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(54) **EXPANDABLE SPINAL FUSION DEVICE**

(71) Applicant: **Atlas Spine, Inc.**, Jupiter, FL (US)

(72) Inventor: **Matthew Glen Baynham**, Jupiter, FL (US)

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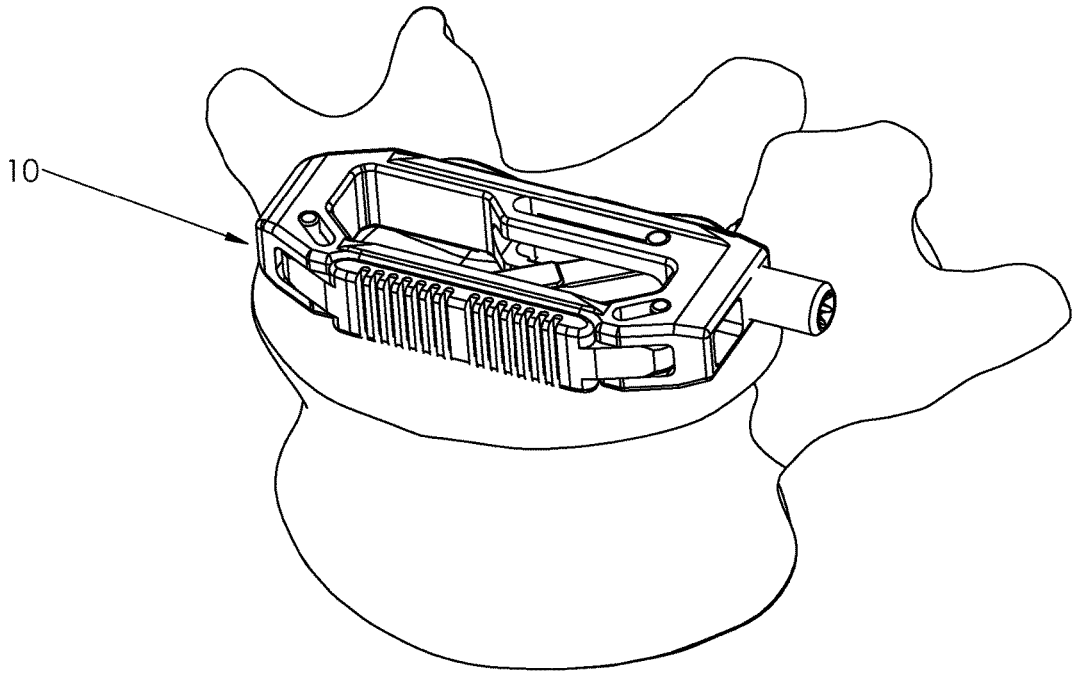
(52) **U.S. Cl.**
CPC ***A61F 2/447*** (2013.01); *A61F 2002/30579* (2013.01)

(57) **ABSTRACT**

An implant formed from an expandable spinal device which incorporates a main body, a flexible front body, a push arm, and a drive screw with the intention of expanding the footprint (surface area and bone grafting volume) of the device after insertion.



