UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDTRONIC, INC.
Petitioner

v.

MOSKOWITZ FAMILY LLC.
Patent Owner

Patent No. 12,011,367

DECLARATION OF MR. BRAD CULBERT IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 12,011,367

TABLE OF CONTENTS

I, Brad Culbert, declare as follows:

I. INTRODUCTION

1. I have been retained as an independent expert consultant by Medtronic, Inc. ("Petitioner") in this proceeding before the United States Patent and Trademark Office regarding U.S. Patent No. 12,011,367 ("the '367 patent") (Ex. 1001) assigned to Moskowitz Family LLC ("Patent Owner").[1] I have been asked to consider whether prior art references disclose or suggest the features recited in claims 8, 9, 13, and 17-21 (the "challenged claims") of the '367 patent. My opinions are set forth below.

2. I am being compensated at my standard rate for services provided in this matter and reimbursed for reasonable expenses, including travel. My compensation is not contingent upon my opinions, the outcome of this matter, or any of the technical positions I present in this declaration.

II. BACKGROUND AND QUALIFICATIONS

3. My qualifications are stated more fully in my curriculum vitae ("CV"), which is attached as Exhibit 1003. My CV also lists patents and publications in

[1] In this Declaration, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the '367 patent.

which I am a named author and identifies parties on behalf of whom I have previously provided expert testimony.

4. I believe that I qualify as an expert in the field of intervertebral spinal implants, and as at least a person of ordinary skill in the art (*see infra* Section IV). Below is a summary of my education, work experience, and other qualifications.

5. I am a medical device engineer with substantial experience designing and developing spinal implants for treating damaged and diseased vertebrae.

6. I earned a Bachelor of Applied Science in Metals and Materials Engineering from the University of British Columbia in 1992, followed by a Master of Business Administration from California State University, Fullerton in 2001.

7. From 1994 to 1996, I worked as a manufacturing engineer and later served as the Angioplasty Product Team Leader at Vas-Cath, a medical device company specializing in dialysis and angioplasty catheters. In that role, I oversaw a multi-functional team of R&D, manufacturing, and quality engineers to improve the company's product lines.

8. From 1996 to 1998, I worked as an R&D Project Manager at CVD, a medical device company specializing in angioplasty balloons and stents. In that role, I designed and developed new catheters and stent delivery systems. I also contributed to the preparation and submission of regulatory documents for those products.

9. From 1998 to 2000, I worked as Senior R&D Project Manager at Endicor Medical, Inc, a medical device company specializing in percutaneous thrombectomy and atherectomy systems for cardiovascular and neurovascular applications. In that role, I designed and prototyped a new thrombectomy system, including developing animal models to satisfy FDA requirements.

10. From 2000 to 2010, I worked at Interventional Spine, Inc. (formerly known as Triage Medical, Inc.), a medical device company specializing in spinal and orthopedic trauma products. I was their first employee and started as Director of Engineering before being promoted to Vice President of R&D, and ultimately Chief Technology Officer. In these roles, I oversaw the design and development of a series of percutaneous spine procedures and devices, while leading and managing employees who were also considered persons of ordinary skill in the art.

11. With nearly 10 years of experience designing spinal fusion implants, I gained extensive familiarity with the surgical techniques used in these procedures. I attended many surgical conferences and lectures worldwide and was present for dozens of spinal fusion surgeries, collaborating closely with surgeons to develop implants, instruments, and surgical techniques. My work also included hosting hands-on cadaver laboratories, where I both assisted in surgical practice and trained new surgeons in the use of the implants, including performing cadaver surgeries myself as part of the training process.

12. Based on my experience at Interventional Spine, I am highly familiar with the anatomy of the spine and vertebrae, as well as intervertebral fusion devices designed for insertion into the intervertebral disc space. I also have extensive knowledge of supplemental fixation methods, such as anterior plates, used to secure implants after insertion, along with the surgical procedures and tools associated with intervertebral fusion devices.

13. Since 2010, I have operated a consulting business advising medical device companies, including those focused on spinal implant technology. My work spans a wide range of areas, including product development, regulatory approval, manufacturing, and intellectual property.

14. In addition to my professional experience and education discussed above, I am also listed as an inventor on over 30 U.S. patents relating to devices and methods for treating the spine. Many of my patents relate specifically to intervertebral spinal implants for insertion into the intervertebral space, including, for example, U.S. Patent Nos. 8,105,382; 8,568,481; and 10,390,963.

III. MATERIALS REVIEWED

15. The opinions contained in this Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge regarding spinal implants, including those that are inserted in the disc space between vertebrae.

16. In forming my opinions expressed in this Declaration, I reviewed the following materials:

Ex. 1001	U.S. Patent No. 12,011,367 to Moskowitz et al. ("the '367 patent")
Ex. 1004	File History for U.S. Patent No. 12,011,367
Ex. 1006	U.S. Patent Application Publication No. 2008/0249569 A1 to Waugh et al. ("Waugh")
Ex. 1020	Phulchand Prithvi Raj, *Intervertebral Disc: Anatomy-Physiology-Pathophysiology-Treatment*, 8(1) PAIN PRACT. 18 (2008)
Ex. 1021	Fabio Galbusera et al., *Ageing and degenerative changes of the intervertebral disc and their impact on spinal flexibility*, 23(3) EUR. SPINE J. 324 (2014)
Ex. 1022	Dil Patel et al., *Interbody options in lumbar fusion*, 5(1) J. SPINE SURG. S19 (2019)
Ex. 1024	U.S. Patent No. 9,585,766 to Robinson ("Robinson")
Ex. 1047	U.S. Patent No. 6,342,074 to Simpson ("Simpson")
Ex. 1053	Anne Polikeit et al., *The importance of the endplate for interbody cages in the lumbar spine*, 12(6) EUR. SPINE J. 556 (2003)
Ex. 1057	U.S. Patent No. 9,445,919 to Palmatier et al. ("Palmatier")
Ex. 1059	Patent Owner's Infringement Claim Charts, Exhibit K1, *Moskowitz Family, LLC v. Medtronic, Inc.*, No. 0:25-cv-00769 (D. Mass.), served October 30, 2025.
Ex. 1060	Senthil Eswaran et al., *The micro-mechanics of cortical shell removal in the human vertebral body*, 31 COMPUT. METHODS APPL. MECH. ENGRG. 3025 (2007)
Ex. 1061	Vivek Palepu et al., *Biomechanics of Disc Degeneration*, ADV. ORTHOP (2012)

Ex. 1062	Kai-Uwe Lewandrowski, *Surgical Technique of Endoscopic Transforaminal Decompression and Fusion with a Threaded Expandable Interbody Fusion Cage and A Report of 24 Cases*, 7(2) J. SPINE 1 (2018)
Ex. 1063	Erik Emstad et al., *The VariLift(®) Interbody Fusion System: expandable, standalone interbody fusion*, 8 MED. DEVICES (AUKL.) 219 (2015)
Ex. 1064	Gstoettner Michaela et al., *Footprint mismatch in lumbar total disc arthroplasty*, 17(11) EUR. SPINE J. 1470 (2008)
Ex. 1065	Thomas Steffen et al., *Cages: designs and concepts*, 9 EUR. SPINE J. S89 (2000)
Ex. 1066	Thomas Lowe et al., *A Biomechanical Study of Regional Endplate Strength and Cage Morphology as It Relates to Structural Interbody Support*, 29(21) SPINE 2389 (2004)

17. I also considered any other documents and materials I refer to in this Declaration.

18. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art ("POSITA") would have understood the state of the art, the prior art, and the claims and the specification of the '367 patent at the time of the alleged invention, which I discuss below.

19. I have been asked to consider that the time of the alleged invention of the '367 patent was early-2010s (including the time leading up to October 25, 2012).

20. Based on my experience and expertise, it is my opinion that certain references disclose or suggest all of the features recited in claims 8, 9, 13, and 17-21 of the '367 patent, as I discuss in detail below.

IV. PERSON OF ORDINARY SKILL IN THE ART

21. I am familiar with the level of ordinary skill in the art regarding the ’367 patent in the early-2010s. Considering the ’367 patent, the technology, the educational level and experience of workers in the field relating to the patent, and problems and solutions in that field, and drawing on my own experience, I believe a POSITA at the time of the alleged invention (early-2010s, including the time leading up to October 25, 2012) would have a bachelor’s or equivalent degree in Mechanical Engineering or a related discipline (*e.g.*, biomechanics, biomedical or metals and materials engineering), and at least five years of experience. A person could have qualified as a POSITA with some combination of (a) more formal education and less technical or professional experience in the listed fields, or (b) less formal education and more technical or professional experience in the listed fields. In other words, more education can supplement practical experience and *vice versa*. For example, a POSITA could have an advanced degree, in the technical disciplines provided above, or a Doctor of Medicine, and at least two years of experience in the subject areas provided above.

22. My opinions in this Declaration regarding the ’367 patent and the prior art (including the state of the art) are from the perspective of a POSITA during the relevant timeframe, as I defined above.

V. TECHNICAL BACKGROUND

23. Below, I present a brief overview of the anatomy of the spine and intervertebral fusion devices, including several advancements in the field. The functionalities and concepts I describe below in this technical background section reflect the state of the art that a POSITA would have understood prior to and at the time of the alleged invention of the ’367 patent. I rely on and incorporate as applicable (even if not expressly mentioned below) the following disclosures and opinions to support my opinions in this Declaration, including those opinions relating to how the prior art discloses or suggests the subject matter of the challenged claim of the ’367 patent, as I explain below in Section VIII and in the Appendix. The concepts below would have been within the knowledge and mindset of a POSITA during the relevant time frame (early-2010s, including the time leading up to October 25, 2012).

A. Anatomy of the Spine and Vertebral Bodies

24. The human spine, or spinal column, is the body’s central support structure that protects the spinal cord and allows flexibility for movement. (*See* Ex. 1020, 18-19.) It is composed of a series of bones called vertebrae. Most vertebrae are separated by joints known as intervertebral discs. (*See* Ex. 1021, 3.) These discs act as cushions, absorbing shock and allowing flexibility for movement. (*See, e.g.,* Ex. 1047, 1:46-61.) The figure below “shows a lateral view of a portion

of a spinal column 10, illustrating a group of adjacent upper and lower vertebrae V1, V2, V3, V4 separated by natural intervertebral discs D1, D2, D3." (Ex. 1006, [0025].)

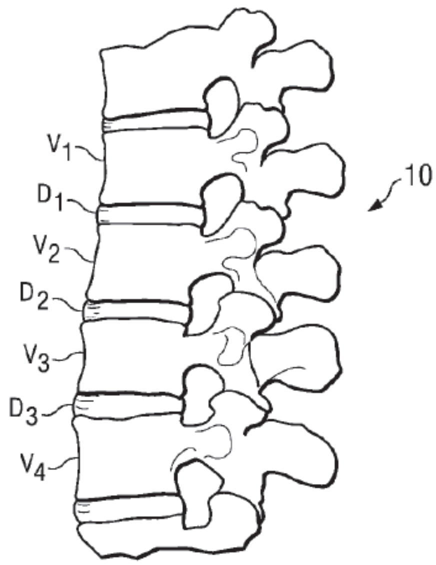


Fig. 1

(*Id*., Fig. 1 (annotated).)

25. Vertebrae consist primarily of a highly porous bone center and a thin bone shell. (Ex. 1060, 3025.) They are separated from the discs by an interface called a vertebral endplate, as shown in the figures below.

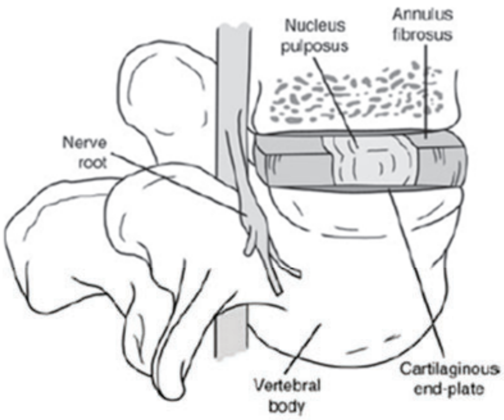


Figure 1. A line drawing of the spinal segment consisting of two vertebral bodies and a normal intervertebral disc sandwiched between them.

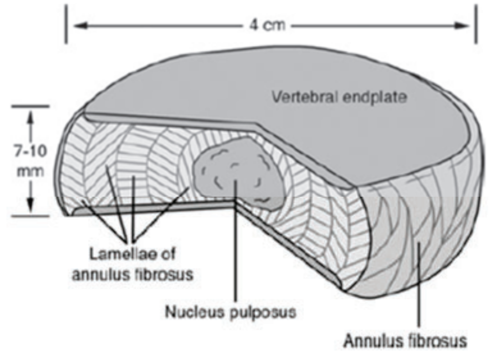


Figure 2. A cut out portion of a normal disc. Note the location of the Nucleus Pulposus, the vertebral end plate and the architecture of Annulus Fibrosis. The intervertebral disc is 4 cm wide and 7–10 mm thick.

(Ex. 1020, 19.) The shape and strength of the vertebral endplate varies across its surface, with the center as the weakest part. (Ex. 1053, 556.)

26. The intervertebral discs, however, can become damaged due to various reasons, including degenerative diseases, aging, trauma, and mechanical stress. (*See* Ex. 1020, 23-26; *see also* Ex. 1021, 2-3.) Damaged discs can bulge and lose height, which, in turn, can cause compression of nearby nerves, reduce the discs' ability to absorb mechanical loads, and lead to decreased mobility. (*See* Ex. 1020, 26-27.) When spinal disc injury is severe, surgical intervention may be needed.

