

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDTRONIC, INC.
Petitioner

v.

MOSKOWITZ FAMILY LLC.
Patent Owner

Patent No. 11,864,755

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,864,755**

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LIST OF EXHIBITS

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Ex. 1001	U.S. Patent No. 11,864,755 to Moskowitz et al. (“the ’755 patent”)
Ex. 1002	Declaration of Brad Culbert
Ex. 1003	Curriculum Vitae of Brad Culbert
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Ex. 1006	U.S. Patent Application Publication No. 2008/0249569 A1 to Waugh et al. (“Waugh”)
Ex. 1007	U.S. Patent No. 7,077,864 to Byrd et al. (“Byrd”)
Ex. 1008	U.S. Patent Application Publication No. 2003/0045877 A1 to Yeh (“Yeh”)
Ex. 1009	U.S. Patent Application Publication No. 2004/0059271 A1 to Berry (“Berry”)
Ex. 1010	U.S. Patent No. 7,056,343 to Schäfer et al. (“Schäfer”)
Ex. 1011	U.S. Patent No. 6,395,034 to Suddaby (“Suddaby”)
Ex. 1012- Ex. 1019	RESERVED
Ex. 1020	Phulchand Prithvi Raj, <i>Intervertebral Disc: Anatomy-Physiology-Pathophysiology-Treatment</i> , 8(1) PAIN PRACT. 18 (2008)
Ex. 1021- Ex. 1030	RESERVED
Ex. 1031	Daniela Alexandru and William So, <i>Evaluation and Management of Vertebral Compression Fractures</i> , 16(4) PERM J. 46 (2012)

Exhibit No.	Document
Ex. 1032	Michael Shulte et al., <i>Vertebral body replacement with a bioglass-polyurethane composite in spine metastases – clinical, radiological and biomechanical results</i> , 9(5) EUR. SPINE J. 437 (2000)
Ex. 1033	Issada Thongtrangan et al., <i>Vertebral body replacement with an expandable cage for reconstruction after spinal tumor resection</i> , 15(5) NEUROSURG FOCUS. 1 (2003)
Ex. 1034	Christian Knop et al., <i>Biomechanical compression tests with a new implant for thoracolumbar vertebral body replacement</i> , 10(1) EUR. SPINE J. 30 (2001)
Ex. 1035	U.S. Patent No. 4,657,550 to Daher (“Daher”)
Ex. 1036	U.S. Patent No. 6,752,832 to Neumann (“Neumann”)
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Ex. 1050	Ortrun Pohler, <i>Unalloyed titanium for implants in bone surgery</i> , 31 INJURY 7 (2000)
Ex. 1051	Patent Owner’s Infringement Claim Charts, Exhibit J1, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass.), served October 30, 2025.
Ex. 1052	Memorandum Opinion, <i>Moskowitz Family LLC v. Globus Medical, Inc.</i> , No. 2:20-cv-03271 (E.D.Pa.), Dkt. 143.
Ex. 1053	Anne Polikeit et al., <i>The importance of the endplate for interbody cages in the lumbar spine</i> , 12(6) EUR. SPINE J. 556 (2003)

I. INTRODUCTION

Medtronic, Inc. (“Petitioner”) respectfully requests *inter partes* review of claims 1-6, 8-12 and 17-20, (the “challenged claims”) of U.S. Patent No. 11,864,755 (“the ’755 patent”) (Ex. 1001) assigned to Moskowitz Family LLC (“Patent Owner”). As this Petition demonstrates, these claims issued only because the Office overlooked the prior art cited in this Petition—in no small part due to Patent Owner’s deliberate occlusion of that art in veritable forest of IDS citations.

Between most spine vertebrae are discs, which act as shock absorbers and allow for spinal flexibility. Over time, however, these discs may deteriorate or become injured, and surgery may be needed. The ’755 patent discloses an “intervertebral fusion device” incorporating “bi-directional fixing transvertebral screws” that can allegedly be used to maintain the spacing between adjacent vertebrae. But, as demonstrated by the prior art cited in this Petition, such implants were well-known to those of ordinary skill in the art at the relevant time.

While the ’755 patent claims priority to a non-provisional application that was filed on August 23, 2005, the patent issued nearly two decades later on January 9, 2024. This extensive delay is the result of Patent Owner’s questionable prosecution strategy of relying on multifarious continuations and the burying of key prior art in successive IDS filings. In fact, from the ’755 patent’s priority application, Patent

Owner has filed nearly 70 other applications, which resulted in 61 other patents.
(*See infra* Section VI.B.)

As explained below in Section VI.B.2, the Office overlooked key prior art (Schäfer (Ex. 1010), Yeh (Ex. 1008), and Berry (Ex. 1009)) disclosing the very limitations that formed the basis of the Office's reasons for allowance. But this oversight was in no small part due to Patent Owner's patent prosecution strategy, which includes burying Yeh among one hundred fifty-eight (158) references in an Information Disclosure Statement. (*See, e.g.*, Ex. 1004, 171-79.) After abusing Office procedure for almost two decades, Patent Owner now overburdens the district court by asserting *eleven* (11) patents, including the '755 patent, which already expired on August 23, 2025.

Petitioner therefore requests that this Petition be granted and that the challenged claims be found unpatentable and canceled.

II. MANDATORY NOTICES

Real Parties-in-Interest: Pursuant to 37 C.F.R. § 42.8(b)(1), the real party-in-interest is Medtronic, Inc. Medtronic plc is the ultimate parent of Medtronic, Inc. Medtronic, Inc. is a co-defendant with Medtronic Sofamor Danek, Inc., Medtronic Sofamor Danek USA, Inc., Warsaw Orthopedic, Inc., and Titan Spine, Inc. in a suit involving the '755 patent (*see* Related Matters below).

Related Matters: Patent owner has asserted the '755 patent against Petitioner in the following civil action: *Moskowitz Family LLC v. Medtronic, Inc. et al.*, U.S. District Court for the District of Minnesota, civil action no. 0:25-cv-00769, filed on February 28, 2025 (“the Pending Litigation”). In the Pending Litigation, Patent Owner accuses Petitioner’s spinal implant device of infringing the '755 patent. Patents related to the '755 patent were previously at issue in IPRs filed by Globus Medical, Inc. (See IPR2020-01303, -01304, -01305, -01306, -01307, -01308, -01309, -01310.) For example, U.S. Patent No. 10,251,643 (“the '643 patent”), which is a grand-parent of the '755 patent was at issue in IPR2020-01310 and was also at issue in *Moskowitz Family LLC v. Globus Medical Inc.*, Case No. 2:20-03271 in the U.S. District Court for the Eastern District of Pennsylvania.

Counsel and Service Information: Lead counsel is Naveen Modi (Reg. No. 46,224). Backup counsel are (1) Young Park (Reg. No. 51,114) and (2) Chetan Bansal (Reg. No. 81,590). Service information is Paul Hastings LLP, 2050 M Street NW, Washington, D.C. 20036, Tel.: 202.551.1700, Fax: 202.551.1705, email: PH-Medtronic-Moskowitz-IPR@paulhastings.com. Petitioner consents to electronic service.

III. PAYMENT OF FEES

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 50-2613.

IV. STANDING

Petitioner certifies under 37 C.F.R. § 42.104(a) that the '755 patent is available for review and that Petitioner is not barred or estopped from requesting review on the grounds identified herein.

V. RELIEF REQUESTED AND GROUNDS RAISED

Petitioner respectfully requests review of claims 1-6, 8-12, and 17-20 of the '755 patent and cancellation of these claims as unpatentable on the following grounds:

Ground 1: Claims 1, 8, 10-12, and 17-19 are unpatentable under pre-AIA 35 U.S.C. § 102 as anticipated by Schäfer (Ex. 1010).

Ground 2: Claims 2-6 are unpatentable under pre-AIA 35 U.S.C. § 103(a) as obvious based on Schäfer in view of Yeh (Ex. 1008).

Ground 3: Claims 9 and 20 are unpatentable under pre-AIA 35 U.S.C. § 103(a) as obvious based on Schäfer and Suddaby (Ex. 1011).

Ground 4: Claims 1-4, 8, 10-12, and 17 are unpatentable under pre-AIA 35 U.S.C. § 103(a) as obvious based on Yeh in view of Berry (Ex. 1009).

Ground 5: Claims 5-6 and 18-19 are unpatentable under pre-AIA 35 U.S.C. § 103(a) as obvious based on Yeh in view of Berry and Schäfer.

Ground 6: Claims 9 and 20 are unpatentable under pre-AIA 35 U.S.C. § 103(a) as obvious based on Yeh in view of Berry and Suddaby.

The '755 patent issued on January 9, 2024, from U.S. Application No. 17/208,640, filed on March 22, 2021. The '755 patent claims priority to U.S. Application No. 11/208,644 (“the '644 application”), filed on August 23, 2005. For purposes of this Petition, Petitioner has applied a priority date of August 23, 2005, which is the filing date of the '644 application.

