**. Device **700** further comprises hinge **712** fixedly secured to superior component **702** and inferior component **704** and arranged to rotatably displace the superior component about axis of rotation AR. Locking mechanisms **714** and **716** are preferably locking mechanism **720** described supra. Expansion mechanism **710** is preferably expansion mechanism **176** described supra. It should be noted that since plates 722 and 724 are fixedly secured to superior and inferior components **702** and **704**, respectively, recesses **718** are provided within which plates **722** and **724** can nest while device **700** is in a collapsed state. It should further be appreciated that plates **722** and **724** can be hingedly secured to superior component **702** and inferior component **704**, respectively. FIG. **42** is a front perspective view of device **700** with locking mechanisms **714** and **716** in an expanded state.

FIG. **43** is a partial front perspective view of a locking mechanism **820** in an unlocked state. Locking mechanism **820** comprises plate **822**, plate **824**, and fastener **826**. Plates **822** and **824** are fixedly secured to superior component **802** and inferior component **804** (discussed infra), respectively. Plate **822** includes plurality of catches **830** and plate **824** includes through-bore **832**. Through-bore **832** has female threading **834**. Plurality of catches **830** are illustrated as a series of cylindrical partial-through-bores. Fastener **826** includes first end **840** and second end **842**. Second end **842** has diameter D1 and includes male threading **844** operatively arranged to engage with female threading **834** of through-bore **832**. First end **840** of fastener **826** has diameter D2 larger than D1. First end **840** is operatively arranged to engage with any device known in the art that can impart rotational motion onto fastener **826**, e.g., a drill. Each catch of plurality of catches **830** has a width greater than or equal to diameter D2.

Before locking, fastener **826** is loosely engaged with female threading **834** of through-bore **832**. During surgery, and after device **800** (discussed infra) has been expanded to its final height, a surgeon imparts rotational motion to fastener **826**. Male threading **844** of fastener **826** further engages with female threading **834** of through-bore **832**, which pulls fastener **826** in direction DR4. When second end **842** of fastener **826** is engaged with one of the catches of plurality of catches **830**, device **800** is locked and prevented from collapsing in direction DR2. FIG. **44** is a partial front perspective view of a locking mechanism **820** in a locked state. When device **800** is in the fully collapsed state, plates **822** and **824** nest within recesses **818**.

FIG. **45** is a front perspective view of device **800** with locking mechanisms **814** and **816**, in an unexpanded state. Device **800** comprises superior component **802**, inferior component **804**, and expansion mechanism **810** arranged to displace superior component **802** in a first direction DR1 relative to inferior component **804**. Superior component **802** and inferior component **804** further comprise at least one first aperture **806** and at least one second aperture **808**, which are arranged to allow fusion between bone fusing material and the adjacent vertebra. Superior component **802** has a first surface **803** and inferior component **804** has a first surface **805**. Device **800** further comprises hinge **812** fixedly secured to superior component **802** and inferior component **804**, and it is arranged to rotatably displace the superior component about axis of rotation AR. Locking mechanisms **814** and **816** are preferably locking mechanism **820** described supra. Expansion mechanism **810** is preferably expansion mechanism **176** described supra. It should be noted that since plates **822** and **824** are fixedly secured to superior and inferior components **802** and **804**, respectively, recesses **818** are provided within which plates **822** and **824** can nest while device **800** is in a collapsed state. It should further be appreciated that plates **822** and **824** can be hingedly secured to superior component **802** and inferior component **804**, respectively. FIG. **46** is a front perspective view of device **800** with locking mechanisms **814** and **816** in an expanded state.