B. Expandable Intervertebral Fusion Devices and Surgical Tools for Installing the Devices

27. Surgical intervention for severely damaged discs may involve a discectomy, in which the surgeon removes all or part of the damaged disc, followed by placement of an implant together with bone graft material that can fuse adjacent

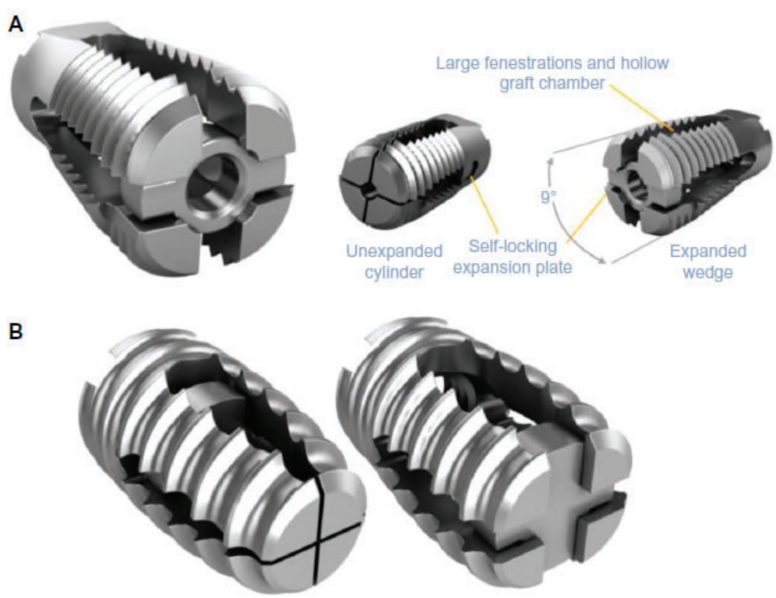
vertebrae through the implant. (*See id*., 32-37; *see also* Ex. 1022, 20.) These implants, known as intervertebral or interbody fusion devices, are positioned between adjacent vertebrae and may employ various components, such as screws, to achieve fusion with the vertebrae. (*See* Ex. 1022, 19-21.) One technique, referred to as the lumbar interbody fusion ("LIF") technique, uses standalone cages that are placed into the intervertebral disc space and filled with bone graft material to stabilize the spine and promote fusion of the adjacent vertebrae. (Ex. 1061, 4.) Cages for LIF techniques were initially designed as rigid structures. (*Id*., 4, Fig. 2 (reproduced below).) However, "to overcome the problems associated with these rigid cages, . . . expandable cages" were developed. (*Id*., 4, Fig. 3.)

FIGURE 2: Rigid interbody cages. (a) Ardis (Zimmer spine, Minneapolis, MN, USA), (b) Leopard (DePuy, Raynham, MA, USA), (c) Cougar (DePuy, Raynham, MA, USA), and (d) Jaguar (DePuy, Raynham, MA, USA) (website).

FIGURE 3: Expandable interbody cages. (a) Varian (Medyssey spine, Skokie, IL, USA), (b) VariLift-L (Wenzel spine, Austin, TX, USA), and (c) StaXx XDL (Spine wave, Shelton, CT, USA) (website).

(*Id.*, Figs. 2-3.)

28. One known expandable cage was the VariLift®-L (shown below). (*Id.*, 4-5.) The VariLift®-L device was designed to be expanded in the intervertebral space to offer stable engagement with the vertebral endplates over a large contact area. (*Id.*) VarifLift®-L included a central expansion screw. (Ex. 1062, 4.) When the expansion screw was turned, as shown in the figure below, a sliding expansion plate expanded the device. (Ex. 1063, 220.)



(*Id*., Fig. 1.)

29. Another expandable device known by the early 2010s is described in U.S. Patent No. 9,585,766 ("Robinson") (Ex. 1024). Robinson discloses an "expandable assembly for insertion into an intervertebral space" that includes "an upper portion 1012 and a lower portion 1018," which are "joined together by a pin-in-slot joint or another type of hinge 1070 near the proximal end." (Ex. 1024, 1:57-58, 4:1-10.) Robinson's device also includes an expander 1032 that "is generally conical in cross-section with a rectangular or square end, like the head of a bolt, and tapered on both sides." (*Id.*, 4:15-20.) As shown in figures 4A and 4B below, when expander 1032 is pulled along the longitudinal axis, "two portions 1012, 1018 of the cage body 1010 [] expand or spread open." (*Id.*, 4:54-57.) "The pin-in-slot joint or hinge 1070 may allow the two portions 1012, 1018 to expand or move vertically relative to one another, while also allowing the two portions 1012, 1018 to rotate about the hinge 1070." (*Id.*, 4:57-62.)

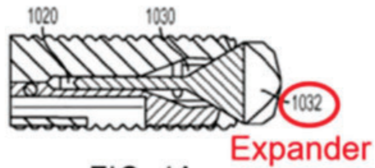


FIG. 4A

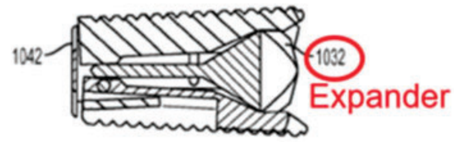


FIG. 4B

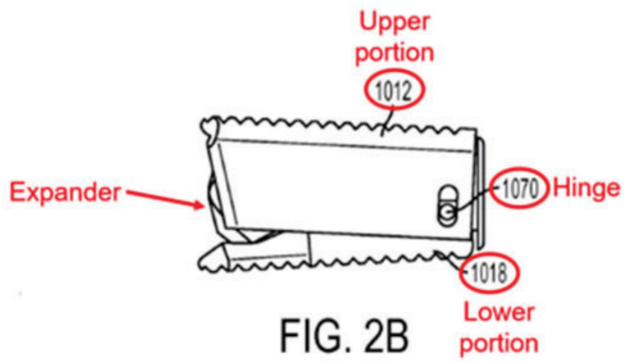


FIG. 2B

(*Id.*, Figs. 4A-4B (top), and 2B (bottom) (all annotated).)

Expandable implants based on hinges were thus known in the art.

C. Design Considerations to Mitigate Subsidence

30. When intervertebral or interbody fusion devices are positioned between adjacent vertebrae, there is a risk that these devices can sink into the body of the vertebrae. This problem is referred to as "subsidence." To mitigate the risk of subsidence, those in the art investigated how to better distribute stress caused by interbody cages. (Ex. 1053, 556; Ex. 1064, 1472.) Researchers observed that "[t]he shape, density and the strength of the [vertebral] endplate have been shown to vary across its surface, with the centre being the thinnest and weakest area." (Ex. 1053, 556.) Improper size and geometry of the interbody implant and placement of the implant in the porous ***central area*** of the vertebral body were factors that could cause

subsidence. (*Id.*; Ex. 1066, 2389; Ex. 1064, 1472.) Those in the art concluded that implants should be designed "such that they can rely on the strong peripheral part of the endplate to reduce the risk of subsidence . . . ." (Ex. 1053, 560.) Additionally, for "an optimal surface fit," cages should "mimic the inverse shape of the endplate's concave contour," *i.e.*, have a convex surface. (Ex. 1065, 90.)

31. Moreover, it was known that "[t]he footprint size of the interbody fusion device is an important factor that determines the biomechanical stability afforded by these implants" and that "occurrence of subsidence is also influenced by the cage's footprint." (Ex. 1061, 4.) A larger footprint increases the biomechanical stability, lessens the occurrence of subsidence, and results in lower stress on the endplates after surgery. (*Id.*, 4-5.) "From a biomechanical point of view, an implant with the largest possible surface area appears to be best to avoid subsidence into the vertebral body as the circumference would provide a brace for the strongest areas in the periphery." (Ex. 1064, 1473.)

VI. THE '367 PATENT

32. The '367 patent discloses an expandable intervertebral implant for fusion and distraction, *i.e.*, a device placed between vertebrae to join them together or promote proper spacing. (Ex. 1001, Abstract.) As shown in figure 6D below, the device has two housings 602, 604, and a wedge 616 in between the housings. (*Id.*, 9:23-45.)

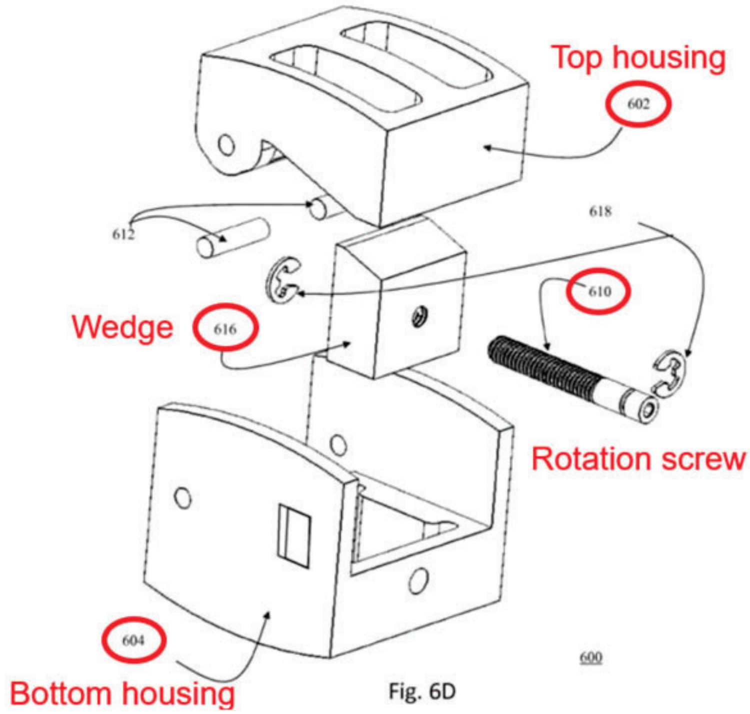
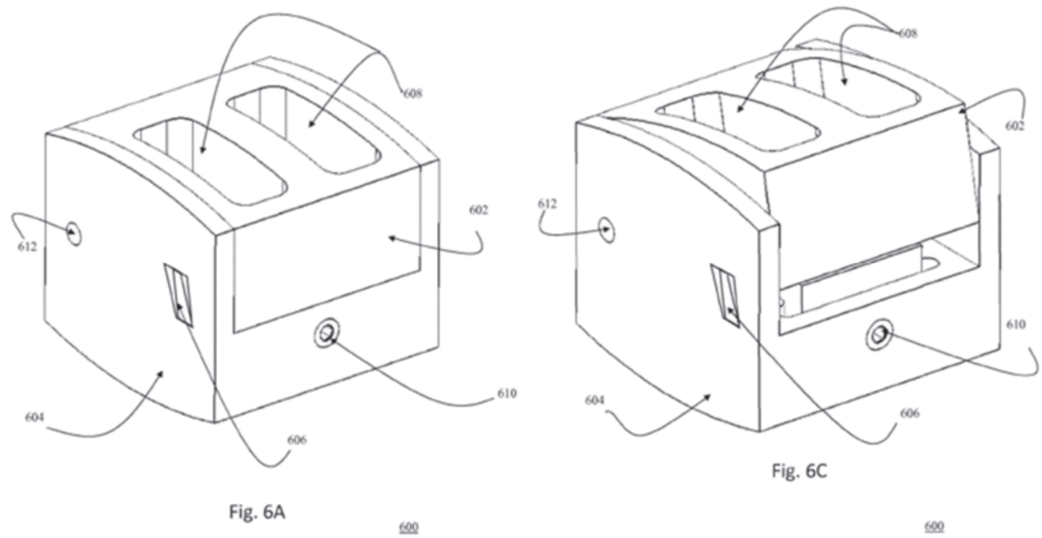


Fig. 6D

(*Id.*, Fig. 6D (annotated).)

33. The two housings are connected by one or more pins 612 that allow pivoting of the top housing 602 and bottom housing 604 relative to each other. (*Id.*, 9:26-30.) A rotation screw 610 "can control the relative angular orientation of the two housing pieces 602, 604." (*Id.*, 9:35-38.) "When the screw 610 is rotated by an external tool[,] . . . the screw 610 causes lateral motion" of the wedge 616. (*Id.*, 9:40-43.) As the wedge moves, it engages "an inner tapered surface of the top housing 602 and forces the top housing piece 602 to rotate away from the bottom housing 604," *i.e.* expands the device. (*Id.*, 9:43-45.) Figure 6A below shows the device in its closed configuration, and figure 6C shows the device in its fully expanded configuration. (*Id.*, 6:4-8.)



(*Id.*, Figs. 6A, 6C.)

34. The device 600 "can include indentions 606" on the lateral sides of the top housing 602 and the bottom housing 604 "to mate with prongs" of a tool "to assist in grasping, inserting and impacting the device 600." (*Id.*, 9:30-35.) The device 600 can also include "one or more bone cavities 608 incorporated into the top housing 602 and/or bottom housing 604 for bone fusion." (*Id.*, 9:45-47.)

35. The '367 patent claims priority to U.S. Application No. 61/718,707 ("the '707 application"), filed on October 25, 2012. No application predating the '707 application in the '367 patent priority chain discloses an expandable implant with a wedge-based expansion mechanism for adjusting the spacing between two movable bodies that engage the vertebrae, as recited in each challenged claim, and described above with reference to figure 6D. For example, no application predating the '707 application discloses "**a first body**," "**a second body**," a "**wedge []**

positioned between the first body and the second body," wherein an "**angled wedge surface [of the wedge] presses against the first interior surface of the first body to move the first body relative to the second body from a compressed configuration to an expanded configuration**," as recited in claim 8.

VII. CLAIM CONSTRUCTION

36. I understand that when considering the meaning of patent claims, one must consider the language of the claims, the specification, and the prosecution history of the patent. I also understand that claim terms are typically given their ordinary and customary meanings as would have been understood by a POSITA at the time of the invention for the patent. For purposes of my opinions in this Declaration, I have not expressly construed any claim term because the prior art discloses or suggests each claim limitation under any reasonable construction, particularly in view of Patent Owner's infringement contentions (*see* Ex. 1059).

VIII. THE PRIOR ART

37. I provide a detailed explanation of my opinions on each element of the challenged claims in the Appendix. In this section, I address the relevant disclosure of Palmatier, as well as concepts known in the art at the time of the alleged invention. I also address some of the key issues.

A. Palmatier

1. Overview

38. Palmatier discloses "an expandable interbody implant system." (Ex. 1057, 1:35-37.) Palmatier's intervertebral implant 40, described with references to figures 1-16, is one embodiment of the disclosed "expandable interbody implant system." (*Id.*, 15:9-12 ("intervertebral implant 40 . . . described above with regards to FIGS. 1-16").) Palmatier describes variations of implant 40 as implants 540 and 840, which have largely similar components as implant 40. (*Id.*, 15:9-12, 18:38-41.) For example, all three have a piston component 46/546/846, a base component 48/548/848, a wedge 58/558/858 between the two components, and a rotating screw 92/592/892. (*Id.*, 6:28-31, 8:34-38, 15:15-20, 16:25-29, 18:42-45.[2]) As explained below, each embodiment has the same basic operating mechanism: the piston component is hingedly connected to the base component, and a wedge is axially translated between them by rotating the screw, which moves the distal portion of the piston component away from the base component to expand the implant. For example, the implant expands from a "collapsed configuration" (shown in figure 15) to an "expanded configuration" (shown in figure 16) by moving the wedge 58 from right to left, *i.e.*, in the direction of arrow D. (Ex. 1057, 13:54-14:2.)