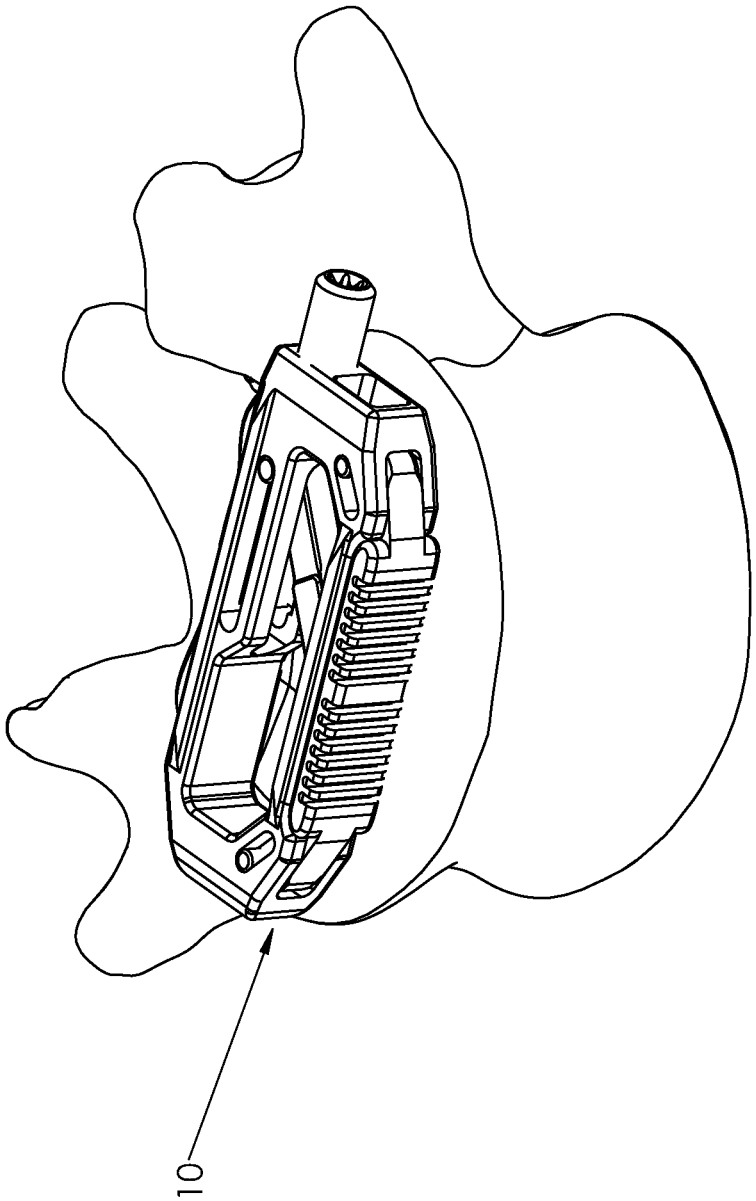


FIGURE 1

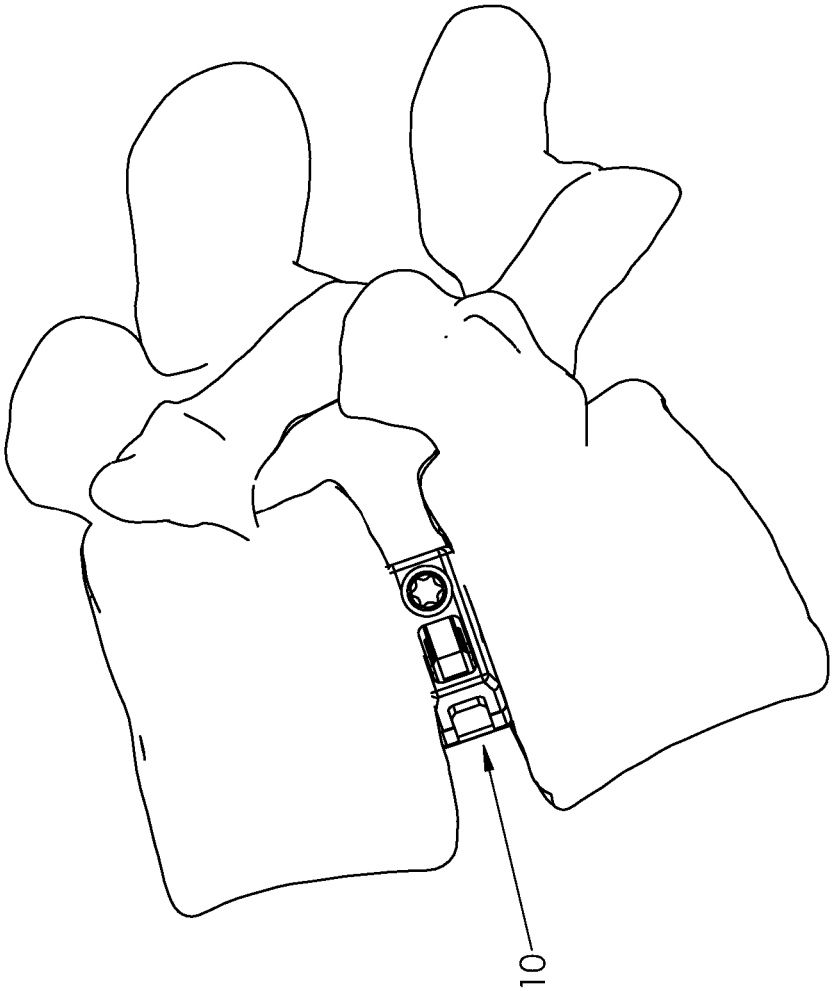


FIGURE 2

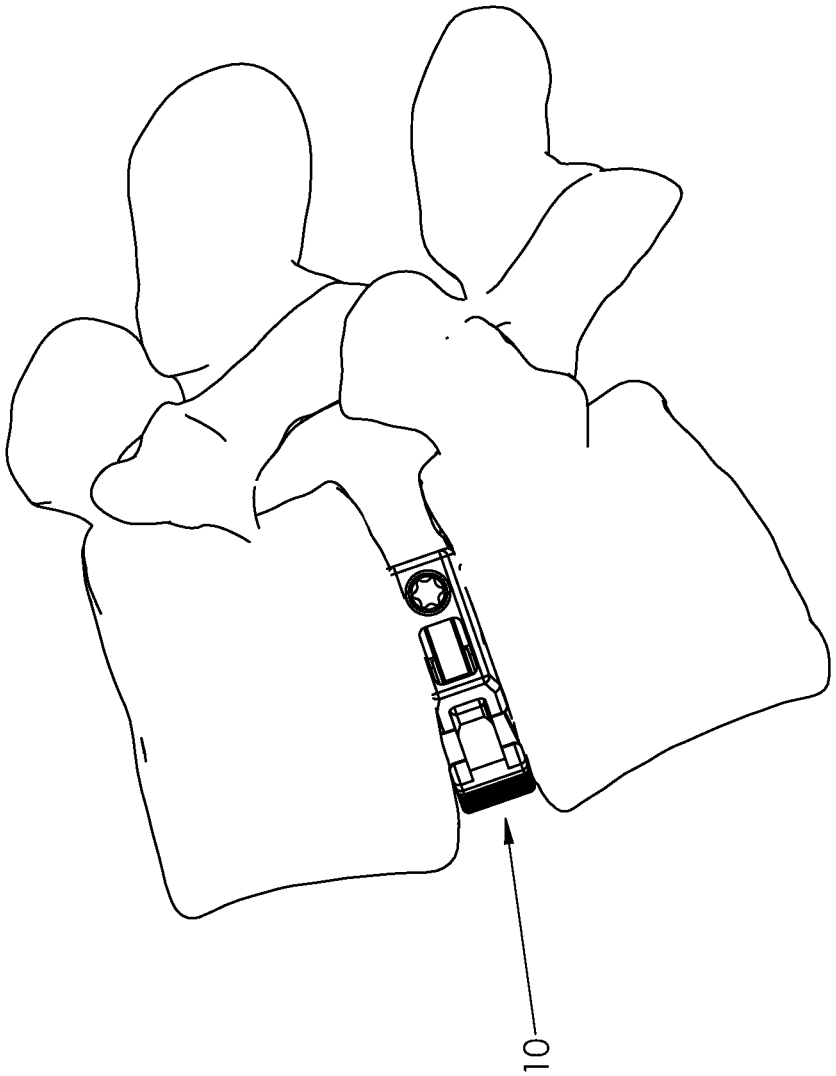
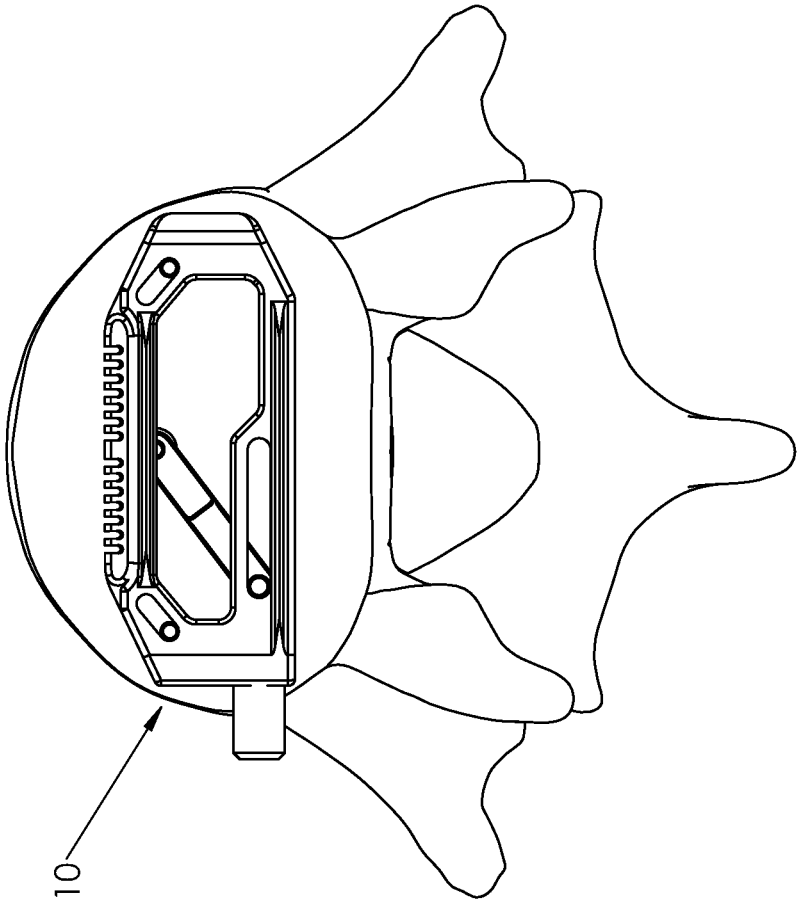