FIG. **47** is a front perspective view of expandable interbody spinal fusion device **900**. FIG. **47** is a front perspective view of stand-alone expandable interbody spinal fusion device **900** in an expanded state. FIG. **48** is a partial exploded view of stand-alone expandable interbody spinal fusion device **900**. FIG. **49** is a detail view of stand-alone expandable interbody spinal fusion device **900** taken generally along detail **49** in FIG. **48**. FIG. **50**A is a front perspective view of stand-alone expandable interbody spinal fusion device **900**. FIG. **50**B is a side elevational view of stand-alone expandable interbody spinal fusion device **900**. FIG. **51** is a side elevational view of stand-alone expandable interbody spinal fusion device **900** in a collapsed state. Expandable interbody spinal fusion device **900** generally comprises superior component **910**, inferior component **940**, and one or more locking screws **904**A-B. The following description should be read in view of FIGS. **47-51**.

Superior component **910** comprises surface **912**, protrusion **918**, protrusion **922**, protrusion **926**, and hinge portion **930**. Surface **912** is operatively arranged to engage a vertebra. Surface **912** may further comprise one or more ribs **914** and at least one aperture **916**. Aperture **916** is arranged to allow bone material injected into cavity **902** to fuse with the adjacent vertebra. Protrusion **918** extends from surface **912** and engages with slot **952** of inferior component **940**. Protrusion **918** comprises a plurality of catches **920**. Protrusion **922** extends from surface **912** and engages with slot **948** of inferior component **940**. Protrusion **922** comprises a plurality of catches **924**. Protrusion **926** comprises through-bore **928**. Through-bore **928** is designed such that screw **906**A can pass therethrough and secure superior component **910** to the adjacent vertebra. In the embodiment shown, through-bore **928** is arranged at an angle to surface **912**, said angle being greater than 0 degrees and less 90 degrees (see FIG. **51**).

Inferior component **940** comprises surface **942**, slot **948**, slot **925**, protrusion **956**, and hinge portion **960**. Surface **942** is operatively arranged to engage a vertebra. Surface **942** may further comprise one or more ribs **944** and at least one aperture **946**. Aperture **946** is arranged to allow bone material injected into cavity **902** to fuse with the adjacent vertebra. Slot **948** is arranged to engage protrusion **922**. Slot **948** comprises hole **950** which is operatively arranged to be aligned with one or more of plurality of catches **924**. Slot **952** is arranged to engage protrusion **918**. Slot **952** comprises hole **954**, which is operatively arranged to be aligned with one or more of plurality of catches **920**. Protrusion **956** comprises through-bore **958**. Through-bore **958** is designed such that screw **906**B can pass therethrough and secure inferior component **940** to the adjacent vertebra. In the embodiment shown, through-bore **958** is arranged at an angle to surface **942**, said angle being greater than 0 degrees and less 90 degrees (see FIG. **51**). Inferior component **940** may further comprise one or more ports **964**A-B. Ports **964**A-B are operatively arranged to be engaged by a tool such that the user (e.g., a surgeon) can hold expandable interbody spinal fusion device **900** in place between adjacent vertebrae (i.e., in place of the removed disc) while expanding superior component **910** with respect to inferior component **940**.