[2] Analogous structures in Palmatier have the same ending digits. For example, piston component ends with "46," base component ends with "48," wedge ends with "58," and screw ends with "92."

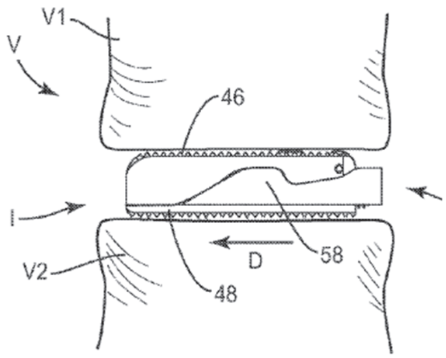


FIG. 15

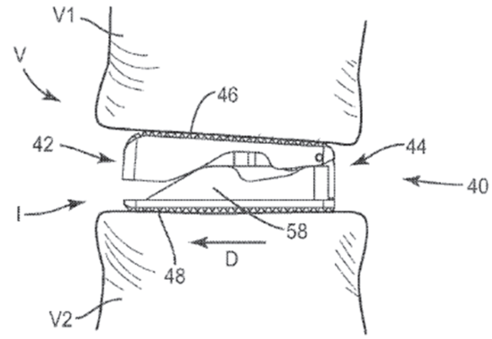


FIG. 16

(*Id.*, Figs. 15, 16.)

39. The embodiment of figures 22-26 discloses an "intervertebral implant 840, similar to intervertebral implant 40 . . . ." (*Id.*, 18:38-41.) Like implant 40, implant 840 has a base component 848 that is pivotably connected by a hinge with the piston component 846. (*Id.*, Fig. 24 (reproduced below), 18:42-48, 8:43-46 ("Base component 48 is pivotably connected to piston component 46 adjacent posterior ends 66, 86 with hinge 50 to facilitate a pivoting connection between components 46, 48."), 15:9-23.)

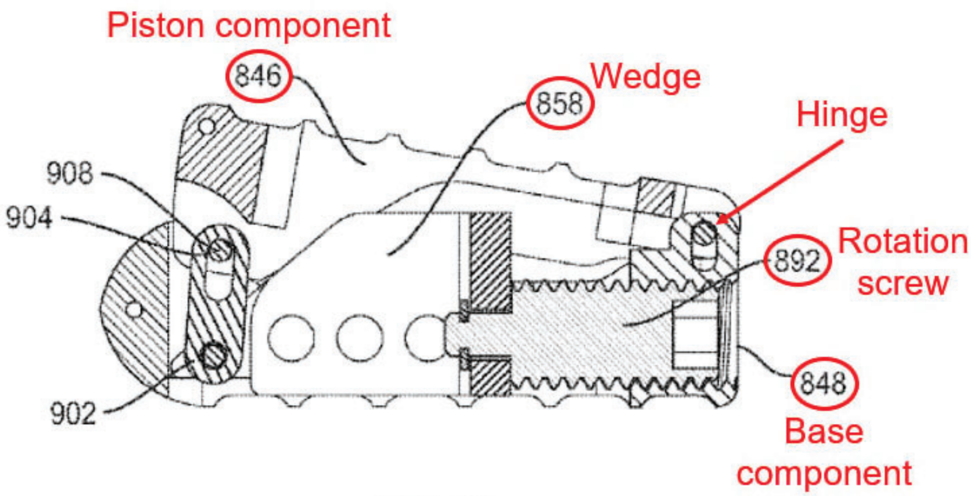


FIG. 24

(*Id.*, Fig. 24 (annotated).)

40. To expand the implant, a tool rotates rotation screw 892, which then pushes wedge 858 along the longitudinal axis of the implant. (*Id.*, 18:42-45 ("an inserter or tool (not shown) [] engages a screw 892 for axially translating a wedge 858"); *compare, id.*, Fig. 26, *with* Fig. 24.) As wedge 858 moves longitudinally, the surface of wedge 858 engage an angled abutting surface of piston component 846 to pivot piston component 846 relative to base component 848 about a hinge. (*Id.*, Figs. 24-26, 16:25-42.)

41. Palmatier's implant 840 differs from implants 40, 540 because, as shown in figure 22 below, base component 848 has side walls that create an opening to nest part of piston component 846 within base component 848. According to Palmatier, "[b]ase component 848 protects wedge 858 and screw 892 as

intervertebral implant 840 is inserted into an intervertebral disc space." (*Id.*, 18:46-48.)

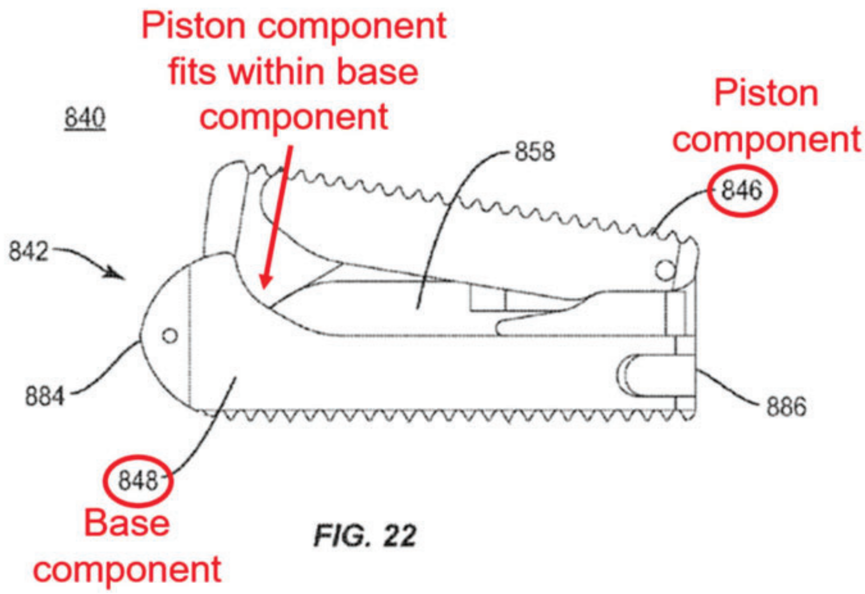


FIG. 22

(*Id.*, Fig. 22 (annotated).)

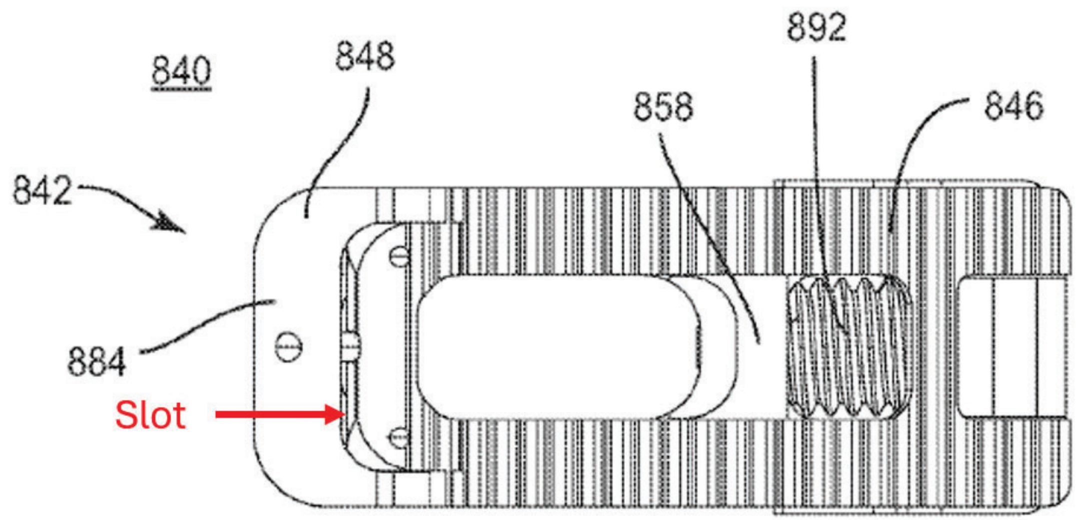


FIG. 23

(*Id.*, Fig. 23 (annotated).)

2. Palmatier Discloses "a Wedge" that "Slide[s] Within a Space Defined by the First Body and Second Body"

42. Limitation [8.f] requires "**a wedge having an angled wedge surface, wherein the wedge is positioned between the first body and the second body with the angled wedge surface facing the first interior surface of the first body and the at least one angled housing surface of the first body is positioned to engage the angled wedge surface of the wedge**."[3] Palmatier discloses this limitation, as I explain below.

[3] Claim language is bolded throughout.

43. Palmatier discloses that the implant 840 expands like implants 40 and 540 via a mechanism comprising a screw and "**a wedge**" that pivots piston component 846 relative to the base component 848. (Ex. 1057, 18:42-45; *see also id*., 19:18-20.) For example, pushing wedge 858 along the longitudinal axis of implant 840 pivotably moves piston component 846 and base component 848 apart relative to one another, such that components 846 and 848 expand from a collapsed configuration to an expanded configuration. (*Id.*, 14:2-12, 18:9-17, 18:63-66 ("intervertebral implant 840 is expanded . . . as described above with regard to intervertebral implants 40, 540.").) As shown in the figures below, wedge 858 has "**an angled wedge surface**" and is positioned between piston component 846 (**first body**) and base component 848 (**second body**). Moreover, as shown in figure 22 below, "**the angled wedge surface** [is] **facing the first interior surface of the first body**" and the "**angled housing surface of the first body is positioned to engage the angled wedge surface of the wedge**."

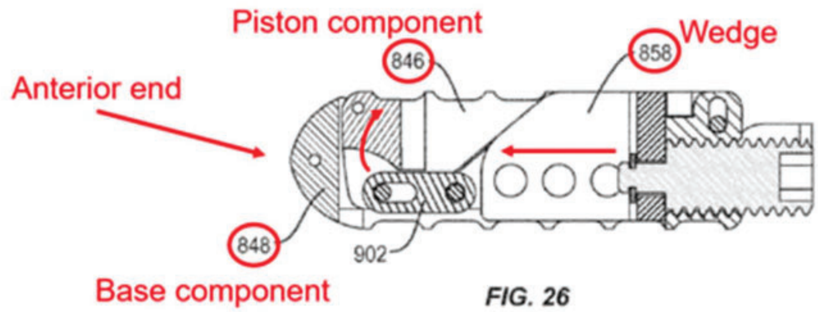


FIG. 26

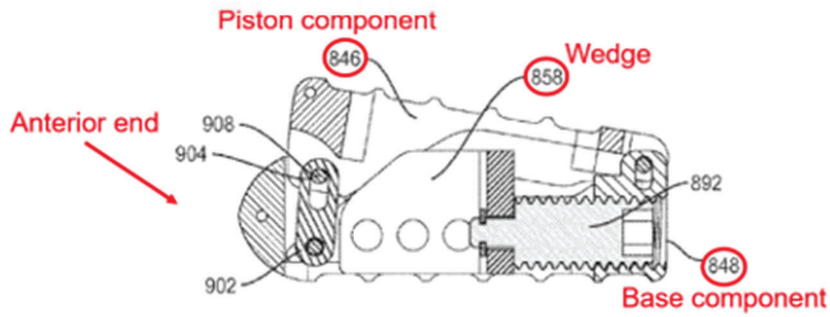


FIG. 24

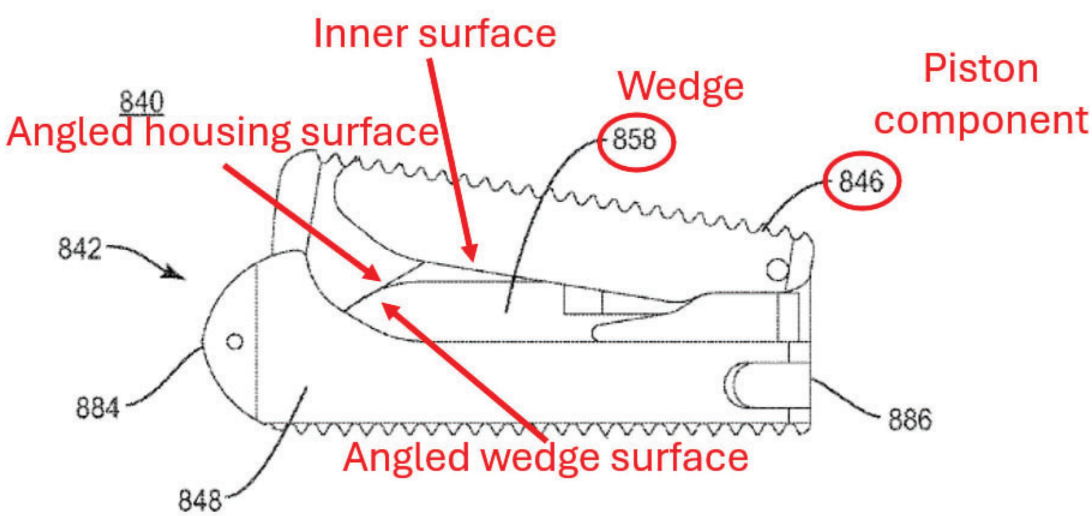


FIG. 22

(*Id.*, Figs. 26, 24, 22 (all annotated).)

44. Limitation [8.g] requires that "**the wedge is configured to slide within a space defined by the first body and second body in a direction toward the**

second and fourth ends of the first body and second body from a first wedge position in which the first body and the second body are in a substantially closed position to a second wedge position whereby the angled wedge surface presses against the first interior surface of the first body to move the first body relative to the second body from a compressed configuration to an expanded configuration without moving the second body."