Schäfer was filed on January 30, 2003, and published on September 2, 2004. Schäfer is thus prior art under pre-AIA 35 U.S.C. §§ 102(a) and/or (e). Yeh was filed on May 16, 2002, and published on March 6, 2003. Yeh is thus prior art under pre-AIA 35 U.S.C. § 102(a), (b), and/or (e). Berry was filed on September 16, 2003, and published on March 25, 2004. Berry is thus prior art under pre-AIA 35 U.S.C. §§ 102(a), (b), and/or (e). Suddaby issued on May 28, 2002. Suddaby is thus prior art under pre-AIA 35 U.S.C. § 102 (b).

Patent Owner disclosed the patent, which issued from the application that was published as Yeh, in an Information Disclosure Statement (*see* Ex. 1004, 172) during prosecution of the '755 patent, but it was not discussed by the Examiner. Berry and Schäfer are not listed on the front cover of the '755 patent but they were listed in the Examiner's prior art search history encompassing over 1900 references.¹

¹ Berry and Schäfer are listed in the file history in “PE2E Search – Search History (Prior Art).” (Ex. 1004, 298-99, 302, 353-54, 357, 420-21, 424.)

Regardless, they were not discussed during prosecution. Suddaby was the subject of an obviousness rejection for the dependent claims that issued as claims 5-6 and 18-19 during prosecution of the '755 patent. (*Id.*, 132.)

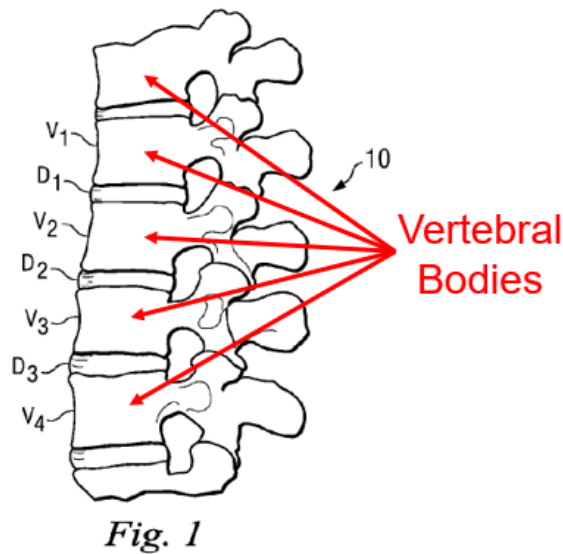
VI. BACKGROUND

A. Technology Overview

1. Anatomy of the Spine and Vertebral Bodies

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, 1-2; Ex. 1002, ¶¶24-25.²) 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, ¶25.)

² Petitioner submits a declaration (Ex. 1002) by Mr. Brad Culbert, an expert in the field of spinal implants (Ex. 1003). (Ex. 1002, ¶¶3-14.)



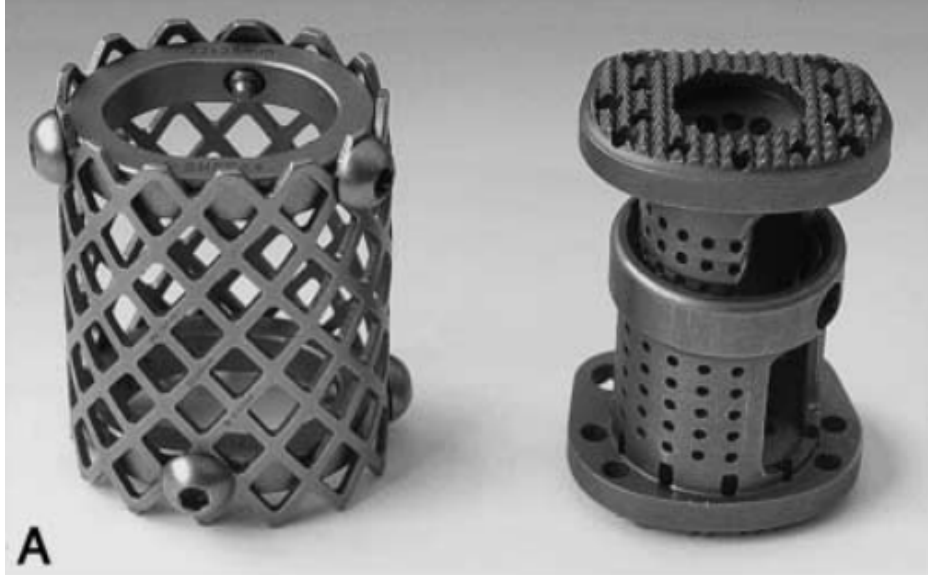
(*Id.*, Fig. 1 (annotated).)

Vertebral bodies may become severely damaged due to trauma, tumor, infection, or advanced degenerative disease, resulting in pain and the loss of structural integrity. (See Ex. 1031, 1; *see also* Ex. 1032, 1-2.) In such cases, surgery may be required, such as corpectomy (partial or complete vertebral body resection) with reconstruction using a vertebral body replacement device. (See Ex. 1032, 1-2; *see also* Ex. 1033, 1, 3.)

2. Vertebral Body Replacement Device

During the 1990s, non-expandable, titanium-mesh cages, such as the one shown in figure 1A below (left), were used as vertebral body replacement devices. (Ex. 1034, 2; Ex. 1002, ¶26.) By the late 1990s, STRATEC Medical introduced a vertebral body replacement called “Synex™,” as shown in figure 1A (right). (Ex.

1034, 2.) This expandable device was found to withstand compressive forces better than a non-expandable mesh cage. (*Id.*, 1.)



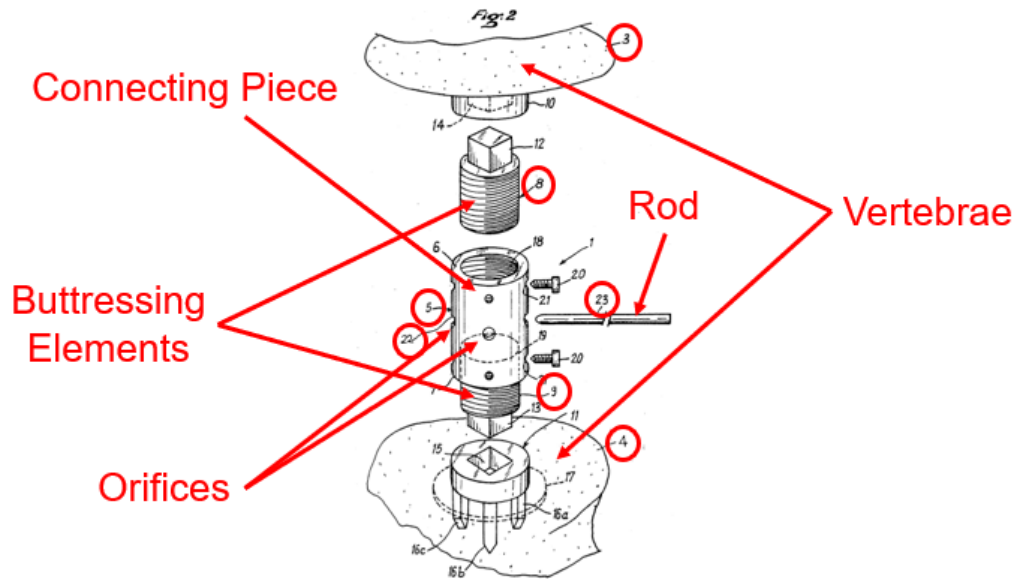
(Ex. 1034, Fig. 1A.)

Expandable vertebral body replacement devices were used on patients in the United States since the early 2000s. (Ex. 1033, 1.) They “[could] be expanded either with an expansion instrument or wrench.” (*Id.*, 3) Although the expansion instrument or wrench is not described or shown, a proper tool would minimize lateral movement, preventing the surgical opening from widening and reducing the risk of injury to nearby structures, including nerves and tissues. (Ex. 1002, ¶27.)



(Ex. 1033, Fig. 1.)

Designs for expandable vertebral body replacement devices were also disclosed in patents from the late 1980s, including U.S. Patent No. 4,657,550 (“Daher”) (Ex. 1035). (Ex. 1002, ¶28.) As shown in the figures below, the implant maintains the spacing between vertebrae 3, 4, after removing the intervening vertebra and discs. (Ex. 1035, 1:7-11, 2:45-46, 2:56-60.) Daher’s implant expands when a rod 23 is inserted into orifices 22, which rotates connecting piece 5 relative to the buttressing elements 8, 9. (*Id.*, 3:32-51.)



(*Id.*, Fig. 2 (annotated).)

Moreover, tools for use with expandable intervertebral devices were also well-known. For example, such a device is described in one patent issued in the early 2000s: U.S. Patent No. 6,752,832 (“Neumann”) (Ex. 1036). (Ex. 1002, ¶29.)