When assembled, superior component **910** is hingedly secured to inferior component **940**, and cavity **902** is formed therebetween. As shown, cup-shaped hinge portion **960** is arranged at least partially concentrically around pin-shaped hinge portion **930**. In some embodiments, hinge portion **960** is pin-shaped and hinge portion **930** is cup-shaped, with hinge portion **930** concentrically arranged around hinge portion **960**. In some embodiments, hinge portions **930** and **960** comprise through-bores through which a pin is passed, to form a normal pin-style hinge between superior component **910** and inferior component **940**. Superior component **910** comprises surface **932** and inferior component **940** comprises surface **962**. In a collapsed state, as shown in FIG. **51**, surface **932** abuts against (or is arranged substantially proximate to) surface **962**. In an expanded state, as shown in FIGS. **47-50**B, surface **932** is spaced apart from surface **962**. To expand expandable interbody spinal fusion device **900**, locking screws **904**A-B are removed and superior component **910** is hingedly expanded to a desired height. Once expandable interbody spinal fusion device **900** has been expanded to the desired height, locking screws **904**A-B are reinserted to lock superior component **910** and inferior component **940**. Specifically, locking screw **904**A is inserted through the catch of plurality of catches **924** that is aligned with hole **950** and screwed into inferior component **940**. As locking screw **904**A is tightened in hole **950**, a locking portion of locking screw **904**A engages the aligned catch, thereby locking expandable interbody spinal fusion device **900** at its set height. Similarly, locking screw **904**B is inserted through the catch of plurality of catches **920** that is aligned with hole **954** and screwed into inferior component **940**. As locking screw **904**B is tightened in hole **954**, a locking portion of locking screw **904**B engages the aligned catch thereby locking expandable interbody spinal fusion device **900** at its set height. Once expandable interbody spinal fusion device **900** is locked at its desired height, screws **906**A-B are inserted through through-bores **928** and **958**, respectively, securing superior component **910** and inferior component **940** to adjacent vertebrae. Expandable interbody spinal fusion device **900**, specifically cavity **902**, may then be filled with bone fusion material. In some embodiments, locking screws **904**A-B are not arranged to be completely removed from inferior component **940**, and comprise retention rings such that they cannot be removed from inferior component **940**. In such embodiments, locking screws **904**A-B are unscrewed from inferior component **940** until such is prevented by the retention rings, at which point the locking portion of locking screws **904**A-B are clear of catches **924** and **920**, respectively, and superior component **910** can be expanded/collapsed with respect to inferior component **940**.

It will be appreciated that various aspects of the disclosure above and other features and functions, or alternatives thereof, may be desirably combined into many other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations, or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

LIST OF REFERENCE NUMERALS

10 Spinal column
C1-C7 Cervical vertebrae
T1-T9 Thoracic vertebrae
L1-L5 Lumbar vertebrae
S Sacrum
C Coccyx
D**1** First diameter
D**2** Second diameter
D**3** Third diameter
D**4** Fourth diameter
DR**1** Direction
DR**2** Direction
DR**3** Direction
DR**4** Direction
DL1-L2 Disc
DL2-L3 Disc
DL3-L4 Disc
DL4-L5 Disc
F Facet
FJ Facet joint
H**1** Collapsed height
H**2** Expanded height
SP Spinous process
TP Transverse process
IF Intervertebral foramen
A Annulus
AR Axis of rotation
N Nucleus
NC Neural canal
H**1** Unexpanded height
H**2** Expanded height
RD**1** Rotational direction **1**
RD**2** Rotational direction **2**
12 Disc space
100 Device
102 Superior component
103 First surface
104 Inferior component
105 Second surface
106 Expansion mechanism
108 Expansion mechanism
110 Expansion mechanism
112 Locking mechanism
114 Locking mechanism
116 Locking mechanism
118 Locking mechanism
120A Plate
120B Plate
120C Plate
120D Plate
120E Plate
120F Plate
120G Plate
120H Plate
122A Through-bores
122B Through-bores
122C Through-bores
122D Through-bores
122E Through-bores
122F Through-bores
122G Through-bores
122H Through-bores
124 First aperture
126 Second aperture
128 Post
130 Fastener
132 First end
134 Second end
136 Female threading
138 First section
140 Second section
142 Third section
144 Fourth section
146 Male threading
148 Stopping element
150 Longitudinal space
152 Post
154 Fastener
156 First end
158 Second end
160 Female threading
162 First section
164 Second section
166 Third section
168 Fourth section
170 Male threading
172 Stopping element
174 Longitudinal space
176 Expansion mechanism
178 Threaded rod
180 Threaded sleeve
182 Worm drive
184 Worm
186 Gear
200 Second embodiment
202 Superior component
203 First surface
204 Inferior component
205 Second surface
206 First aperture
208 Second Aperture
210 Expansion mechanism
212 Hinge
214 Locking Mechanism
216 Locking Mechanism
220 Locking mechanism
222 Plate
224 Pawl
226 Biasing element
228 Post
230 Fastener
232 First surface
234 Second surface
236 Corner
238 Hinge
240 Through-bore
242 First plurality of teeth
244 Second plurality of teeth
246 Through-bore
248 First pawl head
250 Second pawl head
252 Hinge
254 First protrusion
256 Second protrusion
258 First end
260 Second end
262 Male threading
264 Stopping element
266 First end
268 Second end
270 Female threading
276 Expansion mechanism