45. As shown in figure 22 below, Palmatier's implant 840 includes a piston component 846, which is a "**first body**" that moves between an expanded and collapsed configuration. (Ex. 1057, 18:38-19:2, Figs. 24-26; *see also id*., 6:31-36 ("Base component 48 is movably mounted to piston component 46 with a hinge 50 to facilitate a pivoting connection between components 46, 48. Components 46, 48 are relatively movable to expand and collapse with [the] intervertebral implant.").[4])

---

[4] Palmatier discloses three exemplary embodiments (implant 40, implant 540, and implant 840). Palmatier explains that its statements about implant 40 and implant 540 also apply to implant 840. (Ex. 1057, 18:38-41 ("intervertebral implant 840 [is] similar to intervertebral 40 and intervertebral implant 540 and their components.").) Palmatier also states that "intervertebral implant 840 is expanded . . . as described above with regard to intervertebral implants 40, 540." (*Id.*, 18:63-66.) Where certain components are not expressly discussed with respect to implant 840, but are

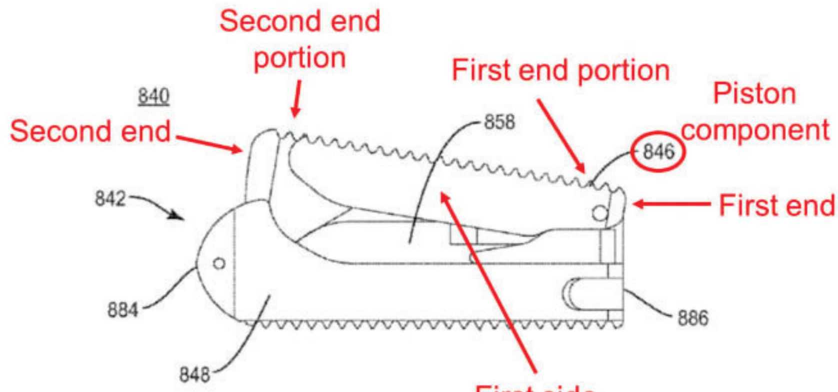


FIG. 22

(*Id.*, Fig. 22 (annotated).)

46. As shown in figure 22 above, the piston component 846 extends from a posterior end, *i.e.*, "**a first end**," to an anterior end, *i.e.*, "**a second end**." (*Id.*, Figs. 22, 24; *see also id.*, 6:25-38, Fig. 12.) Areas around the posterior end and anterior end are "**first and second end portions**," respectively.

47. Palmatier's implant 840 also includes a base component 848, which is a "**second body**." (Ex. 1057, 18:38-19:2, figures 24-26.) As shown in figure 22 below, Palmatier's base component 848 extends from a posterior end 886, *i.e.*, "**a third end**," to an anterior end 884, *i.e.*, "**a fourth end**." (*Id.*, 18:38-46, Fig. 22.)

---

otherwise present in the figures for implant 840, as well as implants 40, 540, I cite disclosure for analogous components in implants 40, 540 that have, for example, been assigned the same ending digits.

Areas around the posterior end and anterior end are "**third and fourth end portions**," respectively.

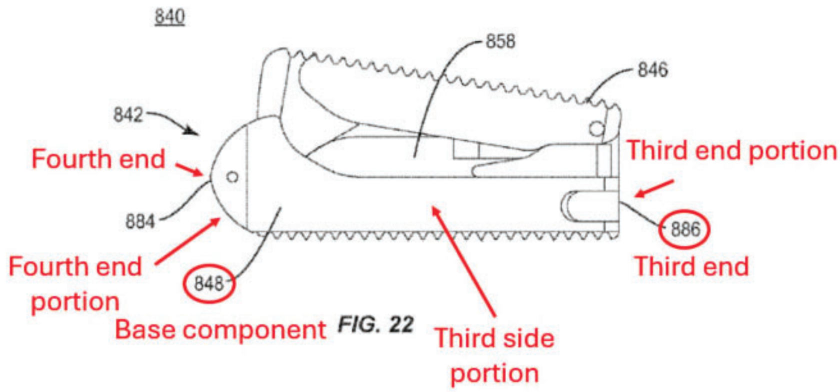
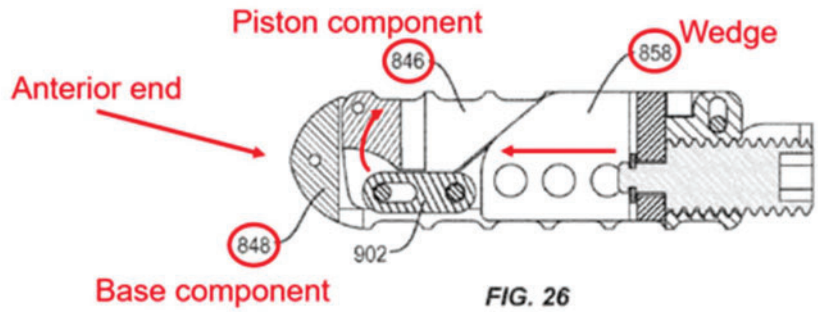
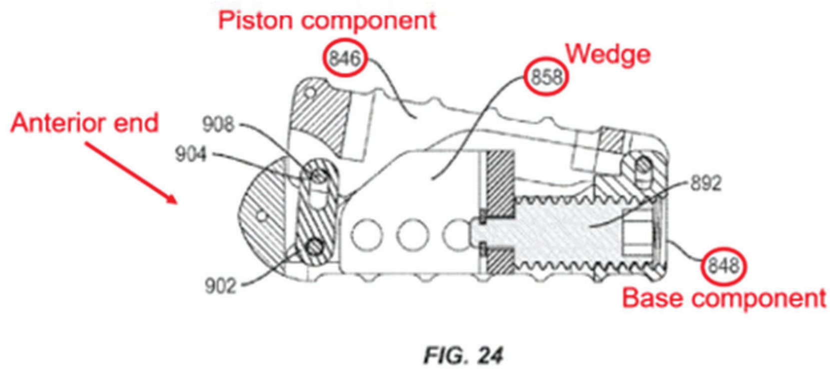


FIG. 22

(*Id.*, Fig. 22 (annotated).)

48. As discussed above in Section VIII.A.2, wedge 858 sits in between piston component 846 (**first body**) and base component 848 (**second body**). As shown in figures 24 and 26 below, wedge 858 slides within the space between piston component 846 and base component 848. Palmatier thus discloses that "**the wedge is configured to slide within a space defined by the first body and second body**." Moreover, as shown in figures 24 and 26 below, the wedge slides towards the anterior end, *i.e.*, the **second and fourth ends**, of implant 840. (*Infra*, Appendix [8.b] and [8.d].) Palmatier thus discloses that "**the wedge is configured to slide . . . in a direction toward the second and fourth ends of the first body and second body**."





(Ex. 1057, Figs. 26, 24 (both annotated).)

49. The position of wedge 858 in figure 26 above is "**a first wedge position in which the first body and the second body are in a substantially closed position**." As shown in figure 22 below and explained below in Appendix [8.f], wedge 858 has an "**angled wedge surface**" that engages an angled portion of the inner surface of piston component 846 in implant 840. And the position of wedge 858 in figure 24 above is "**a second wedge position whereby the angled wedge surface presses against the first interior surface of the first body to move the first body relative to the second body from a compressed configuration to an expanded configuration without moving the second body**." As shown by figures

24 and 26, Palmatier teaches that as the wedge pushes the piston component upwards, the base component 848 does not move.

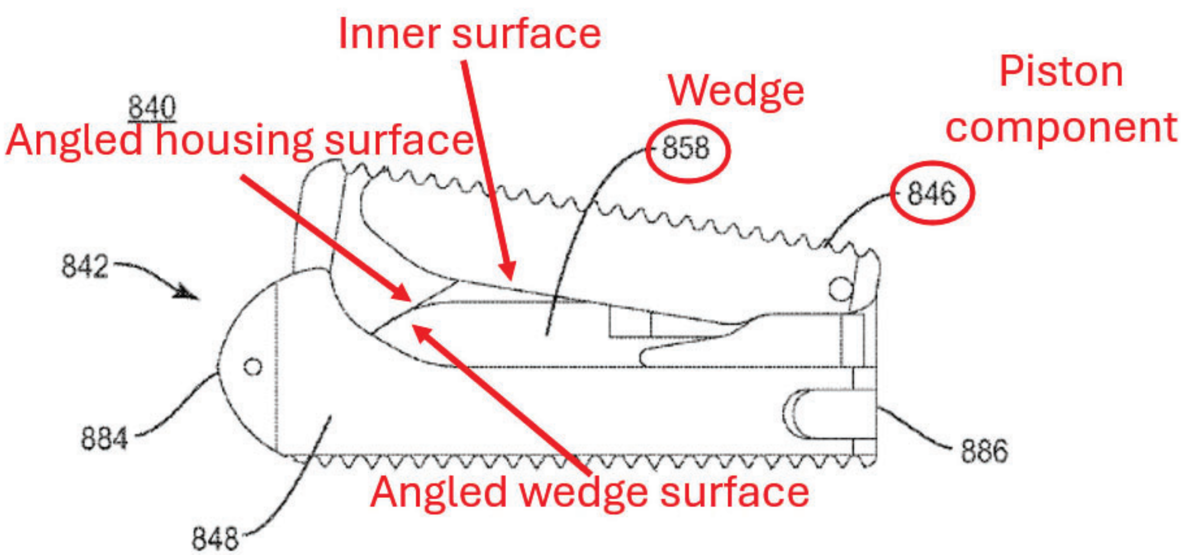


FIG. 22

(*Id*., Fig. 24 (annotated).)

3. Palmatier Discloses "End[s]" That Are "Axially Aligned" with Other "End[s]"

50. Limitation [17.f] requires that "**the first body is aligned with the second body such that the first end of the first body is axially aligned with the third end of the second body and the second end of the first body is axially aligned with the fourth end of the second body**." Palmatier discloses this limitation, as I explain below.

51. As discussed above in Section VIII.A.2, and further addressed in Appendix [8.b] and [8.d], as well as shown below in figure 22, implant 840 has a piston component 846 (**first body**) extending from "**the first end**" to "**the second end**" and a base component 848 (**second body**) extending from "**the third end**" to "**the fourth end**."

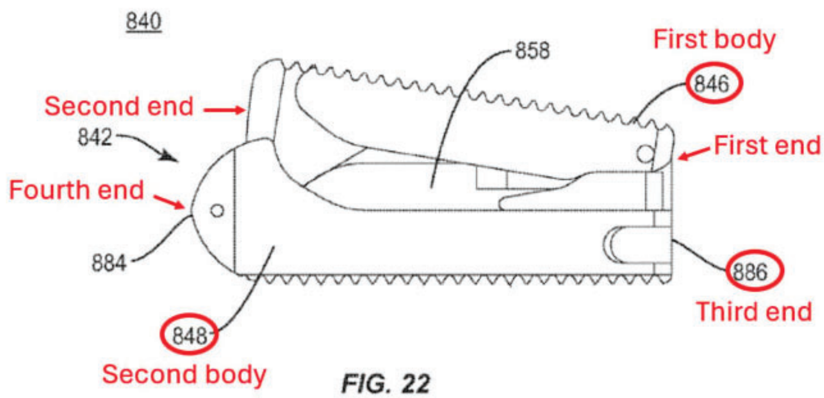


FIG. 22

(Ex. 1057, Fig. 22 (annotated).) Each of these ends is aligned relative to an "axis" of the implant, as shown in the figures below.[5] Figure 23, which is a top view of implant 840, shows that the **second end** and **fourth end** are positioned on the same axis, and further shows (in conjunction with figure 27) that the **first end** and the

[5] Claim 17 does not define the "axis" or give any further clarity regarding what is required for ends to be "axially aligned." For example, claim 17 does not specify if there is one or more than one axis relative to which the ends are aligned. The '367 patent specification is similarly deficient.

third end are positioned on the same axis; thereby, all the ends are axially aligned.[6]

Palmatier thus discloses limitation [17.f].

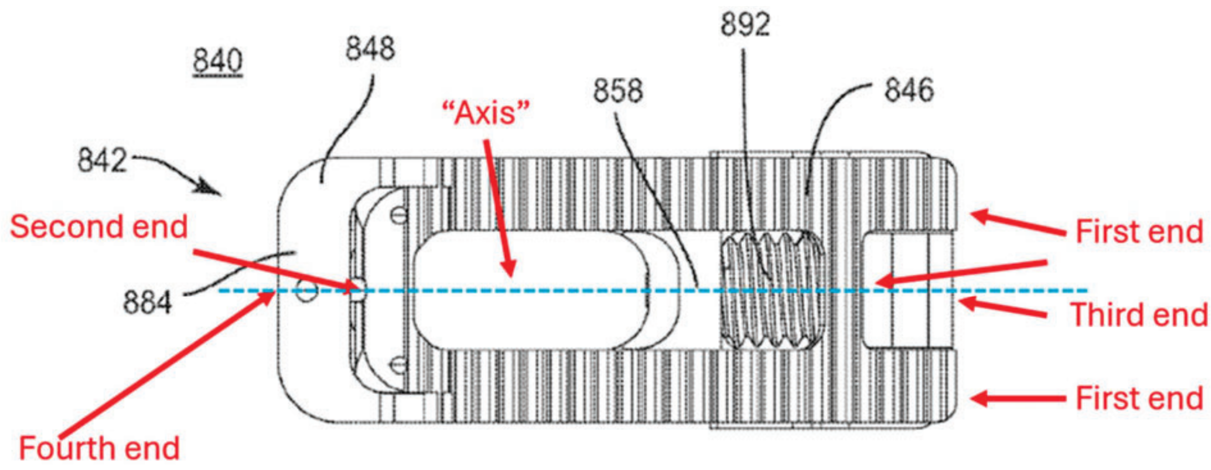


FIG. 23

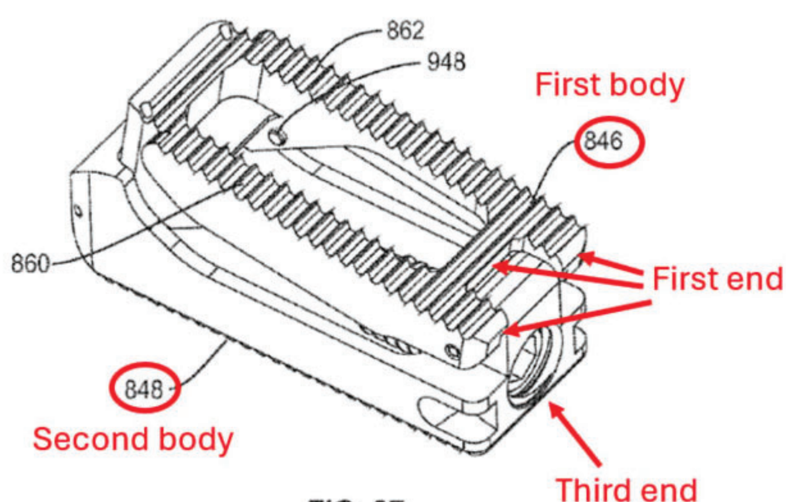


FIG. 27

(*Id.*, Figs. 23, 27 (both annotated).)

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[6] Figure 27 is a "perspective view of one embodiment of the components of the implant shown in FIG. 22." (*Id.*, 3:23-24, Fig. 27.)