B. ’755 Patent Overview

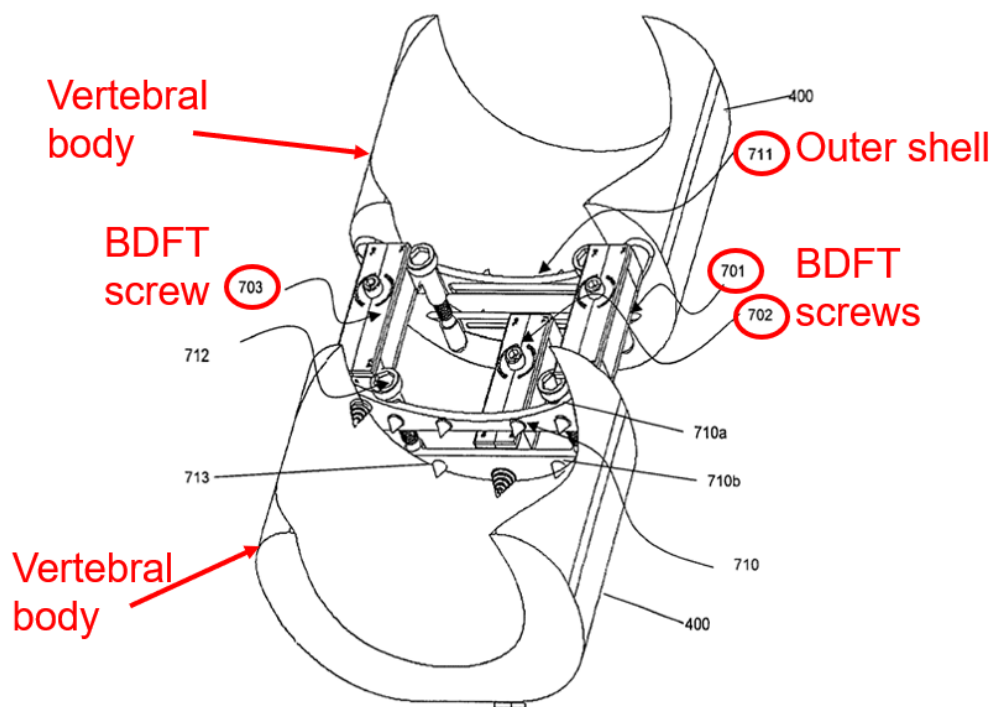
1. Disclosure of the ’755 Patent Specification

The ’755 patent discloses an expandable intervertebral body fusion device (“IBFD”), *i.e.*, a device placed between vertebrae to assist in their fusion. (Ex. 1001, 1:23-39; Ex. 1002, ¶¶30-32.) Figures 7A and 7B illustrate an “IBFD 700” placed between “vertebral bodies 400.” (Ex. 1001, 7:22-27, 8:3-6.)

As shown in figure 7A, IBFD 700 has “shells 700, 711” and three sets of screws, called bi-directional fixating transvertebral (“BDFT”) screws 701, 702, 703, which point in two different directions. (*Id.*, 7:22-27.) The shells have “spikes 713,”

which contact adjacent vertebral bodies 400 to help secure “permanent integration into the vertebral endplates.” (*Id.*, 7:27-31.) “The three incorporated BDFT screws 701, 702, 703 are turned clockwise leading to anterior and middle column engagement of the vertebral bodies 400 above and below the disc space.” (*Id.*, 7:43-46.) After the BDFT screws are “within the vertebral bodies 400, bone fusion substances are placed/packed or poured, into the inner aspects of the device 700 and its surrounding intervertebral space.” (*Id.*, 7:51-55.)

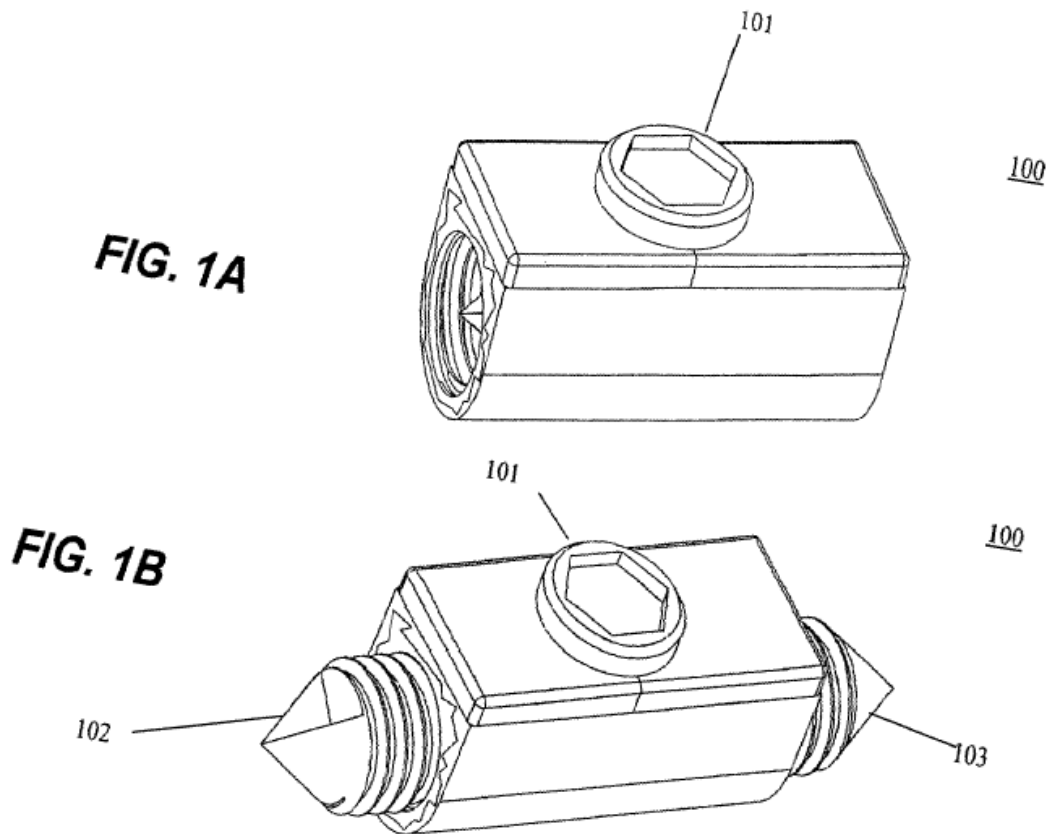
FIG. 7A



(*Id.*, Fig. 7A (annotated).)

The BDFT screws are described, for example, with reference to figures 1A and 1B. (*Id.*, 4:65-67.) The BDFT screws have a “drive screw 101” whose rotation

“enable[es] the simultaneous outward movement of left and right handed screws 102, 103 in equal and opposite directions.” (*Id.*, 5:51-54.)



(*Id.*, Figs. 1A-1B.)

2. Prosecution of the '755 Patent

The Examiner allowed the '755 patent claims even though the prior art disclosed every limitation of the challenged claims. In response to an obviousness rejection based on Daher in view of U.S. Patent No. 6,176,882 to Biedermann et al. (“Biedermann”), Patent Owner argued that the cited prior art failed to disclose the limitation “wherein rotating the tool comprises rotating the tool about a longitudinal

axis of the tool while the tool is engaged with the tool-engagement surface, and wherein the rotating of the tool causes a rotation of the turning mechanism.” (Ex. 1004, 247-49 (May 18, 2023 Reply to Action of February 22, 2023).) According to Patent Owner, “Daher’s rod 23 (the alleged tool) is not rotated about a longitudinal axis of the tool,” where such rotation causes “a rotation of the turning mechanism.” (*Id.* (Reply to Action of February 22, 2023, 8-9).) In allowing a subset of then pending claims, the Examiner stated that “in Daher the tool does not turn along its longitudinal axis but is rotated about the axis of the device and for Biedermann the threaded body has an axis that is perpendicular to an axis that extends from the first to the second shell.” (*Id.*, 316.) The remaining claims were allowed because the Examiner determined that Biedermann’s gear does not rotate “about an axis that passes through the center of the gear.” (*See id.*, 389 (Examiner Interview Summary), 380-84 (amending claim 31 based on Examiner’s suggestion).)

Respectfully, the Examiner overlooked that the prior art before him disclosed these limitations. Tools that rotate along a longitudinal axis (*e.g.*, a screwdriver) were well known in the art. (*See supra* Section VI.A.2; *see infra* Sections VIII.A, VIII.C.) In particular, the Examiner failed to appreciate the disclosure of such tools in Schäfer and Berry, even though both were listed in the Examiner’s prior art search history. (Ex. 1004, 298-99, 302, 353-54, 357, 420-21, 424.) Furthermore, both Schäfer and Yeh (which were also before the Office) disclose a gear that rotates

about an axis passing through the center of the gear. (*See infra* Sections X.A.6, X.D.9.) The Office, therefore, erred in allowing the claims of the '755 patent to issue.