FIGURE 3



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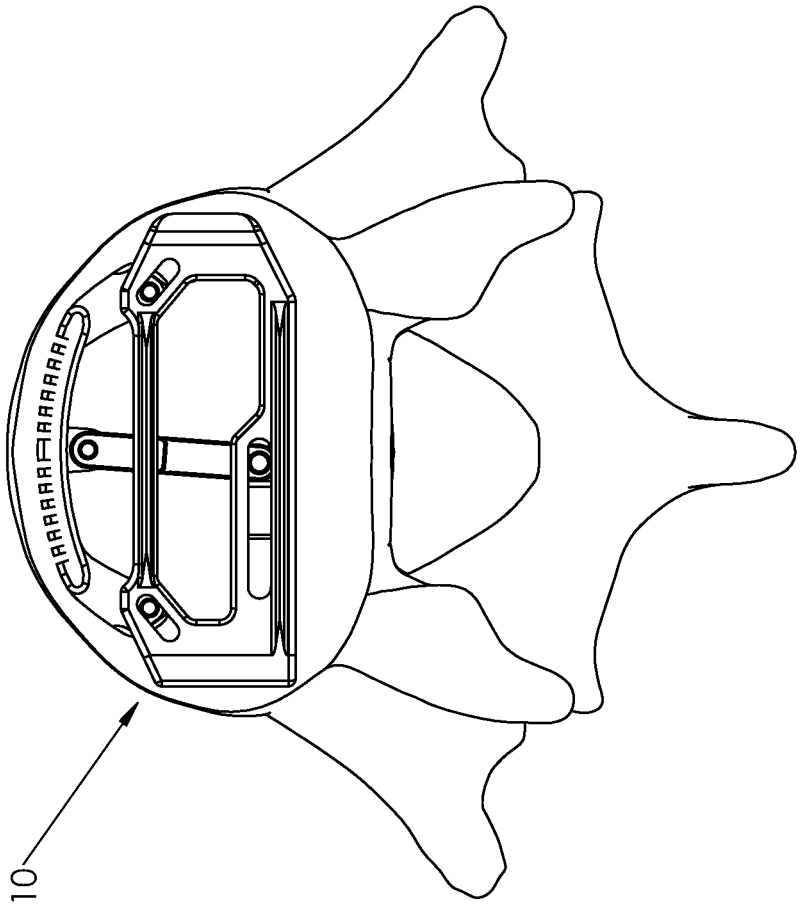
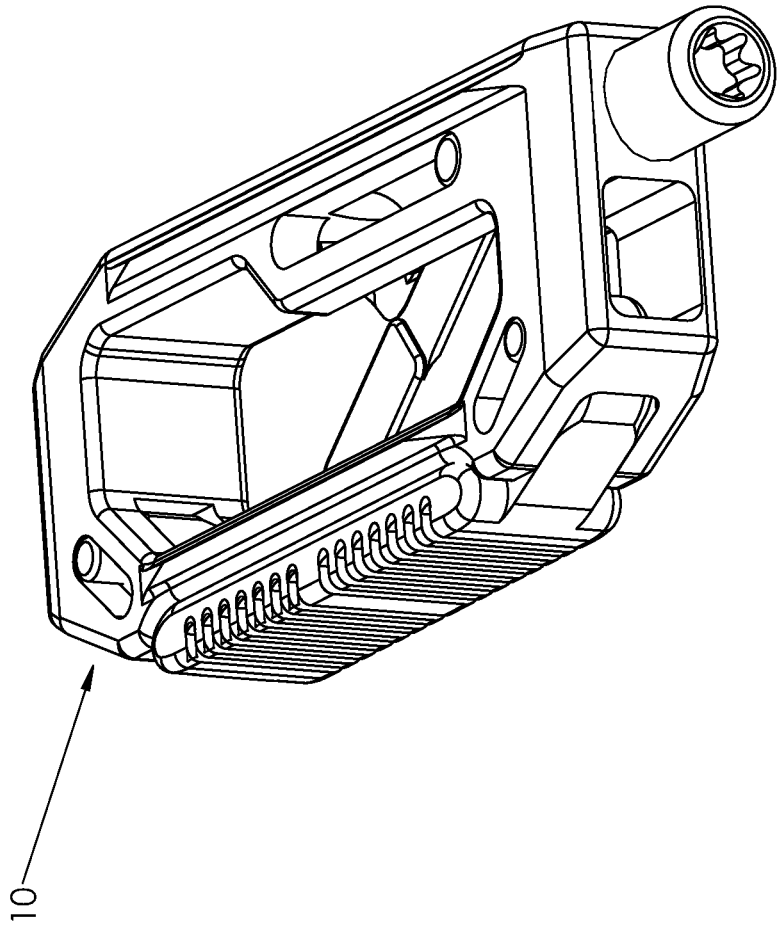