4. A POSITA Would Have Been Motivated to Modify Palmatier's Implant 840, Extending the Anterior End of the First Body All the Way to the Anterior End of the Second Body Relative to the Axis of the Implant

52. The other exemplary embodiments of Palmatier (shown in, *e.g.*, figure 3 as implant 40 and figure 17 as implant 540) are described as "similar" to implant 840. (Ex. 1057, 18:38-41.) All three exemplary embodiments are implementations of Palmatier's expandable implant having "base" and "piston components" sandwiching a translating "wedge" that expands the implant. And like implant 840 shown in figure 23, each of Palmatier's alternative exemplary embodiments are "axially aligned." For example, as shown in figure 3 of Palmatier below, the "first," "second," "third" and "fourth" ends of implant 40 are also axially aligned relative to a "longitudinal axis a" of the device. (*Id.*, 6:25-28, 7:14-18, 8:5-8.)

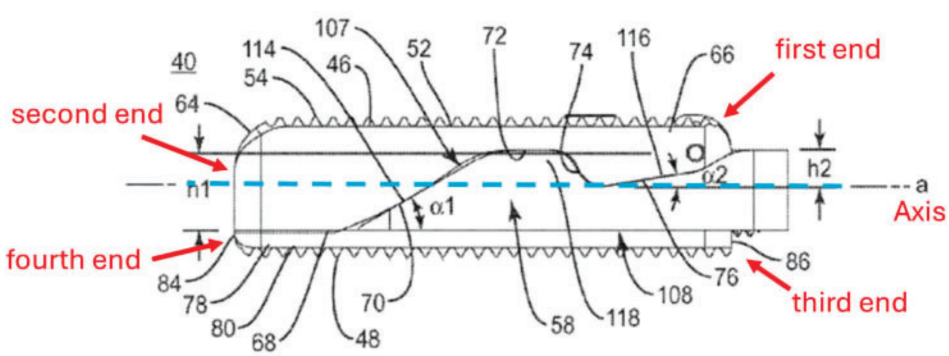


FIG. 3

(*Id.*, Fig. 3 (annotated).) And as shown in figure 17 below, the "first," "second," "third" and "fourth" ends of implant 540 are axially aligned relative to a "longitudinal axis aa" of the device. (*Id.*, 15:12-14.)

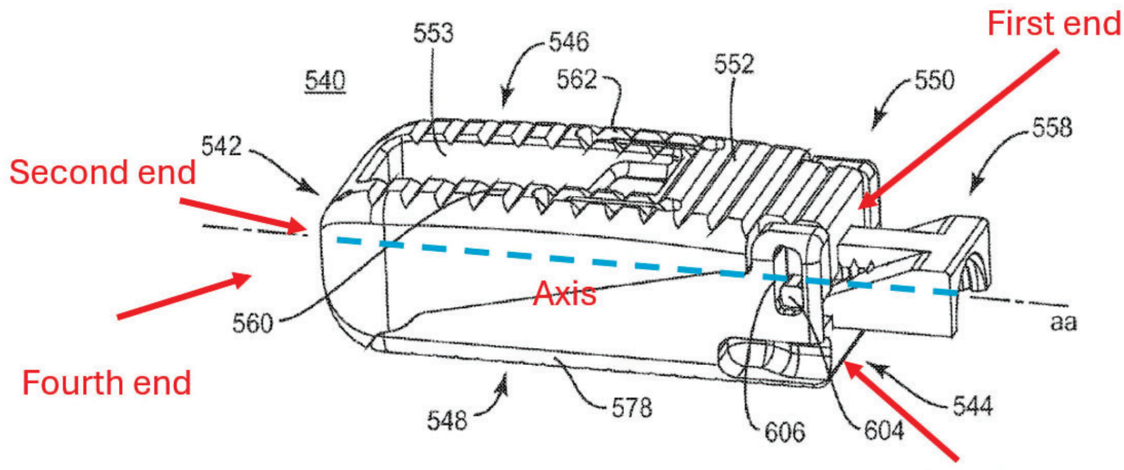


FIG. 17

(*Id*., Fig. 17 (annotated).) Indeed, numerous "axially aligned" implants were well known in the art, for instance, in Robinson, discussed *supra*, Section V.B.

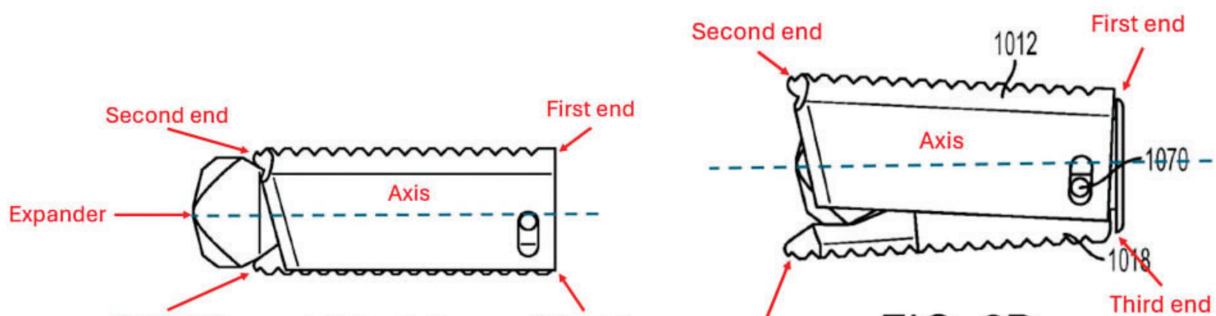


FIG. 2A FIG. 2B

(Ex. 1024, Figs. 2A, 2B (both annotated).)

53. Among other subtle distinctions, implants 40, 540 and 840 of Palmatier differ in terms how the piston and the base components—including their respective vertebral engagement surfaces—are configured, as well as with respect to their wedge components responsible for expansion. For instance, in both implant 40 and 540, the piston and base components have largely the same length as measured from

the "first" to the "second" end and the "third" to the "fourth" end, and are arranged such that the "first" and "third" ends, and the "second" and "fourth" ends align vertically in the same plane. (*See* Ex. 1057, Figs. 3, 17 (annotated and reproduced above).) In contrast, in implant 840, the base and piston components have different lengths and are configured such that the "second end" of the piston component fits between sidewalls adjoining the "fourth end" of the base component.

54. Given the related disclosures in Palmatier, and for additional reasons discussed below, a POSITA would have been motivated to modify implant 840 to extend the anterior end of the piston component 846 all the way to the anterior end of the base component 848, like in implants 40 and 540. Palmatier envisions such modifications as it expressly teaches that "various modifications may be made to the embodiments disclosed herein." (Ex. 1057, 19:27-28.) Modifying the base and piston components of implant 840 in this manner to match implants 40 and 540 would have increased the footprint (surface area) of the piston component 846 relative to the opposing vertebral body endplate. It was known that larger footprints increase the biomechanical stability, lessen the occurrence of subsidence (by distributing the amount of force over a greater surface area and loading the endplates at the denser cortical edge), and result in lower stress on the endplates. (*Supra*, Section V.C.) As discussed in Section V.C, to reduce the risk of subsidence, a POSITA would have been motivated to maximize the footprint on piston component

846 and to ensure that the implant extends to the periphery of the vertebral body (the strongest part of the vertebral body) both above and below the implant. Therefore, a POSITA would have been motivated to extend the anterior end of piston component 846 towards the anterior end of base component 848.

55. A POSITA would have had a reasonable expectation of success in modifying implant 840 in the above manner especially given that Palmatier's other embodiments expressly disclose such a design. Indeed, Palmatier's implant 840 differs from Palmatier's implants 40, 540 in that implant 840 has extended side walls on base component 848 and an opening, *i.e.*, slot, between the side walls that allows piston component 846 to nest within base component 848. (*Id.*) That same arrangement could have been maintained while extending the anterior end of the piston component 846 to align with the anterior end of the base component 848. (*Id.*) Nor would extending the anterior end of the piston component 846 to align with the anterior end of the base component 848 have required any alteration of the expansion mechanism in implant 840. (Ex. 1057, 18:63-66 (disclosing that implants 40, 540, 840 expand in the same manner).)

56. Therefore, because prior art expandable implants were generally known to have axially aligned ends and Palmatier expressly discloses multiple exemplary variations with such ends, a POSITA would have reasonably expected success in modifying implant 840 to have ends configured as in implant 40 or implant 540.

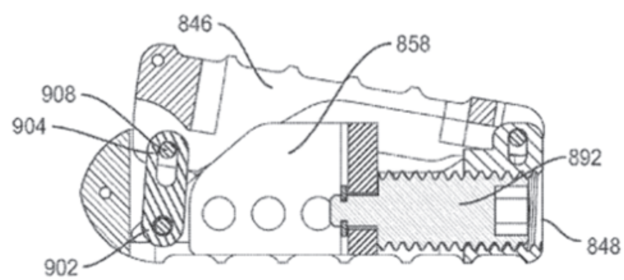
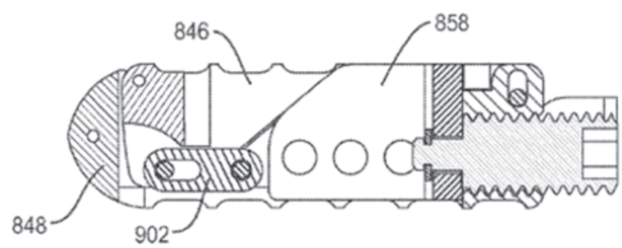
IX. CONCLUSION

57. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

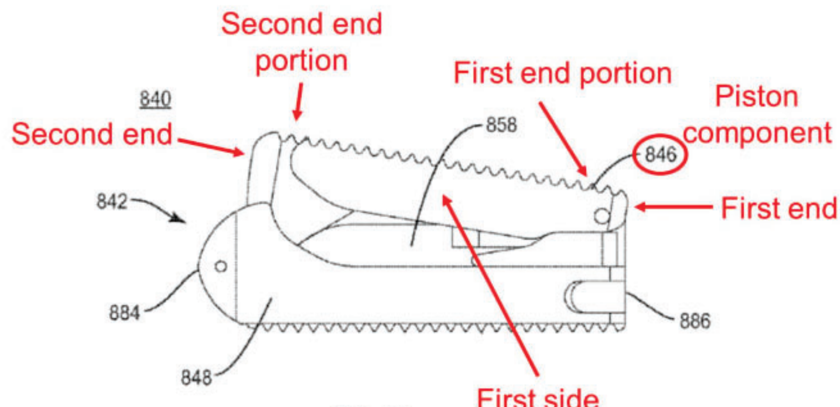
Dated: December 2, 2025 By: Brad Culbert

Brad Culbert

APPENDIX

’367 Patent Claim Element	Prior Art Analysis
Claim 8	
[8.a] “An expandable intervertebral device comprising:”	To the extent the preamble is limiting, Palmatier discloses this limitation. Palmatier discloses an intervertebral implant 840 with reference to figures 22-26, and, as shown in figures 24 (expanded configuration) and 26 (collapsed configuration) below, implant 840 is an “expandable interbody implant system.” (Ex. 1057, 1:35-37, 3:30-35, Figs. 22, 24, 26.) The “implant [] expands after insertion into an intervertebral disc space.” (*Id.*, 3:39-48; *supra* Section VIII.A.1.)  *FIG. 24*  *FIG. 26* (Ex. 1057, Figs. 24, 26.)

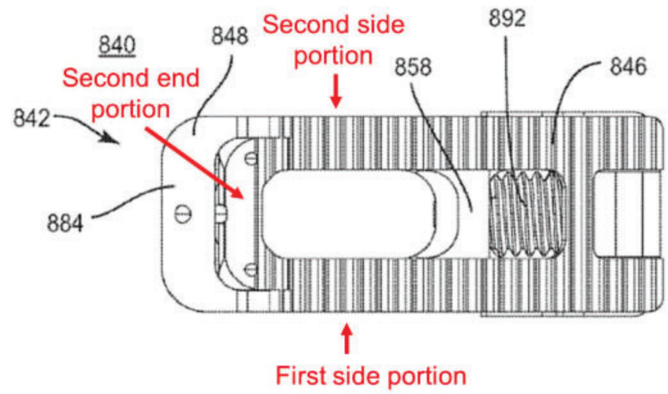
<table>
<tr>
<td>[8.b] “a first body extending from a first end to a second end, wherein the first body has first and second end portions positioned at the first and second ends, respectively, and has first and second side portions extending between the first and second end portions,”</td>
<td>Palmatier discloses this limitation. As shown in figure 22 below, implant 840 includes a piston component 846, which is a “first body,” and it moves between an expanded and collapsed configuration. (Ex. 1057, 18:38-19:2, Figs. 24-26; see also id., 6:31-36 (“Base component 48 is movably mounted to piston component 46 with a hinge 50 to facilitate a pivoting connection between components 46, 48. Components 46, 48 are relatively movable to expand and collapse with [the] intervertebral implant.”).)



(Id., Fig. 22 (annotated).)

As shown in figure 22 above, the piston component 846 extends from a posterior end, i.e., “a first end,” to an anterior end, i.e., “a second end.” (Id., Figs. 22, 24; see also id., 6:25-38, Fig. 12.) Areas around the posterior end and anterior end are “first and second end portions,” respectively. Palmatier thus discloses “a first body extending from a first end to a second end, wherein the first body has first and second end portions positioned at the first and second ends, respectively.”

Moreover, as shown in figure 22 above, Palmatier’s piston component 846 includes “first and second side portions extending between the first and second end portions.” (Id., 3:14-17.) While the “second side portion” is not visible in figure 22, a POSITA would have understood that there is a second side portion on the other side of the second end</td>
</tr>
</table>

	portion given the symmetrical nature of the device evident from figure 23 below.  FIG. 23 (*Id.*, Fig. 23 (annotated).)

<table>
<tr>
<td>[8.c] "wherein the first body has a first vertebral body engagement surface and has a first interior surface positioned on an opposite side of the first body than the first vertebral body engagement surface, the first vertebral body engagement surface comprising a plurality of ridges for interfacing with a vertebral body surface, the first interior surface includes at least one angled housing surface protruding from the first interior surface;"</td>
<td>

Palmatier discloses this limitation. As shown in figure 22 below, piston component 846 (**the first body**) has a ridged outer surface that contacts the vertebral body.