VII. LEVEL OF ORDINARY SKILL

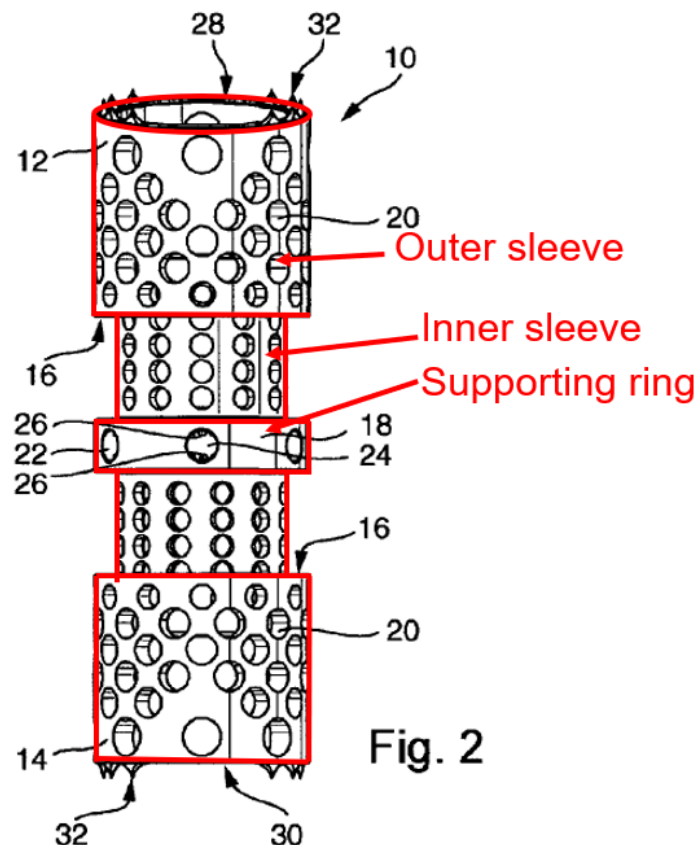
A person of ordinary skill in the art (“POSITA”) at the time of the alleged invention (early-2000s, including the time leading up to August 23, 2005) would have a bachelor’s or equivalent degree in Mechanical Engineering or a related discipline (*e.g.*, biomechanics, biomedical or metals and materials engineering), and at least five years of experience. (Ex. 1002, ¶21.) 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.

VIII. OVERVIEW OF THE PRIOR ART

A. Schäfer

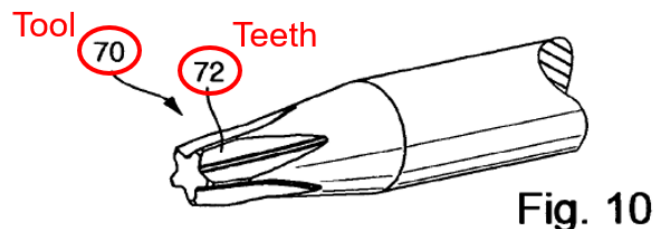
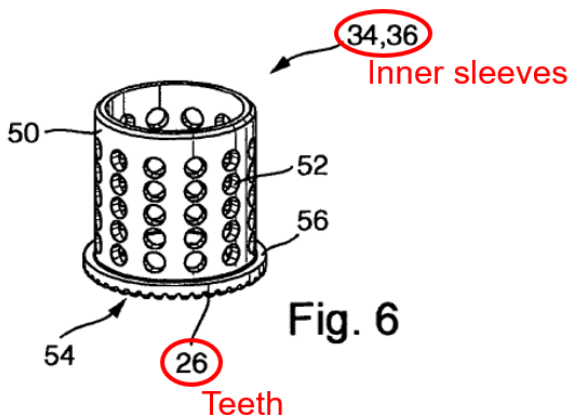
Schäfer is titled “Extendable Spinal Implant and Extension Tool.” Schäfer discloses an expandable intervertebral implant. (Ex. 1010, Abstract; Ex. 1002, ¶¶36-37.) As shown in figure 2 below, Schäfer’s implant has upper and lower outer sleeves 12, 14, upper and lower inner sleeves 34, 36, and a supporting ring 18. “[T]he two outer sleeves 12 and 14 have outwardly oriented front surfaces 28 and 30 which have spinous extensions 32 that project in axial direction. These spinous

extensions 32 penetrate the contact surfaces of the neighboring vertebrae and [] anchor the two outer sleeves 12 and 14.” (Ex. 1010, 4:45-53.) The supporting ring 18 “has at least one radial opening,” which is designed for the insertion of a tool. (*Id.*, 2:63-67.) The outer sleeves 12, 14 are threaded to the inner sleeves 34, 36 so that rotation of the inner sleeves will cause the outer sleeves to move away from each other. (*Id.*, 2:13-22, 2:57-62.) According to Schäfer, operation of the implant provides “an optimum union between the implant and the surrounding tissue.” (*Id.*, 3:44-47.)



(*Id.*, Fig. 2 (annotated).)

As shown in figures 6 and 10 below, Schäfer uses a bevel gear pinion drive system comprising a supporting ring 18, inner sleeves 34, 36 (with teeth 26), locking mechanism 42, and a tool 70 (with teeth 72). (*Id.*, 3:11-29, 4:13-24.) Teeth 72 of tool 70 and teeth 26 of inner sleeves 34, 36 “form a bevel tooth gear.” (*Id.*, 5:52-54.) When the teeth are engaged, rotation of tool 70 about its longitudinal axis causes inner sleeves 34, 36 to rotate. (*Id.*, 2:57-62.) Schäfer’s bevel gear pinion drive system provides the benefit of an expansion tool that does not need to be reinserted after each rotational turn of inner sleeves 34, 36. (*Id.*, 2:36-41.) This is in contrast to earlier devices, which required “that the tool used for turning the threaded sleeve [] be removed and reinserted after it has made a certain turn, e.g., after a quarter turn.” (*Id.*, 1:19-22.) According to Schäfer, operating a tool in that manner “may be quite difficult or even impossible in a great number of surgical interventions.” (*Id.*, 1:22-23.)

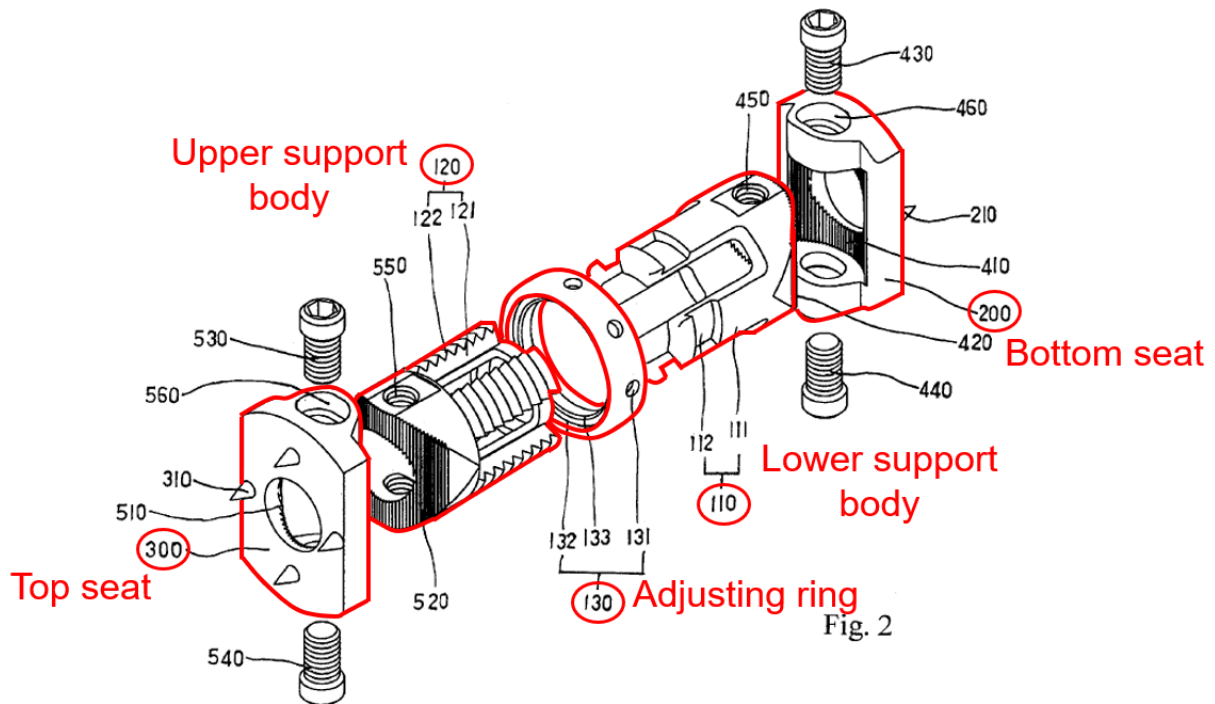


(*Id.*, Figs. 6, 10 (both annotated).)