FIGURE 5



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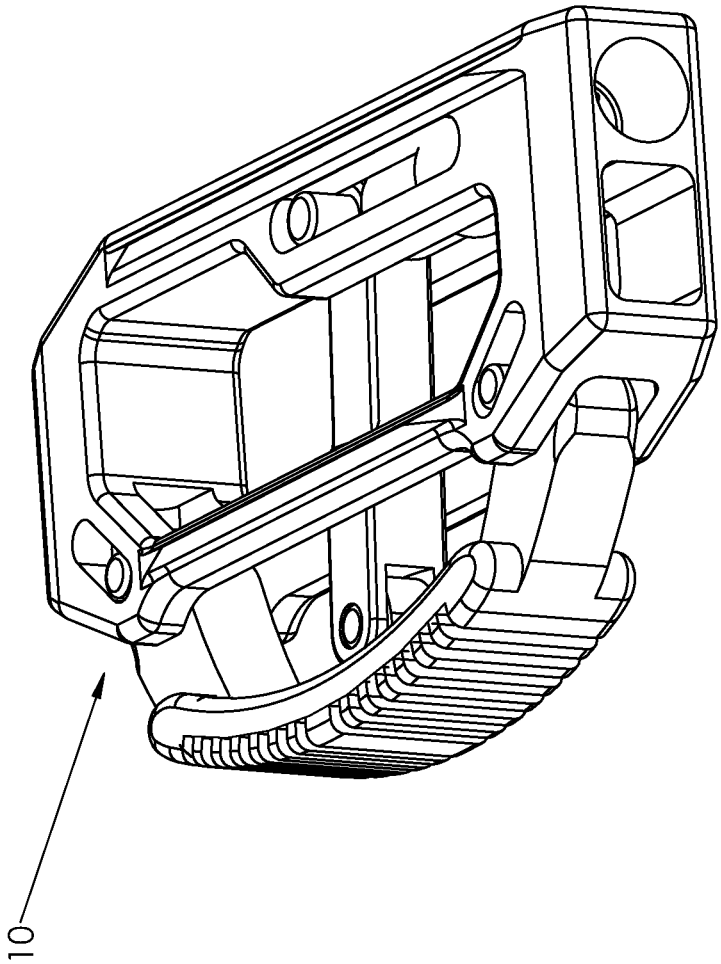