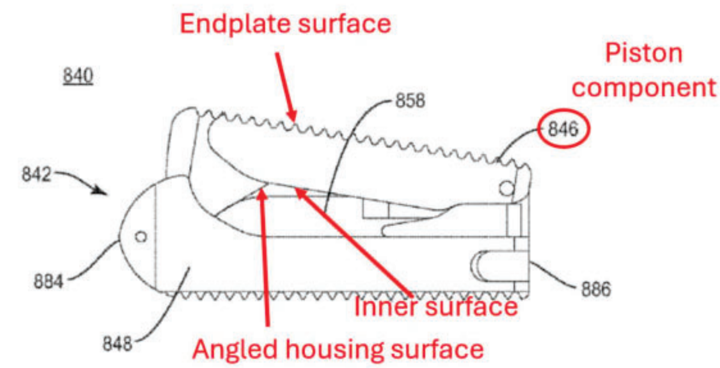


FIG. 22

(Ex. 1057, Fig. 22 (annotated).) As explained with reference to the corresponding parts of implant 40, this ridged outer surface is "an outer tissue engaging surface, such as, for example, an endplate surface 52," which is "configured to engage an endplate of a vertebra." (*Id.*, 6:46-61, Fig. 16; *compare id.*, Fig. 22, *with id.*, Fig. 5; Fig. 15.)

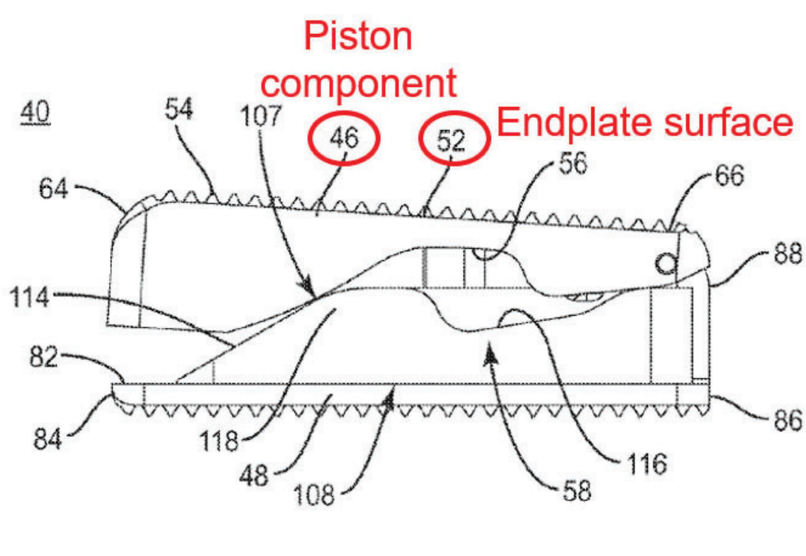


FIG. 4

</td>
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</table>

(*Id.*, Fig. 4 (annotated).) In the expanded configuration as shown in figures 22 and 4 above, the plurality of ridges on the first vertebral body engagement surface are in contact with the vertebral body surface. Palmatier thus discloses that "**the first body has a first vertebral body engagement surface**[,] . . . **the first vertebral body engagement surface comprising a plurality of ridges for interfacing with a vertebral body surface**."

As shown in figure 22 above, piston component 846 has an inner surface (**the first interior surface**) opposite the endplate surface facing and engaging wedge 858. There is also an "**angled housing surface protruding from the first interior surface**." As explained with respect to implant 40, which has a similar design as implant 840, the "[p]iston component 46 includes an inner surface 56 disposed to face an opposing orientation and/or direction relative to the facing orientation and/or direction of endplate surface 52." (*Id.*, 7:4-7, Fig. 4.)

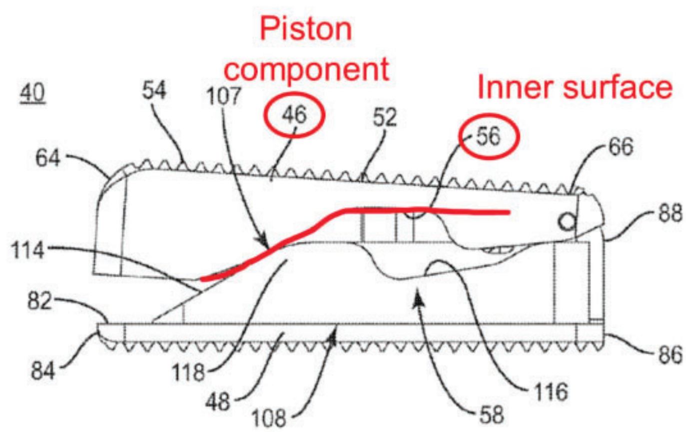
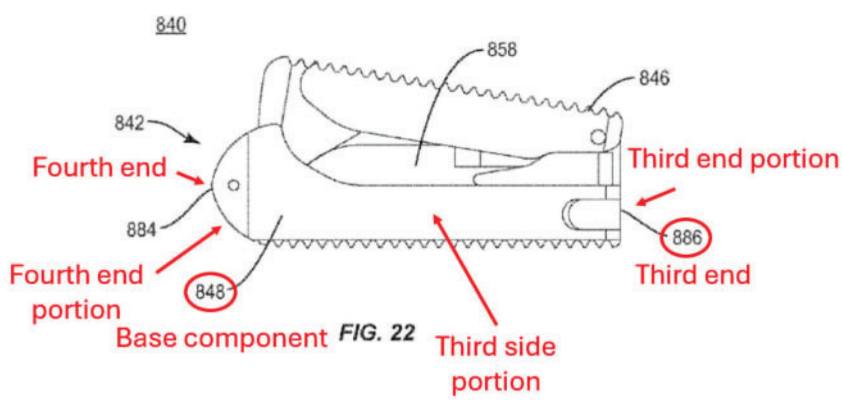


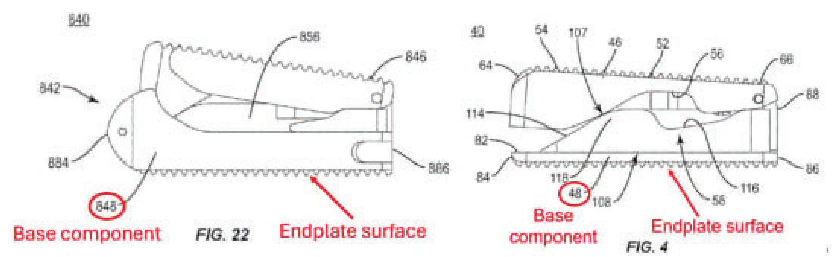
FIG. 4

(*Id.*, Fig. 4 (annotated).)

Palmatier thus discloses "**wherein the first body . . . has a first interior surface positioned on an opposite side of the first body than the first vertebral body engagement surface**, . . . **the first interior surface includes at least one**

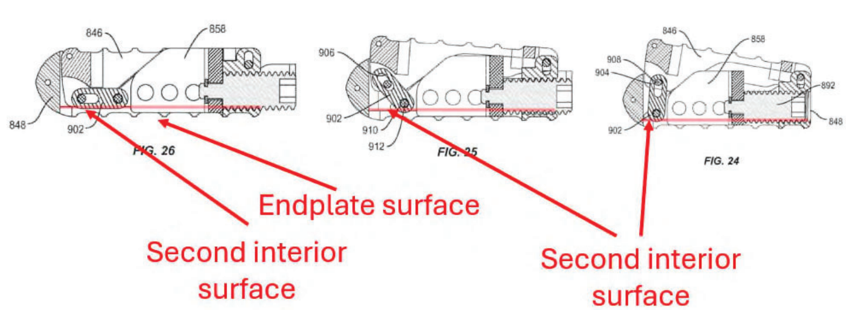
	angled housing surface protruding from the first interior surface.”
[8.d] “a second body extending from a third end to a fourth end, wherein the second body has third and fourth end portions positioned at the third and fourth ends, respectively, and has third and fourth side portions extending between the third and fourth end portions,”	Palmatier discloses this limitation. Palmatier’s implant 840 includes a base component 848, which is a “**second body**.” (Ex. 1057, 18:38-19:2, figures 24-26.) As shown in figure 22 below, Palmatier’s base component 848 extends from a posterior end 886, *i.e.*, “**a third end**,” to an anterior end 884, *i.e.*, “**a fourth end**.” (*Id.*, 18:38-46, Fig. 22.) Areas around the posterior end and anterior end are “**third and fourth end portions**,” respectively.  (*Id.*, Fig. 22 (annotated).) Figure 22 above also shows that the base component 848 includes a “**third . . . side portion[] extending between the third and fourth end portions**.” A POSITA would have understood that there is an additional side portion on the opposite side of the implant, *i.e.*, on the side not shown in figure 22. Such symmetry is evident from figure 23, as discussed above for limitation [8.b]. Palmatier thus discloses “**third and fourth side portions extending between the third and fourth end portions**.”

<table>
<tr>
<td>[8.e] “wherein the second body has a second vertebral body engagement surface and has a second interior surface positioned on an opposite side of the second body than the second vertebral body engagement surface, the first body configured to fit between the third and fourth side portions in a compressed configuration of the expandable intervertebral device; and”</td>
<td>Palmatier discloses this limitation. As shown in figure 22 below, base component 848 (the second body) has a ridged outer surface that is annotated as an “endplate surface.” As explained with reference to implant 40, the ridged outer surface is “an outer tissue engaging surface, such as, for example, an endplate surface 78.” (Ex. 1057, 7:47-48; compare id., Fig. 22, with id., Fig. 4.) Endplate surface 78 is “configured to engage an endplate of a vertebrae.” (Id., 7:51-54.)



(Id., Figs. 22, 4 (both annotated).) Palmatier thus discloses “the second body [that] has a second vertebral body engagement surface.”

The base component 848 also has an inner surface that is opposite the endplate surface. This inner surface (“second interior surface”) is not visible in figure 22 but is visible in figures 24-26 below. The inner surface is described in the embodiment relating to implant 40 as “inner surface 82” (see figure 4 above) and serves as the base surface over which the wedge slides. (Id., 7:62-8:4 (explaining that surface 82 is “planar” and engages a “surface of wedge 58”); see also id., Figs. 4, 7.)



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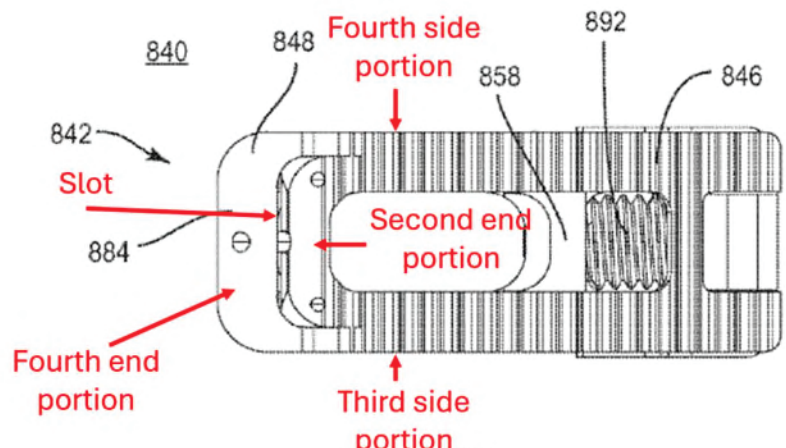
	(*Id*., Figs. 24-26 (all annotated).) Palmatier thus discloses "**wherein the second body . . . has a second interior surface positioned on an opposite side of the second body than the second vertebral body engagement surface**." As explained below Palmatier discloses a slot in the **second body**, such that the "**first body** [is] **configured to fit between the third and fourth side portions in a compressed configuration of the expandable intervertebral device**." As shown in figure 23 below, the anterior end portion of base component 848 (the **fourth end portion** of the **second body**) has an opening that fits within it the anterior end portion of piston component 846 (**second end portion of the first body**). The slot is "**between the third and fourth side portions**."  FIG. 23 (*Id*., Fig. 23 (annotated).) This slot can be further seen in figure 27, which is a "perspective view of one embodiment of the components of the implant shown in FIG. 22." (*Id*., 3:23-24, Fig. 27.)

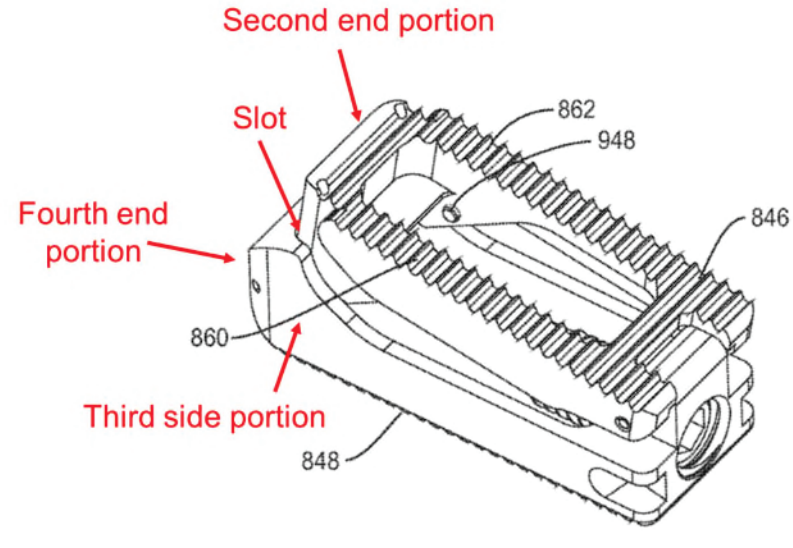


FIG. 27

(*Id.*, Fig. 27 (annotated).)

Furthermore, Palmatier discloses that the above-identified slot allows **the first body** (*i.e.*, **piston component 846**) to fit within "**a compressed configuration of the expandable intervertebral device**." For example, figure 24 shows the implant in an expanded state, whereas figure 26 shows the implant in a compressed configuration. (*Id.*, 18:63-19:3.) Figure 26 shows the anterior end of the piston component 846 fitting inside the slot of base component 848 when the implant is in the compressed (or collapsed) configuration. A POSITA would have understood that figures 24 and 26 in view of figures 22, 23, and 27 shows that the anterior end of the piston component 846 slides into the slot of base component 848 as the device transitions from an expanded to a compressed (or collapsed) configuration.