B. Yeh

Yeh is titled “Device for Fixing Spinal Column Under Treatment.” Yeh discloses a “spinal column fixation device” with “a top seat [300] fastened at the top end with [a] support member [*i.e.*, upper support body 120], and a bottom seat [200] fastened at the bottom end with [a] support member [*i.e.*, lower support body 110].” (Ex. 1008, Abstract, Fig. 2; Ex. 1002, ¶¶47-48.) The top seat 300 and the bottom seat 200 both have fixation teeth 310, 210 on their outer surfaces to hold the implant between adjacent vertebrae. (Ex. 1008, ¶21.) The upper support body 120 comprises upper support legs 121 that fit between lower support legs 111 of the lower support body 110. (*Id.*, ¶26.) An “adjustment ring 130 is fitted over the lower support legs 111” and “threaded teeth 132 of the adjustment ring [] engage[] with [threaded] teeth 122 of the upper support body” to connect the upper support body to the lower support body. (*Id.*)

“The adjustment of height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (*Id.*) Threaded teeth 132 of the adjustment ring 130 and the teeth 122 of the upper support body allow expansion of the device via rotation of the adjustment ring. (*Id.*)

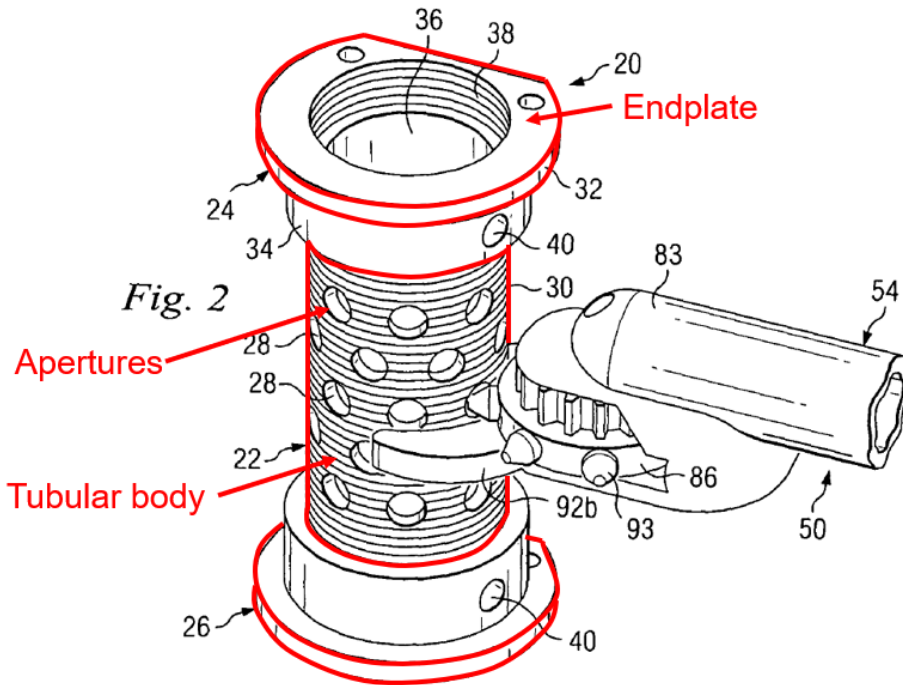


(*Id.*, Fig. 2 (annotated).)

C. Berry

Berry is titled “Expansion Tool for Adjustable Spinal Implant.” Berry discloses an intervertebral implant that is designed to replace damaged vertebrae. (Ex. 1009, ¶4; Ex. 1002, ¶¶49-50.) A “vertebral implant assembly 20,” described in figure 2 of Berry, “may be inserted into the vertebral column (as shown in FIG. 1) and then expanded to achieve the desired fit and alignment between the adjacent intact vertebrae.” (Ex. 1009, ¶¶19, 22, Fig. 1.) Assembly 20 has endplate assemblies 24, 26, which engage adjacent vertebrae, and a rotating tubular body 22, which increases the height of the implant. (*Id.*) Berry discloses a tool (“expander apparatus 50”) for expanding the implant “without the use of lateral movement, thereby

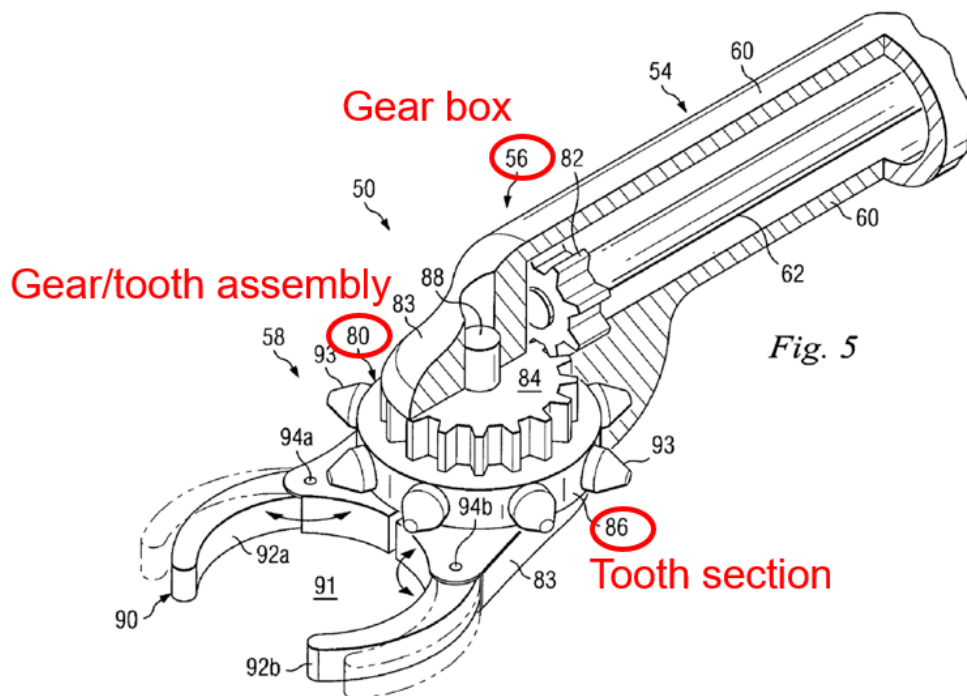
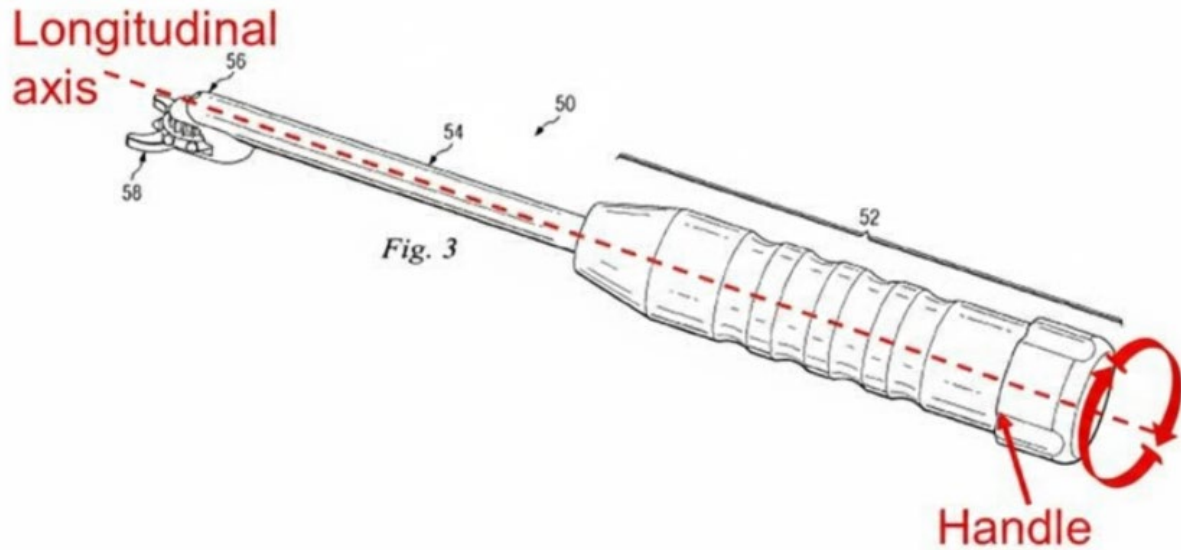
reducing the size of a patient's wound and decreasing the time and labor involved to complete the procedure.” (*Id.*, ¶¶22-23, Figs. 2-3.) The tool can also “be used to facilitate the placement of the assembly 20 inside the vertebral column 10.” (*Id.*, ¶34.)



(*Id.*, Fig. 2 (annotated).)

On one end of the tool is a handle 64, which “[t]he surgeon can [] turn . . . around the axis of the interior axle 62 to expand (or contract, if necessary) the implant assembly 20.” (*Id.*, ¶35, Fig. 4.) As shown in figure 5 below, rotation of the axle 62 “rotates the secondary gear assembly, 82, which rotates the gear section 84.” (*Id.*, ¶35) Gear section 84 is fixedly attached to a “tooth section 86 [that] may include a plurality of teeth 93 that are sized, spaced, and shaped to engage the

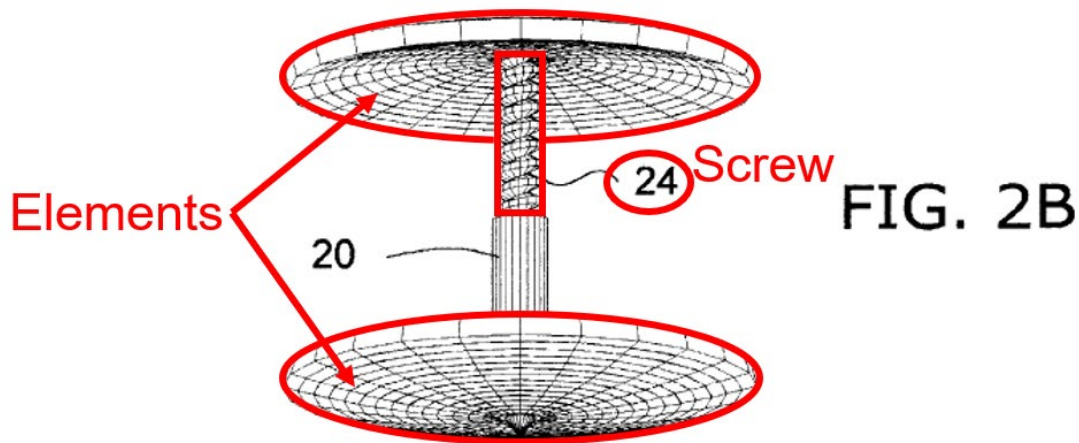
apertures 28 on the tubular body 22,” which “can rotate as the tooth section 86 is rotated.” (*Id.*, ¶¶28, 31, 35.)