FIGURE 7

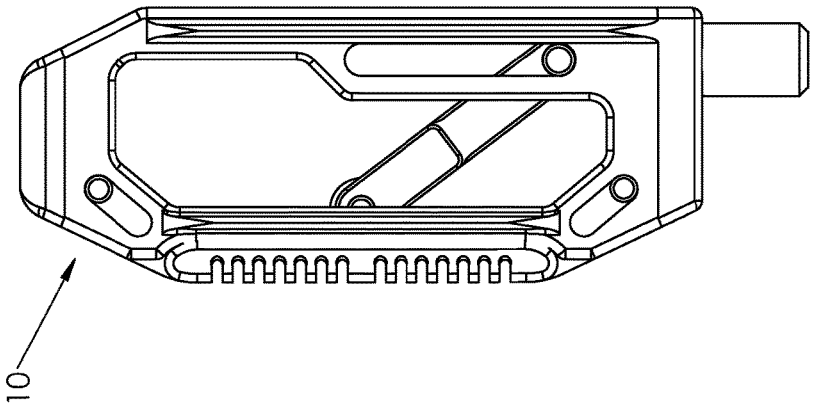

FIGURE 8

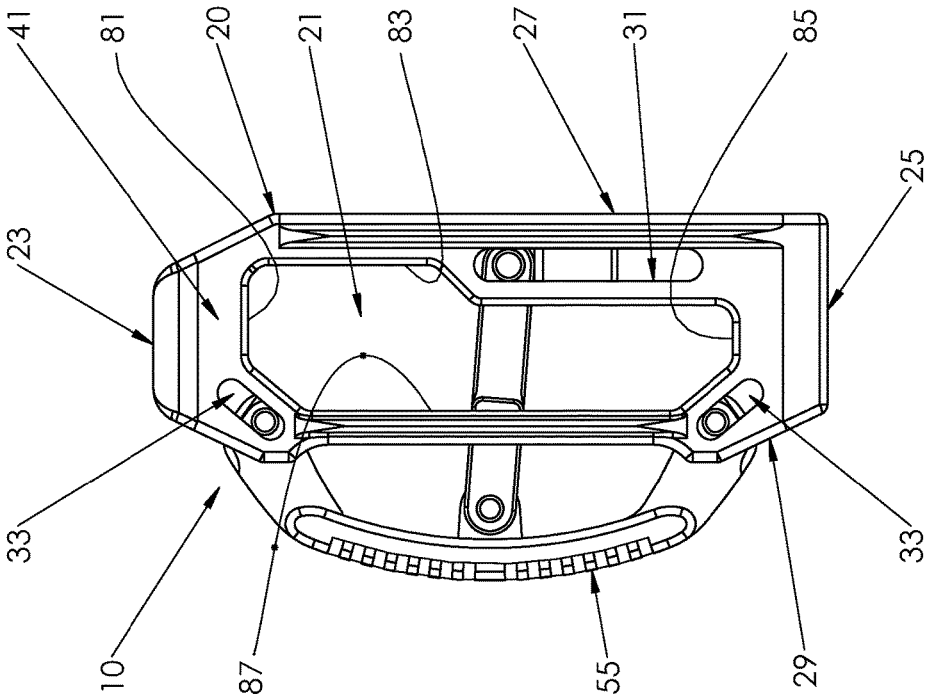

FIGURE 9

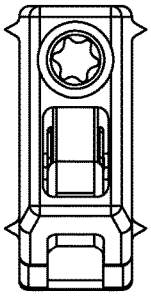

FIGURE 12

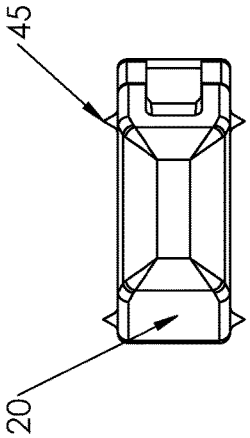

FIGURE 13

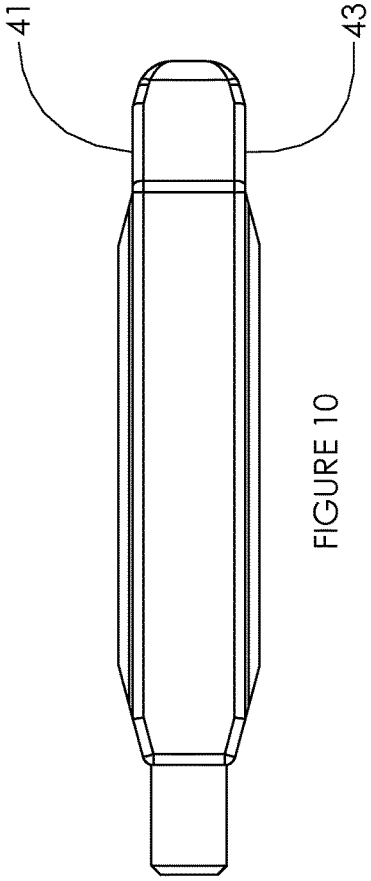

FIGURE 10

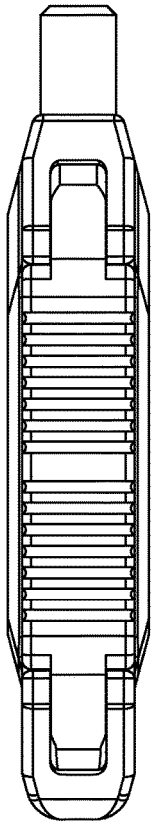

FIGURE 11

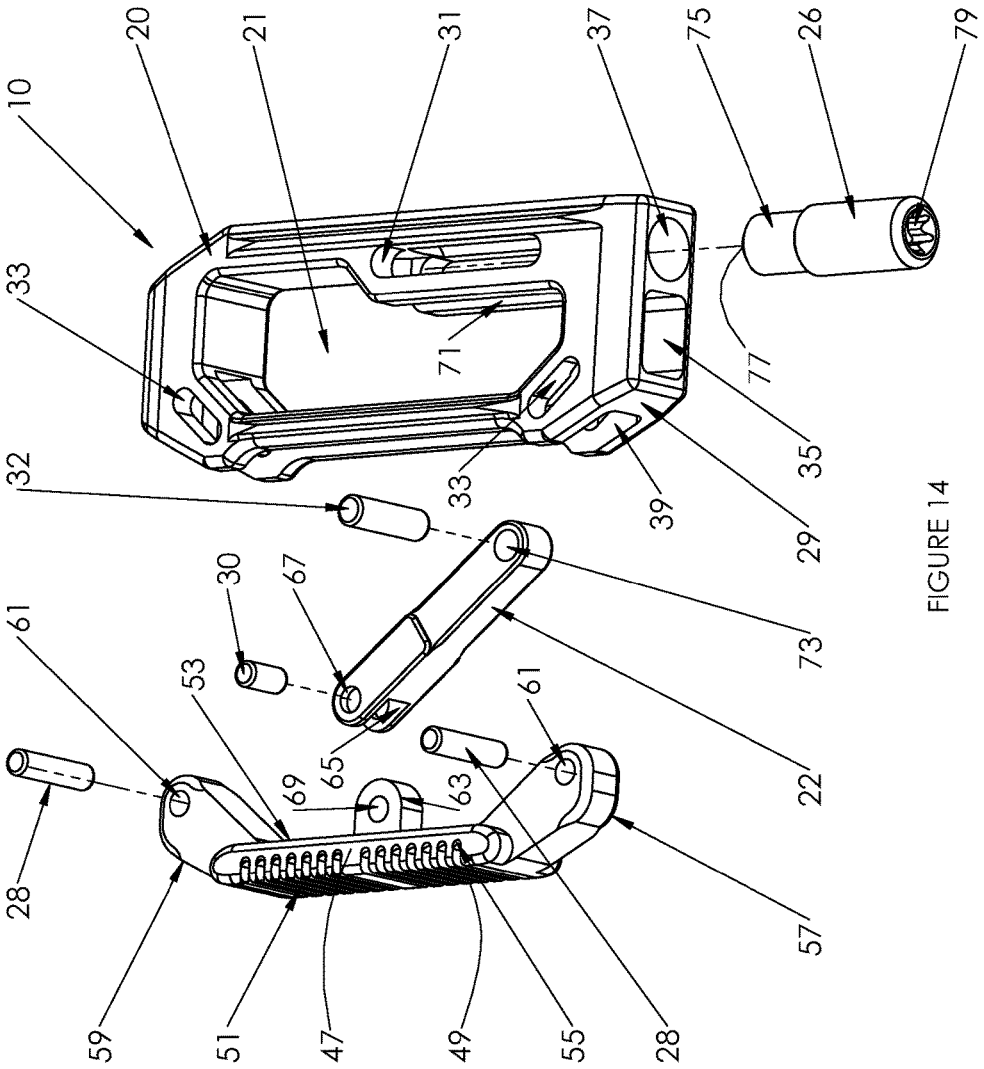
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FIGURE 14