278 Threaded rod
280 Lifting nut
282 Worm drive
284 Worm
286 Gear
288 Platform
300 Device
302 Superior component
303 First surface
304 Inferior component
305 Second surface
306 First aperture
308 Second aperture
310 Expansion mechanism
312 Hinge
314 Locking Mechanism
316 Locking Mechanism
320 Locking mechanism
322 Plate
324 Post
326 Fastener
328 Corner
330 Hinge
332 Plurality of through-bores
334 Longitudinal space
336 First end
338 Second end
340 Male threading
342 Hinge
344 First protrusion
346 Second protrusion
348 First end
350 Second end
352 Flange
354 Female threading
420 Locking mechanism
422 Plate
424 Plate
426 Post
428 Fastener
430 Plurality of through-bores
432 Plurality of through-bores
434 Longitudinal space
436 Longitudinal space
438 First end
440 Second end
442 Male threading
444 Shoulder
446 Stopping element
448 First end
450 Second end
452 Female threading
400 Device
402 Superior component
403 First surface
404 Inferior component
405 Second surface
406 First aperture
408 Second aperture
410 Expansion mechanism
412 Hinge
414 Locking mechanism
416 Locking mechanism
418 Recess
500 Device
502 Superior component
503 First surface
504 Inferior component
505 Second surface
506 First aperture
508 Second aperture
510 Expansion mechanism
512 Hinge
514 Locking mechanism
516 Locking mechanism
518 Recess
520 Locking mechanism
522 Plate
524 Plate
526 Fastener
530 Plurality of through-bores
532 Plurality of through-bores
534 Longitudinal space
540 First end
542 Second end
544 Male threading
600 Device
602 Superior component
603 First surface
604 Inferior component
605 Second surface
606 Expansion mechanism
608 Expansion mechanism
610 Expansion mechanism
612 Locking mechanism
614 Locking mechanism
616 Locking mechanism
618 Locking mechanism
620A Plate
620B Plate
620C Plate
620D Plate
620E Plate
620F Plate
620G Plate
620H Plate
622A Through-bore
622B Through-bores
622C Through-bore
622D Through-bores
622E Square through-bore
622F Through-bores
622G Square through-bore
622H Through-bores
624 First aperture
626 Second aperture
628 Post
630 Fastener
632 First end
634 Second end
636 Flange
638 First section
640 Second section
642 Third section
644 Fourth section
646 Male threading
647 Cylindrical portion
648 Stopping element
650 Cavity
651 Female threading
652 Post
654 Fastener
656 First end
658 Second end

660 Flange
662 First section
664 Second section
666 Third section
668 Fourth section
670 Male threading
671 Cylindrical portion
672 Stopping element
674 Cavity
675 Female threading
700 Device
702 Superior component
703 First surface
704 Inferior component
705 Second surface
706 First aperture
708 Second aperture
710 Expansion mechanism
712 Hinge
714 Locking mechanism
716 Locking mechanism
718 Recess
720 Locking mechanism
722 Plate
724 Plate
726 Fastener
730 Plurality of catches
732 Through-bore
734 Female threading
740 First end
742 Second end
744 Male threading
800 Device
802 Superior component
803 First surface
804 Inferior component
805 Second surface
806 First aperture
808 Second aperture
810 Expansion mechanism
812 Hinge
814 Locking mechanism
816 Locking mechanism
818 Recess
820 Locking mechanism
822 Plate
824 Plate
826 Fastener
830 Plurality of catches
832 Through-bore
834 Female threading
840 First end
842 Second end
844 Male threading
900 Device
902 Cavity
904A Locking screw
904B Locking screw
906A Screw
906B Screw
910 Superior component
912 Surface
914 Ribs
916 Aperture
918 Protrusion
920 Catches
922 Protrusion
924 Catches
926 Protrusion
928 Through-bore
930 Hinge portion
932 Surface
940 Inferior component
942 Surface
944 Ribs
946 Aperture
948 Slot
950 Hole
952 Slot
954 Hole
956 Protrusion
958 Through-bore
960 Hinge portion
962 Surface
964A Port
964B Port