(*Id.*, Figs. 3, 5 (both annotated).)

D. Suddaby

Suddaby is titled “Intervertebral Disc Prosthesis.” Suddaby discloses an expandable device designed for replacement of an intervertebral disc. (Ex. 1011, 2:21-24.) Suddaby discloses two elements with a telescoping mechanism extending between them. The mechanism may be a screw 24 which rotates relative to the elements to facilitate expansion. (*Id.*, 3:64-4:19.) Suddaby discloses an implant that is “easy to manufacture from common materials,” such as “titanium.” (*Id.*, 2:25-27, 2:64-66.)



(*Id.*, Fig. 2B (annotated).)

IX. CLAIM CONSTRUCTION

For IPR proceedings, the Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). See 83 Fed. Reg. 51,340-59 (Oct. 11, 2018). Under *Phillips*, claim terms are typically

given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention, having taken into consideration the language of the claims, the specification, and the prosecution history of record. *Phillips*, 415 F.3d at 1313; *see also id.* at 1312-16. The Board need not construe any claims, other than claim 10 discussed below, as the claims are unpatentable under any reasonable construction, or any construction offered by Patent Owner (*see, e.g.*, Ex. 1051). *Toyota Motor Corp. v. Cellport Systems, Inc.*, IPR2015-00633, Paper No. 11 at 16 (P.T.A.B. Aug. 14, 2015).³

As Patent Owner agreed during prosecution of the application that led to the '755 patent, claim 10 includes a mean-plus-function limitation, *i.e.*, “means for placement of a bone fusion material.” (Ex. 1004, 159 (Reply to Action of August 16, 2022, 7).) The specification discloses an implant with “an incorporated expansile porous elastometric [sic] sheath molded to the inner aspects of the titanium shells” into which “bone fusion material can be injected.” (Ex. 1001, 7:56-62; *see also id.*, 4:36-39, 9:42-45.) Thus, the structure that the specification expressly

³ Petitioner reserves all rights of raise claim construction and other arguments in other venues. Specifically, Petitioner is not conceding that each claim satisfies all statutory requirements, nor waiving any arguments concerning claim scope or grounds that can only be raised in district court.

discloses “for placement of a bone fusion material” is an elastomeric sheath. Petitioner does not challenge the patentability of claim 10 under this construction of the means-plus-function limitation.

In the alternative, the ’755 patent vaguely discloses that “bone fusion substances are placed/packed or poured, into the inner aspects of the device 700 and its surrounding intervertebral space.” (*Id.*, 7:52-55.) To the extent the Board were to determine that this disclosure provides sufficient structure “for placement of a bone fusion material,” Petitioner submits that the corresponding structure would be an orifice in the implant that can receive a bone fusion material. If the Board were to adopt this construction of the means-plus-function limitation, Petitioner challenges the patentability of claim 10 for the reasons set forth below.

X. DETAILED EXPLANATION OF GROUNDS

For the reasons set forth below, the prior art renders the challenged claims unpatentable.

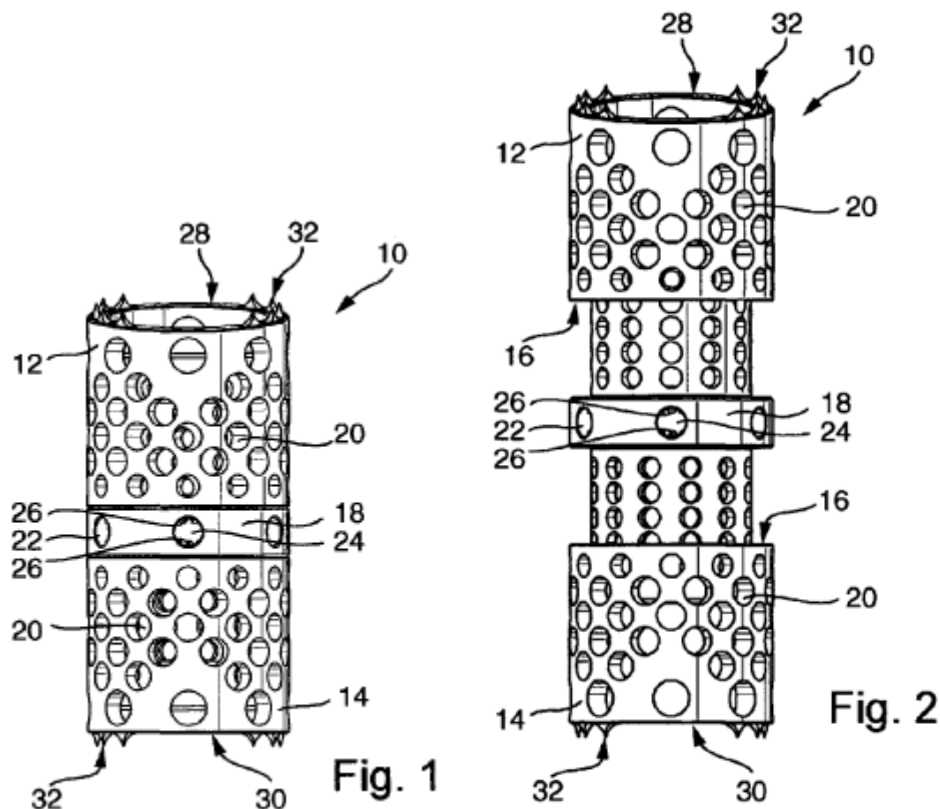
A. Ground 1: Schäfer Anticipates Claims 1, 8, 10-12, and 17-19 of the ’755 Patent

1. Claim 1

i) [1.a] “An artificial spinal implant system comprising: an artificial expansile spinal implant comprising:”

Schäfer discloses this limitation. (Ex. 1002, ¶¶36-37, Appendix A [1.a].) As shown in figures 1 and 2 below, Schäfer discloses an “extendable spinal implant.”

(Ex. 1010, 1:53-57; *see also supra* Section VIII.A.) Moreover, as demonstrated by its man-made parts, Schäfer's implant is "**artificial.**"⁴ Schäfer thus discloses "**an artificial expansile spinal implant.**" The height of the spinal implant can be adjusted using a tool. (Ex. 1010, 4:25-30, 5:52-57, Figs. 1, 2.) Schäfer thus discloses an "**artificial spinal implant system,**" which includes the extendable spinal implant and a tool for adjusting the height of the spinal implant.



(*Id.*, Figs. 1-2.)

- ii) [1.b] "**a first shell having a first vertebral-engaging surface and a first opposite surface, the first shell comprising a first set of engagement features**

⁴ Claim language is bolded throughout.

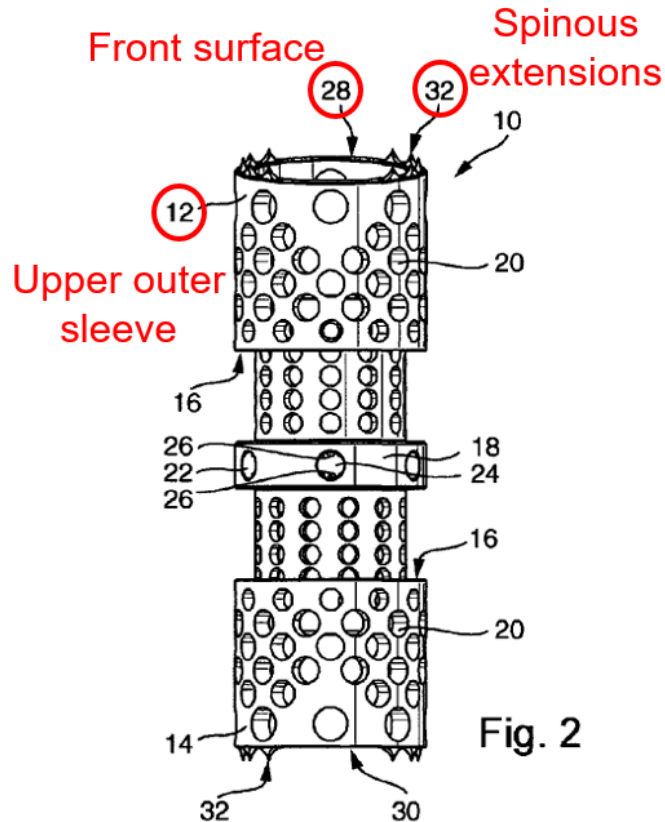
extending from the first vertebral-engaging surface;⁵

Schäfer discloses this limitation. (Ex. 1002, ¶39, Appendix A [1.b].) Schafer’s implant comprises outer sleeves 12, 14 and inner sleeves 34, 36. (Ex. 1010, 4:37-44, 4:53-55.) As shown in figures 1 and 2 above, outer sleeves 12, 14 are hollow and can cover inner sleeves 34, 36, respectively. (*Id.*, 2:13-21.) Schäfer thus discloses an implant with a “**first shell**” (upper outer sleeve 12) and a “**second shell**” (lower outer sleeve 14).