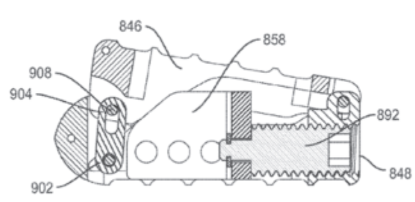


FIG. 24

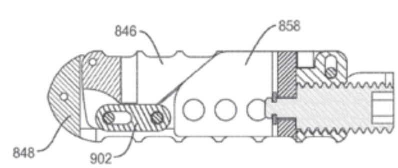
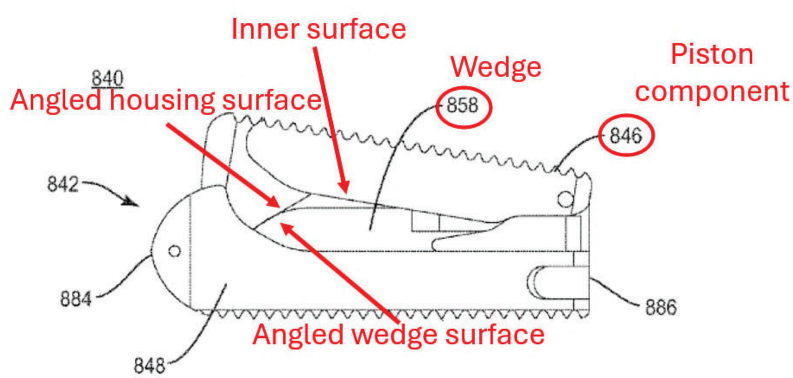


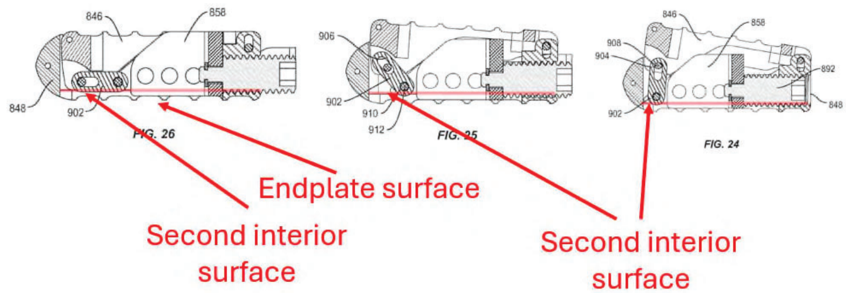
FIG. 26

	(*Id*., Figs. 24, 26.)

[8.f] "a wedge having an angled wedge surface, wherein the wedge is positioned between the first body and the second body with the angled wedge surface facing the first interior surface of the first body and the at least one angled housing surface of the first body is positioned to engage the angled wedge surface of the wedge,"	Palmatier discloses this limitation. (*See supra*, Section VIII.A.2.) Palmatier discloses that the implant 840 expands like implants 40 and 540 via a mechanism comprising a screw and "**a wedge**" that pivots piston component 846 relative to the base component 848. (Ex. 1057, 18:42-45; *see also id.*, 19:18-20.) For example, pushing wedge 858 along the longitudinal axis of implant 840 pivotably moves piston component 846 and base component 848 apart relative to one another, such that components 846 and 848 expand from a collapsed configuration to an expanded configuration. (*Id.*, 14:2-12, 18:9-17, 18:63-66 ("intervertebral implant 840 is expanded . . . as described above with regard to intervertebral implants 40, 540").) As shown in the figures below, wedge 858 has "**an angled wedge surface**" and is positioned between piston component 846 (**first body**) and base component 848 (**second body**). Moreover, as shown in figure 22 below, "**the angled wedge surface** [is] **facing the first interior surface of the first body**" and the "**angled housing surface of the first body is positioned to engage the angled wedge surface of the wedge**." As explained with reference to implant 40, this engagement between angle surface of the wedge and an angled portion of the inner surface allows the piston component to hingedly move relative to the base component. (*See, e.g., id.*, 14:2-12.)  FIG. 22

	(*Id.*, Fig. 22 (annotated).)
[8.g] "wherein the wedge is configured to slide within a space defined by the first body and second body in a direction toward the second and fourth ends of the first body and second body from a first wedge position in which the first body and the second body are in a substantially closed position to a second wedge position whereby the angled wedge surface presses against the first interior surface of the first body to move the first body relative to the second body from a compressed configuration to an expanded configuration without moving the second body,"	Palmatier discloses this limitation. (*See supra*, Section VIII.A.2.)

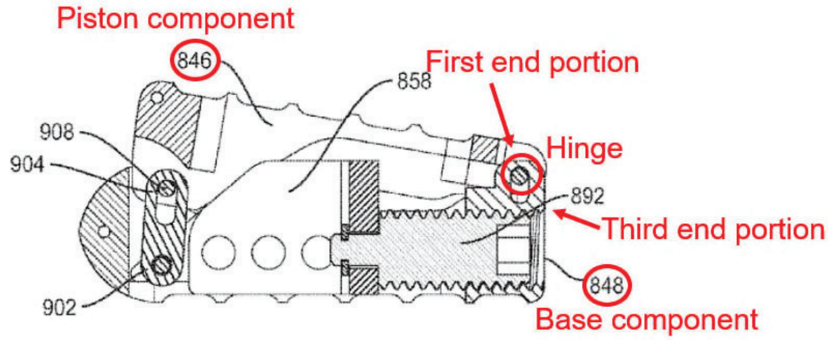
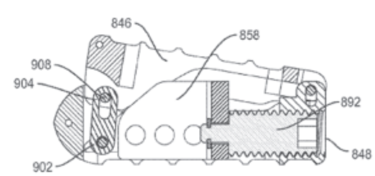
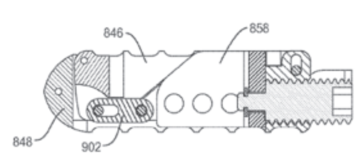
[8.h] "whereby the wedge remains axially confined within the space defined by the first body and second body in the compressed and expanded configurations."	Palmatier discloses this limitation. As discussed in Section VIII.A.2, figures 24 (expanded configuration) and 26 (compressed configuration) of Palmatier discloses that "**the wedge remains axially confined within the space defined by the first body and second body in the compressed and expanded configurations**."
Claim 9	
"The expandable intervertebral device of claim 8, wherein in the expanded configuration of the expandable intervertebral device the plurality of ridges on the first vertebral body engagement surface are configured to be in contact with the vertebral body surface."	Palmatier discloses this limitation as discussed above for limitation [8.c]. (*Supra*, Appendix [8.c].)
Claim 13	

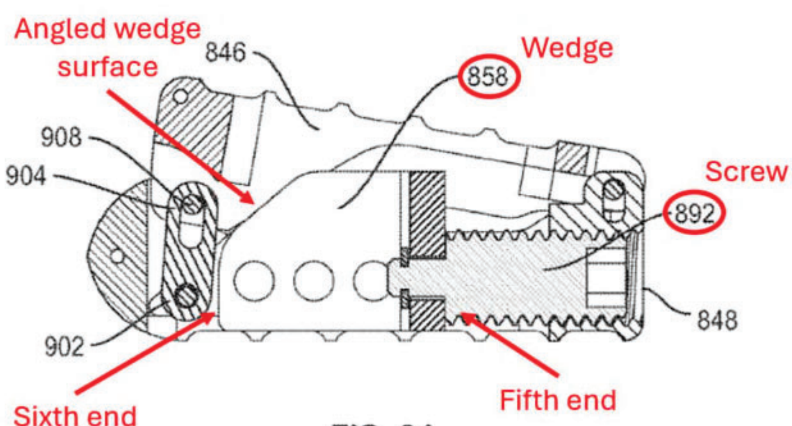
"The expandable intervertebral device of claim 8, wherein the second interior surface is substantially parallel with the second vertebral body engagement surface such that the wedge is configured to move along a path parallel to the second vertebral body engagement surface when the wedge slides within the space against the second interior surface."	Palmatier discloses this limitation. As explained above with respect to claim limitation [8.e], the base component 848 also has an inner surface that is opposite the endplate surface. The two surfaces are "**substantially parallel**" with each other.  (Ex. 1057, Figs. 24-26 (all annotated).) As apparent from figures 24-26, "**the wedge** [858] **is configured to move along a path parallel to the second vertebral body engagement surface**," *i.e.*, the surface annotated as endplate surface. Moreover, "**the wedge slides within the space against the second interior surface**," which is confirmed by Palmatier's earlier disclosure concerning a similar interior surface (*i.e.*, inner surface 82). (*Id.*, 7:62-8:4 (explaining that surface 82 is "planar" and engages a "surface of wedge 58"); *see also id.*, Figs. 4, 7.)
Claim 17	
[17.a] "An expandable intervertebral device comprising:"	Palmatier discloses this limitation as discussed above for limitation [8.a]. (*Supra*, Appendix [8.a].)

[17.b] "a first body extending from a first end to a second end, wherein the first body has first and second end portions positioned at the first and second ends, respectively, and has first and second side portions extending between the first and second end portions,"	Palmatier discloses this limitation as discussed above for limitation [8.b]. (*Supra*, Appendix [8.b].)
[17.c] "wherein the first body has a first vertebral body engagement surface having a first plurality of ridges formed therein and has a first interior surface positioned on an opposite side of the first body than the first vertebral body engagement surface;"	Palmatier discloses this limitation as discussed above for limitation [8.c]. (*Supra*, Appendix [8.c].)

[17.d] "a second body extending from a third end to a fourth end, wherein the second body has third and fourth end portions positioned at the third and fourth ends, respectively, and has third and fourth side portions extending between the third and fourth end portions,"	Palmatier discloses this limitation as discussed above for limitation [8.d]. (*Supra*, Appendix [8.d].)
[17.e] "wherein the second body has a second vertebral body engagement surface having a second plurality of ridges formed therein and has a second interior surface positioned on an opposite side of the second body than the second vertebral body engagement surface,"	Palmatier discloses this limitation as discussed above for limitation [8.e]. (*Supra*, Appendix [8.e].)

[17.f] "wherein the first body is aligned with the second body such that the first end of the first body is axially aligned with the third end of the second body and the second end of the first body is axially aligned with the fourth end of the second body,"	Palmatier discloses and suggests this limitation. (*See supra*, Sections VIII.A.3 and VIII.A.4.)

[17.g] "wherein the first end portion of the first body and the third end portion of the second body are hingedly interconnected such that the first body can pivot with respect to the second body so as to move the second end portion of the first body away from the fourth end portion of the second body; and"	Palmatier discloses this limitation. As shown in figure 24 below, Palmatier discloses a hinge attaching the piston and base components.  FIG. 24 (Ex. 1057, Fig. 24 (annotated).) This understanding is confirmed by Palmatier's description of implant 40, which includes a similar hinge pivotably connecting the base and piston components and allowing "expansion and collapse of intervertebral implant 40 between a first configuration and a second configuration." (*Id.*, 8:43-51, Figs. 5, 6.) Palmatier thus discloses "**wherein the first end portion of the first body and the third end portion of the second body are hingedly interconnected**." And as evident from figures 24 (expanded configuration) and 26 (collapsed configuration), "**the first body can pivot with respect to the second body so as to move the second end portion of the first body away from the fourth end portion of the second body**."  FIG. 24  FIG. 26 (*Id.*, Figs. 24, 26.)

[17.h] "a wedge extending from a fifth end to a sixth end and having an angled wedge surface extending along at least a portion of a distance between the fifth end and the sixth end,"	Palmatier discloses this limitation. As discussed in Appendix [8.f], Palmatier discloses an expansion mechanism comprising a wedge. The wedge 858 of implant 840 sits in between piston component 846 and base component 848 (*supra*, Appendix [8.f]) and has one end ("**the fifth end**") connected to a screw 892 and extends along an angled wedge surface to the other end ("**the sixth end**"). As shown in figure 24 below, Palmatier thus discloses "**a wedge extending from a fifth end to a sixth end and having an angled wedge surface extending along at least a portion of a distance between the fifth end and the sixth end**."  FIG. 24 (Ex. 1057, Fig. 24 (annotated).)
[17.i] "wherein the wedge is positioned between the first body and the second body with the angled wedge surface facing the first interior surface of the first body,"	Palmatier discloses this limitation as discussed above for limitation [8.f]. (*Supra*, Appendix [8.f].)

[17.j] "wherein the first interior surface of the first body has an angled housing surface shaped to engage the angled wedge surface of the wedge,"	Palmatier discloses this limitation as discussed above for limitation [8.f]. (*Supra*, Appendix [8.f].)

[17.k] "wherein the wedge is configured to slide within a space defined by the first body and second body in a direction toward the second and fourth ends of the first body and second body from a first wedge position that allows the first body and second body to pivot to a position that is substantially closed to a second wedge position whereby the angled wedge surface presses against the first interior surface of the first body to hingedly open the first body with respect to the second body whereby the wedge remains axially confined within the space defined by the first body and second body in the first and	Palmatier discloses this limitation as discussed above for limitations [8.g]-[8.h] and [17.g]. (*Supra*, Appendix [8.g], [8.h], [17,g].)

second wedge positions."	
Claim 18	

<table>
<tr>
<td>[18.a] “The expandable intervertebral device of claim 17, wherein a first length of the first body from the first end to the second end is substantially equal to a second length of the second body from the third end to the fourth end and”</td>
<td>Palmatier discloses this limitation. As shown below, Palmatier’s implants 40 and 540 each have “a first length of the first body from the first end to the second end” and “a second length of the second body from the third end to the fourth end” that are “substantially equal” in length.

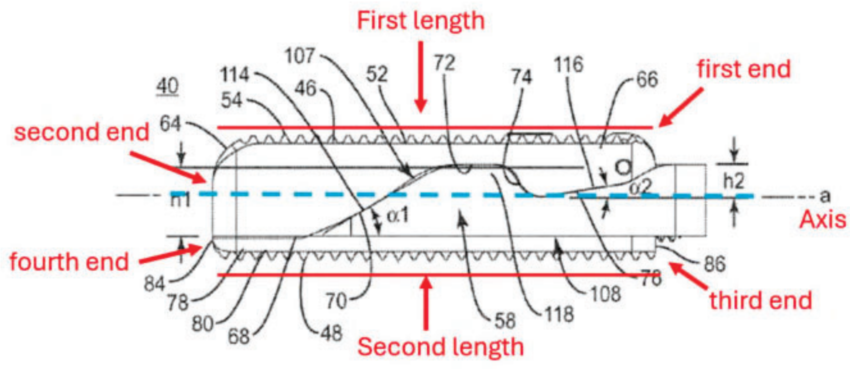


FIG. 3

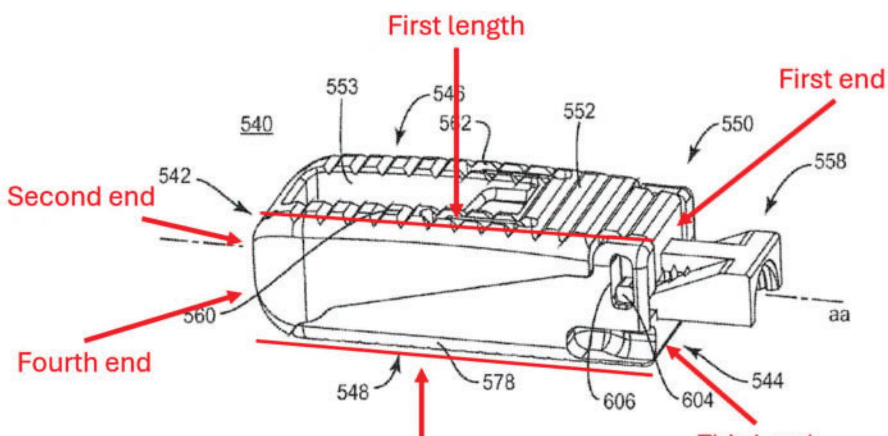


FIG. 17

(Ex. 1057, Figs. 3, 17 (both annotated).)