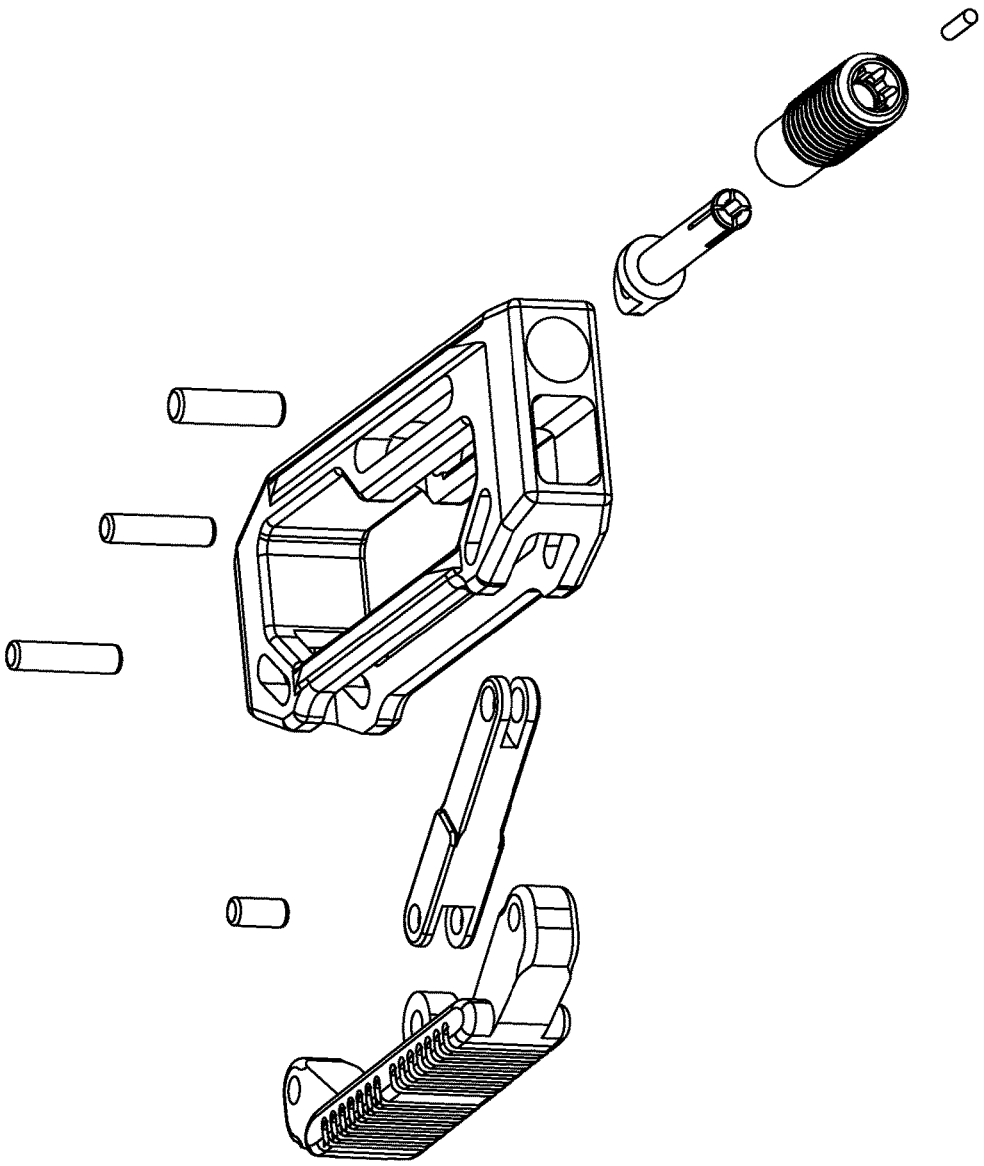

FIGURE 15

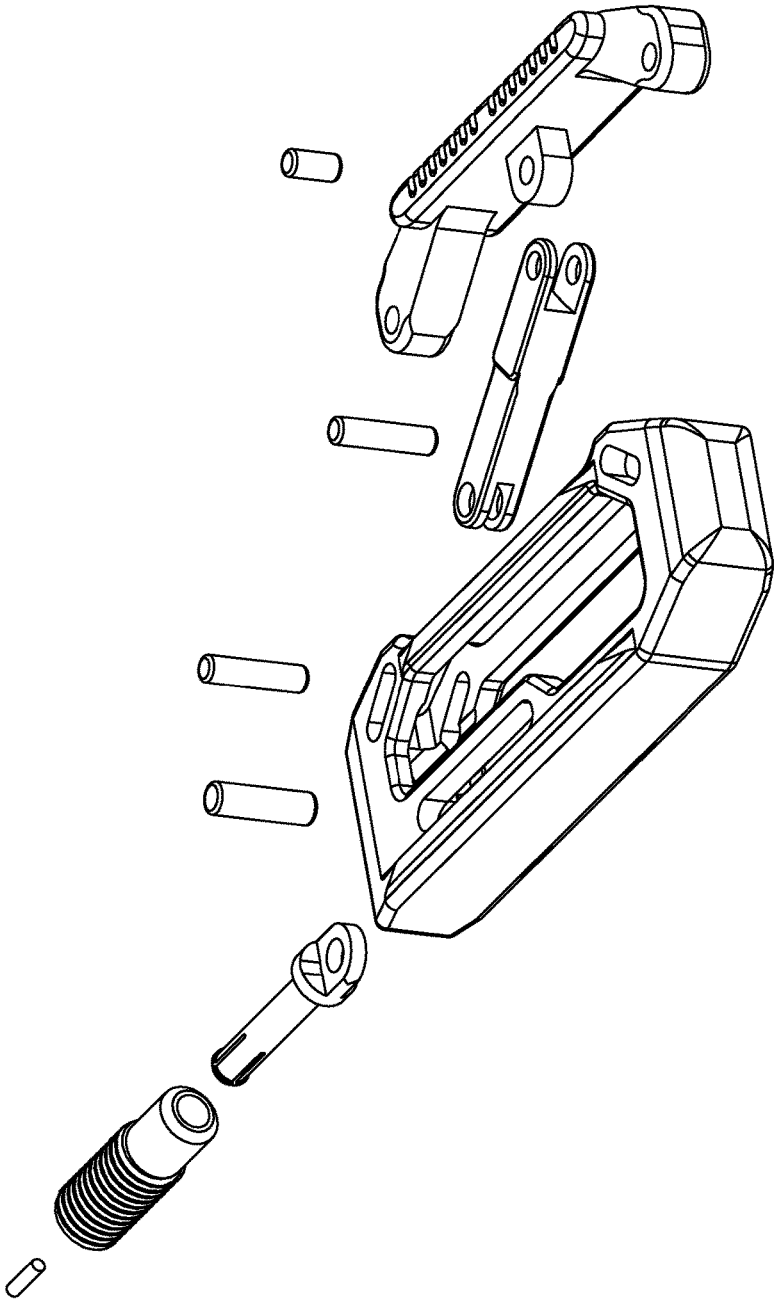

FIGURE 16

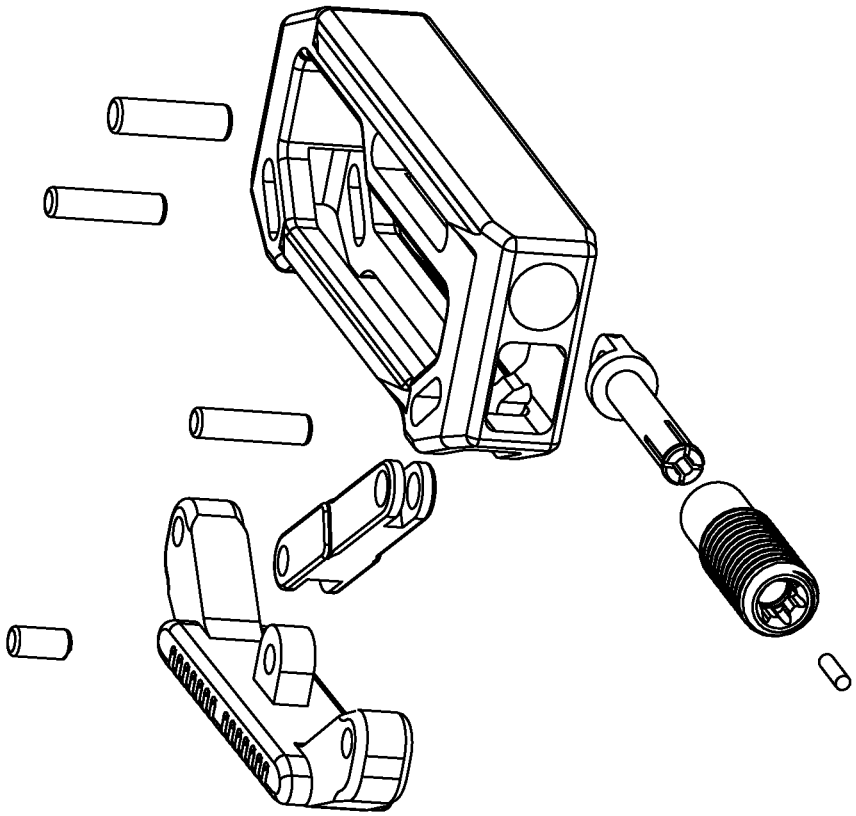

FIGURE 17

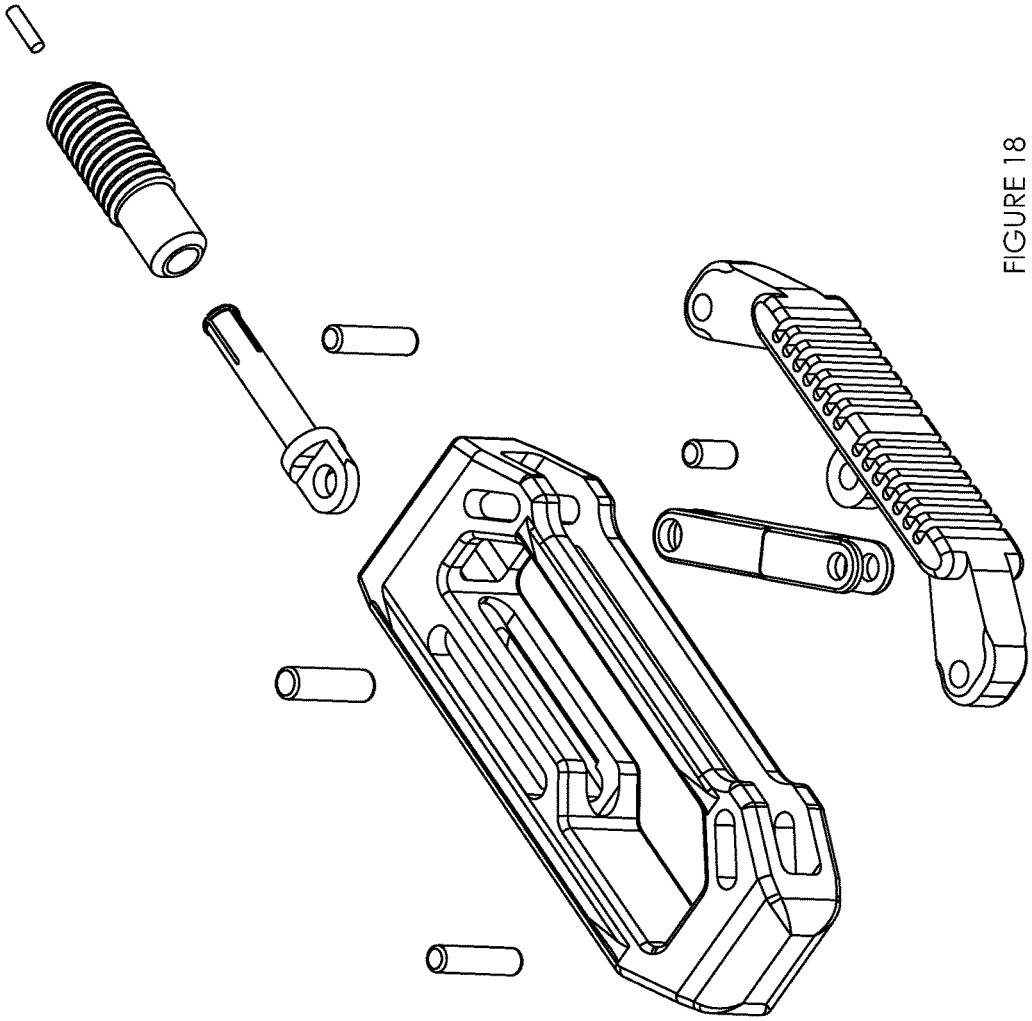

FIGURE 18

EXPANDABLE SPINAL FUSION DEVICE

PRIORITY CLAIM

[0001] In accordance with 37 C.F.R. 1.76, a claim of priority is included in an Application Data Sheet filed concurrently herewith. Accordingly, the present invention claims priority to U.S. Provisional Patent Application No. 62/216,656, entitled "EXPANDABLE SPINAL FUSION DEVICE", filed Sep. 10, 2015. The contents of the above referenced application are incorporated herein by reference in its entirety.

FIELD OF INVENTION

[0002] This invention relates to the field of orthopedic surgery and, more particularly, to implants placed between vertebrae in the spine.