What is claimed is:

1. An expandable interbody spinal fusion device, comprising:
- an inferior component including at least one hole;
- a superior component connected to the inferior component, the superior component including a plurality of catches operatively arranged to align with the at least one hole; and,
- a locking screw operatively arranged to extend through the plurality of catches and engage the at least one hole to lock the superior component with respect to the inferior component.

2. The expandable interbody spinal fusion device as recited in claim **1**, wherein the superior component is hingedly connected to the inferior component.

3. The expandable interbody spinal fusion device as recited in claim **1**, wherein the superior component comprises a first hinge portion and the inferior component comprises a second hinge portion, the second hinge portion being at least partially concentrically arranged around the first hinge portion.

4. The expandable interbody spinal fusion device as recited in claim **1**, wherein the superior component further comprises a first surface including a first aperture.

5. The expandable interbody spinal fusion device as recited in claim **4**, wherein the first surface comprises one or more ribs.

6. The expandable interbody spinal fusion device as recited in claim **1**, wherein the inferior component further comprises a second surface including a second aperture.

7. The expandable interbody spinal fusion device as recited in claim **6**, wherein the second surface comprises one or more ribs.

8. The expandable interbody spinal fusion device as recited in claim **1**, wherein the at least one hole is arranged in a slot of the inferior component and the plurality of catches are arranged on a protrusion of the superior component, the protrusion being arranged to engage the slot.

9. The expandable interbody spinal fusion device as recited in claim **1**, wherein the inferior component further comprises a first through-bore and the superior component further comprises a second through-bore, the first and second through-bore operatively arranged to engage screws.

10. The expandable interbody spinal fusion device as recited in claim **1**, wherein the superior component and the inferior component form a cavity therebetween.

11. The expandable interbody spinal fusion device as recited in claim **1**, wherein one of the inferior component and superior component comprises one or more ports.

12. The expandable interbody spinal fusion device as recited in claim **1**, further comprising an expansion mechanism operatively arranged to displace the superior component in a first direction relative to the inferior component.

13. An expandable interbody spinal fusion device, comprising:

an inferior component including a first surface and at least one hole;

a superior component hingedly connected to the inferior component, the superior component including a second surface and a plurality of catches operatively arranged to align with the at least one hole;

a cavity formed between the inferior component and the superior component; and,

a locking screw operatively arranged to engage the plurality of catches and the at least one hole to lock the superior component with respect to the inferior component.

14. The expandable interbody spinal fusion device as recited in claim **13**, wherein the superior component comprises a first hinge portion and the inferior component comprises a second hinge portion, the second hinge portion being at least partially concentrically arranged around the first hinge portion.

15. The expandable interbody spinal fusion device as recited in claim **13**, wherein the first surface comprises a first aperture.

16. The expandable interbody spinal fusion device as recited in claim **13**, wherein the second surface comprises a second aperture.

17. The expandable interbody spinal fusion device as recited in claim **13**, wherein the at least one hole is arranged in a slot of the inferior component and the plurality of catches are arranged on a protrusion of the superior component, the protrusion being arranged to engage the slot.

18. The expandable interbody spinal fusion device as recited in claim **13**, wherein:

in a collapsed state, a third surface of the inferior component abuts against a fourth surface of the superior component; and,

in an expanded state, the fourth surface is spaced apart from the third surface.

19. The expandable interbody spinal fusion device as recited in claim **13**, wherein the inferior component further comprises a first through-bore and the superior component further comprises a second through-bore, the first and second through-bore operatively arranged to engage screws to secure the expandable interbody spinal fusion device to one or more vertebrae.

20. The expandable interbody spinal fusion device as recited in claim **13**, wherein one of the inferior component and superior component comprises one or more ports.

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