“[T]he two outer sleeves 12 and 14 have outwardly oriented front surfaces 28 and 30 which have spinous extensions 32 . . . that penetrate the contact surfaces of the neighboring vertebrae” (*Id.*, 4:47-52, Fig. 2.) Thus, front surface 28 is a “**first vertebral-engaging surface**” and spinous extensions 32 are “**a first set of engagement features extending from the first vertebral-engaging surface.**” The upper outer sleeve 12 also has a surface 16 that is located opposite surface 28, making surface 16 of the upper outer sleeve 12 the “**first opposite surface.**” (*Id.*,

⁵ In the Globus Medical litigation, the district court construed the term “shell” in the grandparent ’643 patent as an “exterior structure of the artificial expansile spinal implant.” (Ex. 1052, 16.) The outer sleeves 12 and 14 are “shell[s]” under this construction because, as explained below, they form the exterior structure of the implant and have spinous extensions that contact the vertebrae.

4:37-41, Fig. 2.) Schäfer thus discloses “a first shell having a first vertebral-engaging surface and a first opposite surface.”



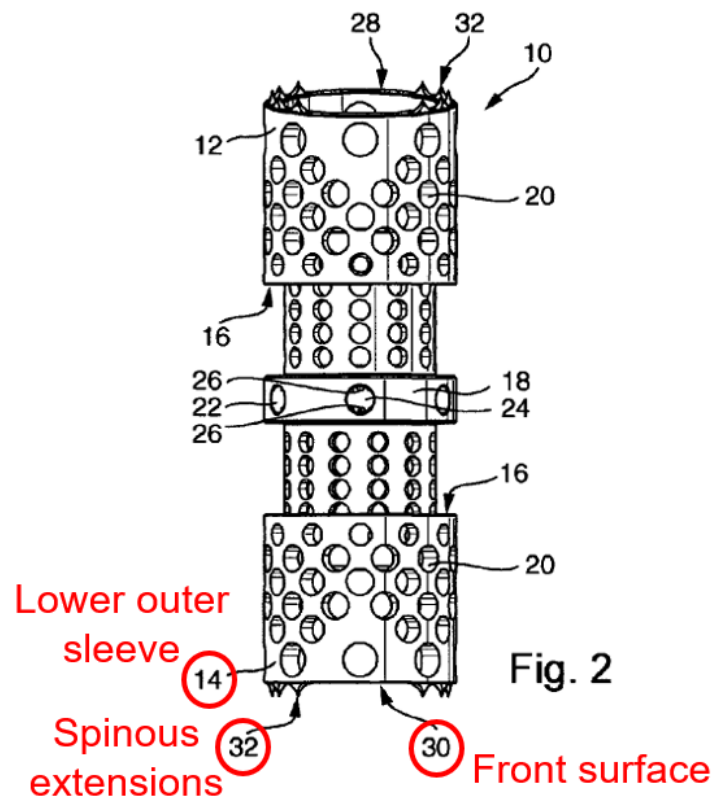
(*Id.*, Fig. 2 (annotated).)

- iii) [1.c] “a second shell having a second vertebral-engaging surface and a second opposite surface, the second shell comprising a second set of engagement features extending from the second vertebral-engaging surface; and”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [1.c].) As discussed in Section X.A.1.ii, and as shown in figure 2 below, Schäfer discloses a lower outer sleeve 14 (**second shell**) with a front surface 30 (**second vertebral-engaging surface**). The lower outer sleeve 14 also has a surface 16 that is located opposite

surface 30, making surface 16 of the lower outer sleeve 14 the “**second opposite surface.**” (*Id.*, 4:38-41, Fig. 2.) Schäfer thus discloses “**a second shell having a second vertebral-engaging surface and a second opposite surface.**”

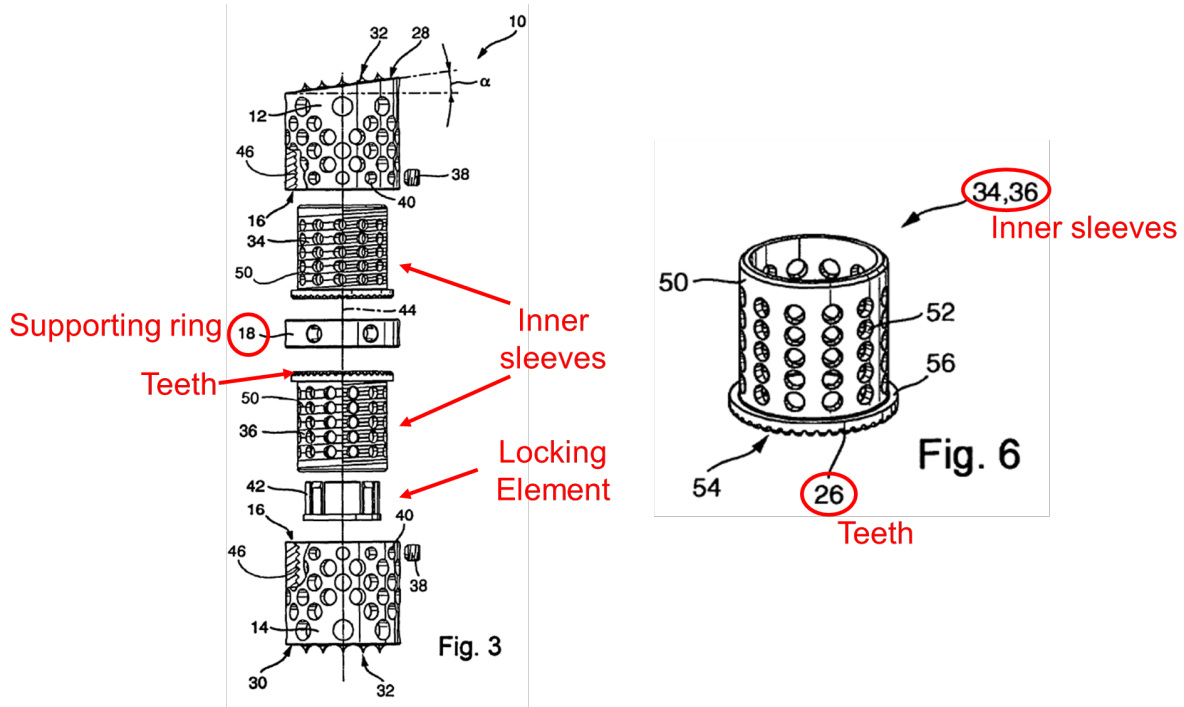
As seen in figure 2 below, like the upper outer sleeve 12, the lower outer sleeve 14 has “spinous extensions 32” (**second set of engagement features**) “that project in axial direction” from the front surface 30 (**second vertebral-engaging surface**) of the lower outer shell 14 and “penetrate the contact surfaces of the neighboring vertebrae” (*Id.*, 4:47-52.) Schafer thus discloses “**the second shell comprising a second set of engagement features extending from the second vertebral-engaging surface.**”



(*Id.*, Fig. 2 (annotated).)

- iv) [1.d] **“an expansion mechanism positioned between the first shell and the second shell and configured to expand the artificial expansile spinal implant, the expansion mechanism coupled to the first opposite surface and the second opposite surface, the expansion mechanism comprising a tool-engagement surface, a threaded body, and a turning mechanism;”**

Schäfer discloses this limitation. (Ex. 1002, Appendix A [1.d].) Schäfer discloses a “drive element” comprising inner sleeves 34, 36, “which are screwed into the associated upper outer sleeve 12 and lower outer sleeve 14.” (Ex. 1010, 2:42-44, 4:53-55.) Surface 54 of the inner sleeves 34, 36 face each other while resting on a supporting ring 18. (*Id.*, 2:44-46, 5:23-27, 5:41-42, Figs. 6, 8.) “The two inner sleeves can be driven in the area of their front surface [54], thus making it possible to screw them into and out of the outer sleeve,” which expands the implant. (*Id.*, 2:47-49.) The surface 54 of the inner sleeves 34, 36 have teeth 26, which can be turned by tool 70 to carry out this screwing function thereby “extend[ing]” the “spinal implant.” (*Id.*, 2:57-62, 5:52-57; *compare id.*, Fig. 1 (compressed configuration), *with id.*, Fig. 2 (extended position).) Schäfer thus discloses **“an expansion mechanism . . . configured to expand the artificial expansile spinal implant.”** (Ex. 1002, ¶39.)