BACKGROUND OF THE INVENTION

[0003] Spinal stabilization is known to alleviate chronic back pain caused by displaced disk material or excessive movement of individual vertebrae. Conventional stabilization techniques include fusing two or more vertebrae together to immobilize the area of excessive movement. In one technique, vertebral disk material which separates the vertebrae is removed and bone graft material is inserted in the space for interbody fusion. In addition to or, in place of, the bone graft material, a spinal implant may be inserted in the intervertebral space.

[0004] The conventional surgical approach for stabilization has been posterior for ease of access to the spine and to avoid interfering with internal organs and tissue. Usually the implant site is prepared to maintain natural lordosis and to accept a certain sized implant within certain pressure limits. This requires considerable time and skill by the surgeon.

[0005] Disclosed is an implant forming an expandable spinal device which incorporates a main body, a flexible front body, a push arm, and a drive screw with the intention of expanding the footprint (surface area and bone grafting volume) of the device after insertion.

[0006] It is an objective of the instant invention to teach a lateral surgical approach for the placement of an intervertebral spacer implant for interbody fusion allowing the implant to be inserted through a small incision and increased in size in situ.

[0007] Other objectives and advantages of this invention will become apparent from the following description taken in conjunction with any accompanying drawings; wherein are set forth, by way of illustration and example, certain embodiments of this invention. Any drawings contained herein constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

BRIEF DESCRIPTION OF THE FIGURES

[0008] FIG. **1** is an isometric view of the implant in place in the spine.

[0009] FIG. **2** is a side view of the implant between two vertebral bodies.

[0010] FIG. **3** is a side view of the implant in the expanded state between two vertebral bodies.

[0011] FIG. **4** is a top view of the implant in position on the spine.

[0012] FIG. **5** is a top view of the implant in the expanded state in position on the spine.

[0013] FIG. **6** is a prospective view of the implant.

[0014] FIG. **7** is a prospective view of the implant in the expanded state.

[0015] FIG. **8** is a top view of the implant.

[0016] FIG. **9** is a top view of the implant in the expanded state.

[0017] FIG. **10** is a side view of the implant.

[0018] FIG. **11** is a side view of the implant.

[0019] FIG. **12** is a back view of the implant.

[0020] FIG. **13** is a front view of the implant.

[0021] FIG. **14** is an exploded view of the implant.

[0022] FIG. **15** is an exploded isometric view of the implant.

[0023] FIG. **16** is an exploded isometric view of the implant.

[0024] FIG. **17** is an exploded isometric view of the implant.

[0025] FIG. **18** is an exploded isometric view of the implant.

DETAILED DESCRIPTION OF THE INVENTION

[0026] The implant **10** is inserted in the intervertebral space to replace damaged, missing, or excised disk material. The implant **10** is placed between adjacent vertebrae which are forced apart to a desired spacing.

[0027] Referring now in general to the figures, depicted is the implant **10** of the instant invention which consists of a main body **20**, a push arm **22**, a flexible body **24**, a drive screw **26**, flexible body guide pins **28**, a push arm pivot pin **30**, and a push arm guide pin **32**.

[0028] The main body **20** has an aperture **21** that extends through it to create and open architecture. The aperture is defined by at least four interior walls **81**, **83**, **85**, and **87**. The main body **20** has a distal end **23**, a proximal end **25**, a side wall **27**, and a side wall **29** formed to make a reasonably rectangular shape. The implant **10** has a slot **31** which extends through the main body **20** as a travel limit for the push arm guide pin **32**. The main body **20** also has slots **33** configured to act as travel limiters for the flexible body guide pins **28**. The main body **20** incorporates an opening **35** at the proximal end which extends into the main cavity of **20**. The main body **20** has a threaded hole **37** at its proximal end to receive the drive screw **26**. The main body **20** has a slot **39** which extends through its side wall **29** to receive push arm **22** and flexible body **24**. The main body **20** has a top surface **41** and a bottom surface **43**. The main body **20** incorporates extended portions **45** as stabilizers (anchors) to maintain position during the expansion maneuver.

[0029] The implant **10** can be made of conventional materials commonly used in surgical implants, such as stainless steel and its many different alloys, titanium, or any other material with the requisite strength and biologically inert properties. Polymeric materials with adequate strength and biological properties may also be used in the construction of the main body **20**, the push arm **22**, the flexible body **24**, the drive screw **26**, the flexible body guide pins **28**, the push arm pivot pin **30**, and the push arm guide pin **32**.

[0030] The flexible body **24** has a top surface **47**, a bottom surface **49**, an exterior side wall **51**, and an interior side wall **53**. The flexible body **24** incorporates an arrangement of slots **55** which extend from the top surface **47** through the

bottom surface **49** in a pattern along the exterior wall **51** to allow for a more flexible member. The flexible body **24** has extensions **57** and **59** that correspond with slot **39** in the main body **20**. The extensions **57** and **59** of the flexible body **24** incorporate thru holes **61** to receive the flexible body guide pins **28** which travel along slot **33** in the main body **20** in the assembled state. The flexible body **24** has an extension **63** which communicates with slot **65** in the push arm **22**.

[0031] The push arm **22** and the flexible body **24** are joined in assembly by the push arm pivot pin **30** which goes through a thru hole **67** in the push arm **22** and a thru hole **69** in the flexible body **24**. The push arm **22** rides through slot **39** and slot **71** of the main body **20**.

[0032] The push arm guide pin **32** goes through slot **31** and thru hole **73** in the push arm **22** in the assembled state. The push arm guide pin **32** travels in a restricted fashion in slot **31** of the main body **20** as the drive screw **26** is advanced. The drive screw **26** has a threaded portion **75** which communicates with the threaded opening of **37** of the main body **20**. The drive screw **26** has a distal end **77** which communicates with the push arm **22** to drive the expansion feature. The drive screw has a receiving end **79** to receive an appropriate screwdriver (not shown).

[0033] As the drive screw **26** is advanced, the push arm **22** changes its angle as it travels towards the distal end of slot **31**. With the push arm **22** rigidly connected to the flexible body **24**, this change in angle applies a force that bends the flexible body **24** and translates it along the flexible body guide pins **28** until they terminate their slot **33**.

What is claimed is:

1. The product comprising any feature described, either individually or in combination with any feature, in any configuration.

2. The process comprising any process described, in any order, using any modality, either individually or in combination with any feature, in any configuration.

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