As I discussed above in Section VIII.A.4, a POSITA would have been motivated to extend the second end of the piston component in implant 840 such that it lines up with the fourth end like in implants 40 and 540 (reproduced above). Under this modification, the first length and the second length would be the same or substantially equal in length in implant 840.</td>
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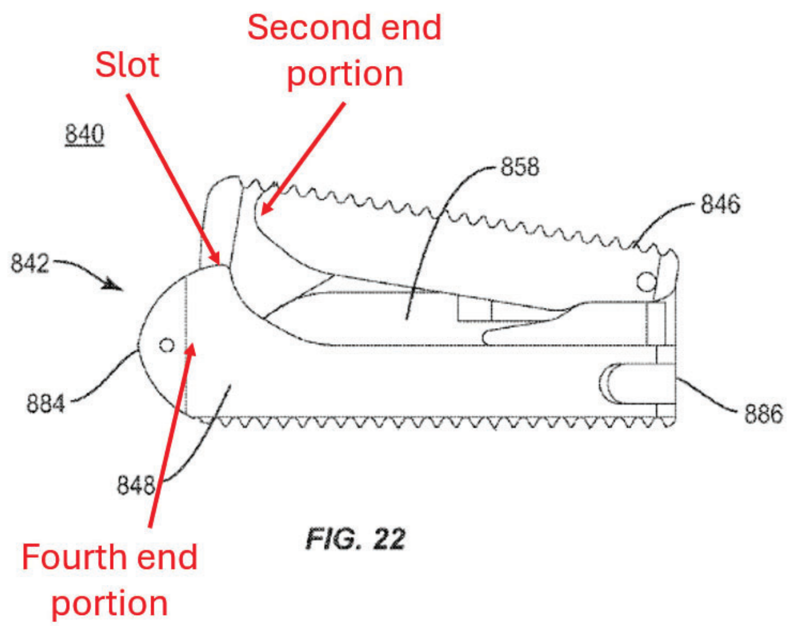
<tr>
<td>[18.b] “wherein the second end portion of the first body is smaller than the fourth end portion of the second body such that the second end portion of the first body is positionable between the third and fourth side portions of the second body at the fourth end of the second body.”</td>
<td>Palmatier discloses this limitation. As shown in figures 22 and 23 below, the anterior end portion of base component 848 (the fourth end portion of the second body) has an opening, i.e., a slot, that fits within it the anterior end portion of piston component 846 (the second end portion of the first body). In other words, Palmatier has a slot in the fourth end portion of the bottom housing that receives the second end portion of the top housing. To fit within this slot, as shown in figure 22 below, “the second end portion of the first body is smaller than the fourth end portion of the second body such that the second end portion of the first body is positionable between the third and fourth side portions of the second body at the fourth end of the second body.”


FIG. 22</td>
</tr>
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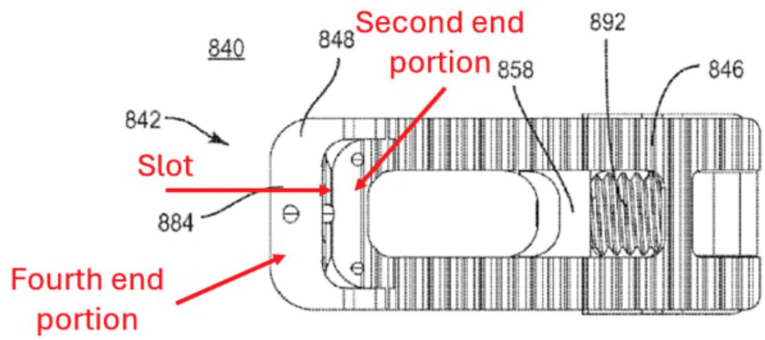
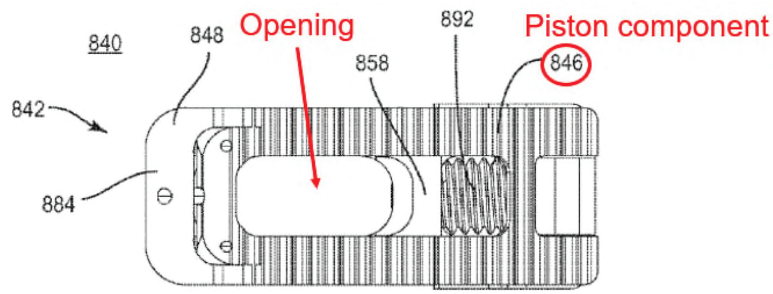
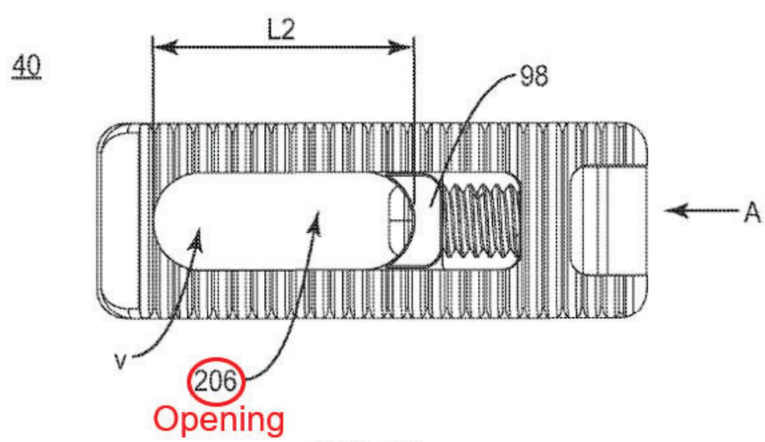
	 FIG. 23 (Ex. 1057, Figs. 22-23 (both annotated).)
Claim 19	

[19.a] "The expandable intervertebral device of claim 18, wherein the first body defines a first bone material receiving area between the first and second end portions and the first and second side portions, and the second body defines a second bone material receiving area between the third and fourth end portions and the third and fourth side portions, and"	Palmatier discloses this limitation. As shown in figure 23 below, Palmatier's implant 840 has an opening, *i.e.*, "**a first bone material receiving area**."  FIG. 23 (Ex. 1057, Fig. 23 (annotated).) A POSITA would recognize this opening as the claimed "**bone material receiving area**" because Palmatier's implants "provide a cavity of relatively large volume for post-packing of . . ., for example, bone graft." (*Id.*, 4:11-15.) This is confirmed by Palmatier's description of implant 40, which has same kind of opening as shown in figure 10 below extending through both the base and piston components. (*Id.*, 10:30-36 ("implant 40 includes an opening 206 . . . configured for disposal of at least one agent, for example, bone graft").)  FIG. 10 (*Id.*, Fig. 10 (annotated).)

	Moreover, because figure 23 is a top-down "plan view" of implant 840, it is apparent that the opening extends through the center of piston component 846, *i.e.*, the opening is "**between the first and second end portions and the first and second side portions**." Again, because figure 23 is a top-down "plan view," the opening shown in Figure 23 also extends through the center of base component 848 and thus "**the second body defines a second bone material receiving area between the third and fourth end portions and the third and fourth side portions**." Palmatier confirms this understanding based on its disclosure that "opening 206" in figure 10 above "extend[s] through" piston component 46 and base component 48. (Ex. 1057, 10:33-35.)

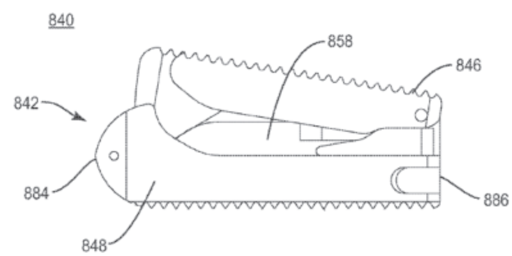
<table>
<tr><td>[19.b] “wherein the first bone material receiving area is coupled to the second bone material receiving area when the wedge is in the second wedge position.”</td><td>Palmatier discloses this limitation. As discussed in Appendix [19.a], an opening extends through components 846 (the first bone material receiving area) and 848 (the second bone material receiving area) and through wedge 858. As such, the two bone material receiving areas are connected or “coupled.” Moreover, as discussed in Appendix [8.g], “the second wedge position” is when the angled wedge surface presses against the first interior surface of the first body. “FIG. 23 is a plan view of implant shown in FIG. 22.” (Ex. 1057, 3:16.) As wedge 858 axially translates, as shown in figure 23 below, “the first bone material receiving area is coupled to the second bone material receiving area.”


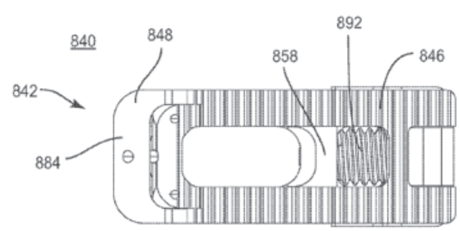
FIG. 22


FIG. 23
(Id., Figs. 22-23.)</td></tr>
<tr><td colspan="2">Claim 20</td></tr>
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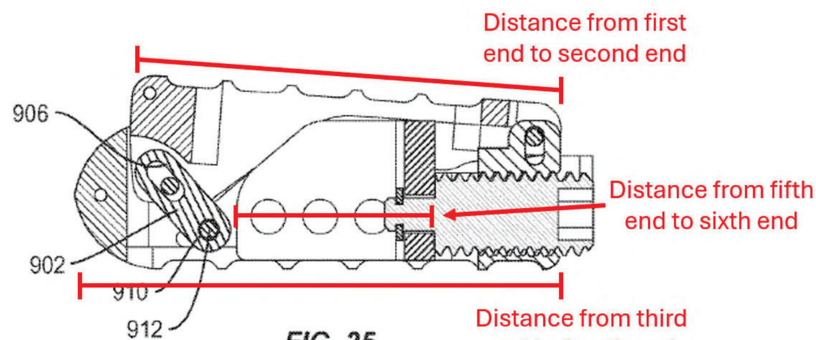
<td>“The expandable intervertebral device of claim 19, wherein a distance from the fifth end to the sixth end of the wedge is less than a distance from the first end to the second end of the first body and is less than a distance from the third end to the fourth end of the second body.”</td>
<td>Palmatier discloses this limitation. As shown in figure 25, the length of the wedge (distance from the fifth end to the sixth end of the wedge) is less than the lengths of both piston component 846 (distance from the first end to the second end of the first body) and the base component 848 (distance from the third end to the fourth end of the second body).


FIG. 25
(Ex. 1057, Fig. 25 (annotated).)</td>
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<tr>
<td colspan="2">Claim 21</td>
</tr>
</table>

"A method of operating the expandable intervertebral device of claim 17, the method comprising: inserting the expandable intervertebral device in a target surgical location between two vertebrae of a human patient; and turning a rotation screw to actuate a movement of the wedge to pivot the first body away from the second body while the device is positioned between the vertebrae of the human patient."	Palmatier discloses this limitation. Palmatier discloses that its implant 840 is an "intervertebral implant," which is "inserted into an intervertebral disc space." (Ex. 1057, 18:46-48). Thus, Palmatier discloses "**inserting the expandable intervertebral device in a target surgical location between two vertebrae of a human patient**." Following insertion of the implant into the desired surgical location, the implant is expanded by turning screw 892 ("rotation screw") to axially translate wedge 858 to pivot piston component 846 away from base component 848 ("**turning a rotation screw to actuate a movement of the wedge to pivot the first body away from the second body while the device is positioned between the vertebrae of the human patient**"). (*Id.*, 3:39-42 ("the system includes an interbody implant that expands after insertion into an intervertebral disc space"), 18:44-45 ("a screw 892 for axially translating a wedge 858"), *supra* Appendix [8.g].) Palmatier further describes the process of operating an implant like implant 840 with reference to implant 40. Specifically, Palmatier explains that a "driver delivers intervertebral implant 40 into the prepared intervertebral disc space I, between vertebrae V1 and vertebrae V2, according to the requirements of a particular surgical application." (Ex. 1057, 13:59-62.) Then, "[u]pon desired positioning of intervertebral implant 40, . . . [t]he driver engages screw 92 for rotation in a clockwise direction such that screw 92 translates axially to drive wedge 58 axially." (*Id.*, 13:63-14:2.) A POSITA would have understood that the above-described process applies equally to implant 840 because implant 840 is similar to implant 40 and is expanded as described for implant 840. (*Id.*, 18:38-42, 18:63-66 ("intervertebral implant 840 is expanded to the second, expanded configuration (FIG. 24), as described above with regard to . . . implants 40, 540").) Palmatier discloses that implant 840 has "a screw 892 for axially translating a wedge 858." (*Id.*, 18:44-45, Fig. 24.) A POSITA would have understood that screw 892 is a "**rotation**" screw and that "**turning a rotation screw . . . actuate**[s] **a movement of the wedge**" based on the disclosure of screws 92 and 592 given the similarities between the implants 40, 540, and 840. (*Compare* Ex. 1057, Fig. 6 (screw 92), *with id.*,

	Fig. 24 (screw 892).) For example, Palmatier discloses that "[s]crew 92 is rotatable" and "effect[s] axial translation of the wedge 58 such that wedge 58 is movable relative to components 46, 48" (**the first body** and **the second body**, respectively). (Ex. 1057, 8:14-16, 8:34-38; *see also id*., 16:14-33.) Palmatier thus discloses a "**method comprising: inserting the expandable intervertebral device in a target surgical location between two vertebrae of a human patient; and turning a rotation screw to actuate a movement of the wedge**." As discussed in Appendix [8.g] and [8.h], Palmatier's implant expands when the wedge moves along the longitudinal axis of the implant, "**pivot**[ing] **the first body away from the second body while the device is positioned between the vertebrae of the human patient**."