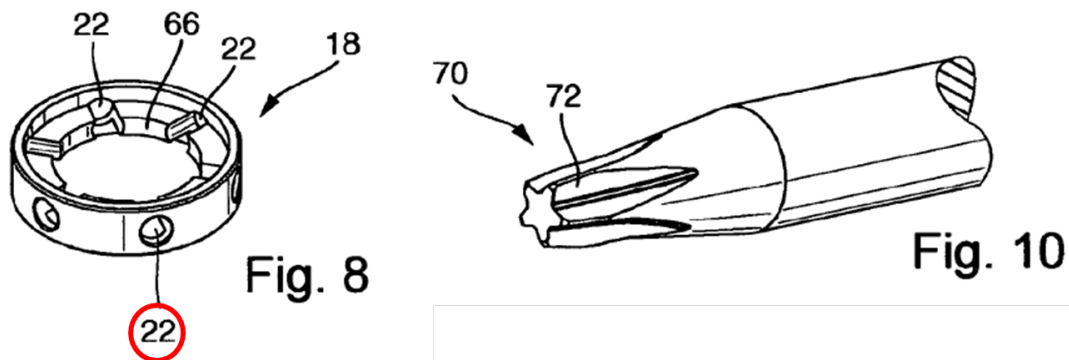
(*Id.*, Figs. 3, 6 (both annotated).)

In addition to inner sleeves 34, 36 and supporting ring 18, Schäfer’s “**expansion mechanism**” also includes locking element 42, which “maintains the two inner sleeves on the supporting ring.” (*Id.*, 4:13-15, Fig. 3.) Schäfer further notes that “[t]he drive element [] is located between the two outer sleeves” (*i.e.*, the **first and second shells**). (*Id.*, 2:42-43, Fig. 3.) Schäfer thus discloses “**an expansion mechanism positioned between the first shell and the second shell.**”

The inner sleeves 34, 36 have “a first screw thread, e.g., an outside screw thread,” that is screwed to “a second screw thread, e.g., an inside screw thread” of the outer sleeves 12, 14. (*Id.*, 2:15-21, 5:8-22, Fig. 3.) As such, the opposite surfaces 16 of outer sleeves 12, 14 are coupled to the inner sleeves 34, 36, as seen in figure

2. Schäfer further discloses that the opposite surfaces 16 “rest against [] supporting ring 18,” (*id.*, 4:38-41), which is part of the “**expansion mechanism.**” Schäfer thus discloses “**the expansion mechanism coupled to the first opposite surface and the second opposite surface.**”

Schäfer also discloses that the supporting ring 18 “has at least one radial opening” 22, which “allows insertion of the tool into the supporting ring” to engage the “front surface of the inner sleeve,” and also “guide[s] and support[s] the tool.” (*Id.*, 2:63-66 (emphasis added), Fig. 8.) Accordingly, the contours of opening 22 are a “**tool-engagement surface.**”



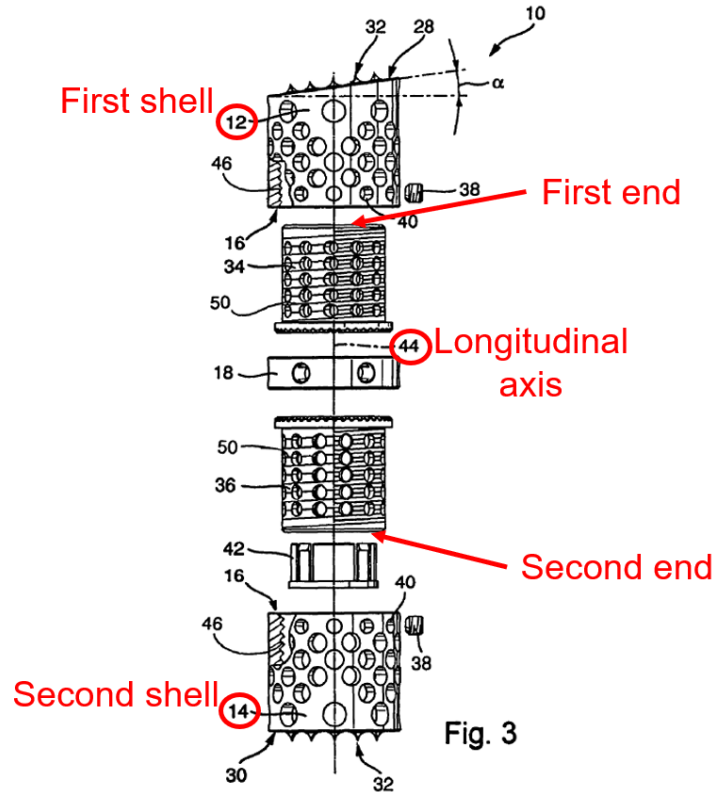
(*Id.*, Fig. 8 (annotated), Fig. 10.)

As shown in figure 3 above, inner sleeves 34, 36 both have an outside thread 50, and are connected with each other through a locking mechanism 42 (*id.*, 5:30-40) to form a “**threaded body.**” Schäfer also discloses a “**turning mechanism**” comprising bevel teeth 26 on the inner sleeves 34, 36 and supporting ring 18. (*Id.*, 4:13-18, 5:19-29.) “By way of these teeth, the inner sleeve or the inner sleeves can

be turned by means of a suitable tool, e.g., by means of the mating part of the bevel teeth, so as to carry out the screwing motion,” and the supporting ring 18 “guide[s] and *support[s]* the tool” while the inner sleeves are screwed, *i.e.*, turned. (*Id.*, 2:41-49, 2:57-67, 4:13-18, 5:19-40.) Schäfer thus discloses “**the expansion mechanism comprising a tool-engagement surface, a threaded body, and a turning mechanism.**”

- v) [1.e] “wherein the threaded body has a first end, a second end, and a longitudinal axis between the first end and the second end, the longitudinal axis extending in a direction from the first shell to the second shell;”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [1.e].) As discussed in Sections X.A.1.ii-iv, the inner sleeves, 34, 36, connected by locking mechanism 42, form a **threaded body**, while outer sleeves 12, 14 are the **first** and **second shells**, respectively. As shown in figure 3 below, “sleeves 12, 14, 34, and 36 and supporting ring 18 and locking element 42 are disposed coaxially with respect to one another and with respect to longitudinal axis 44.” (Ex. 1010, 5:4-7.) Schäfer thus discloses limitation [1.e].



(*Id.*, Fig. 3 (annotated).)

- vi) [1.f] “wherein the expansion mechanism is configured to drive expansion between the first shell and the second shell in response to rotating of a tool engaged with the tool-engagement surface,”

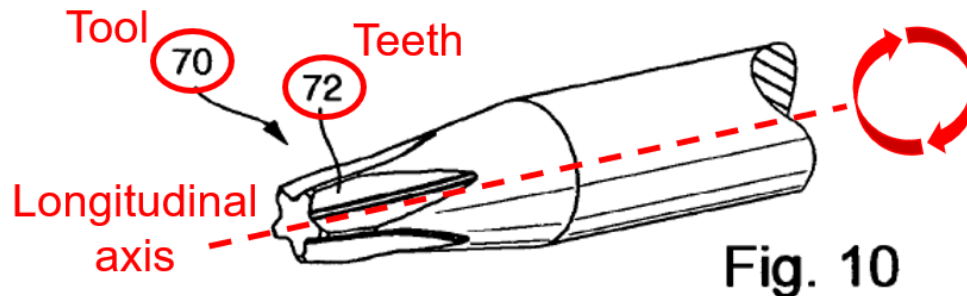
Schäfer discloses this limitation. (Ex. 1002, ¶¶38-39, Appendix A [1.f].) As discussed in Section X.A.1.iv, the front surfaces of the inner sleeve have teeth 26. “By way of these teeth, the inner sleeve or the inner sleeves can be turned by means of a tool, e.g., by means of the mating part of the bevel teeth, so as to carry out the screwing motion,” which drives expansion between the upper and lower outer sleeves 12, 14. (Ex. 1010, 2:57-62, Figs. 1, 2.) Schafer’s “**expansion mechanism**” is thus “**configured to drive expansion between the first shell and the second**

shell in response to rotating of a tool engaged with the tool-engagement surface.”

- vii) [1.g] “wherein rotating the tool comprises rotating the tool about a longitudinal axis of the tool while the tool is engaged with the tool-engagement surface, and wherein the rotating of the tool causes a rotation of the turning mechanism;”

Schäfer discloses this limitation. (Ex. 1002, ¶¶40-43, Appendix A [1.g].) As discussed in Section X.A.1.iv, the surface of opening 22 (**tool-engagement surface**) engages Schäfer’s tool 70. A POSITA would have understood that tool 70 is rotated **about a longitudinal axis of the tool** based on the operation of tool 70. (*Id.*, ¶42.) As discussed in Section, X.A.1.iv, tool 70 is “turned in the supporting ring” so that teeth 72 engage and rotate inner sleeve teeth 26, which is part of the “**turning mechanism.**” (Ex. 1010, 2:59-62, 4:25-33, 5:52-57.) In particular, teeth 72 and teeth 26 form “a bevel tooth gear” (*id.*, 5:52-57), which is turned by rotating the tool about its longitudinal axis. (Ex. 1002, ¶42.) This is further confirmed by Schäfer’s explanation that its disclosed expansion tool does not need to be reinserted after each rotational turn of inner sleeves 34, 36. (Ex. 1010., 2:36-41.) This contrasts with earlier devices, which required “that the tool used for turning the threaded sleeve [] be removed and reinserted after it has made a certain turn, e.g., after a quarter turn.” (*Id.*, 1:19-22.) Schäfer thus discloses “**wherein rotating the tool comprises rotating the tool about a longitudinal axis of the tool while the tool is engaged**

with the tool-engagement surface, and wherein the rotating of the tool causes a rotation of the turning mechanism.”



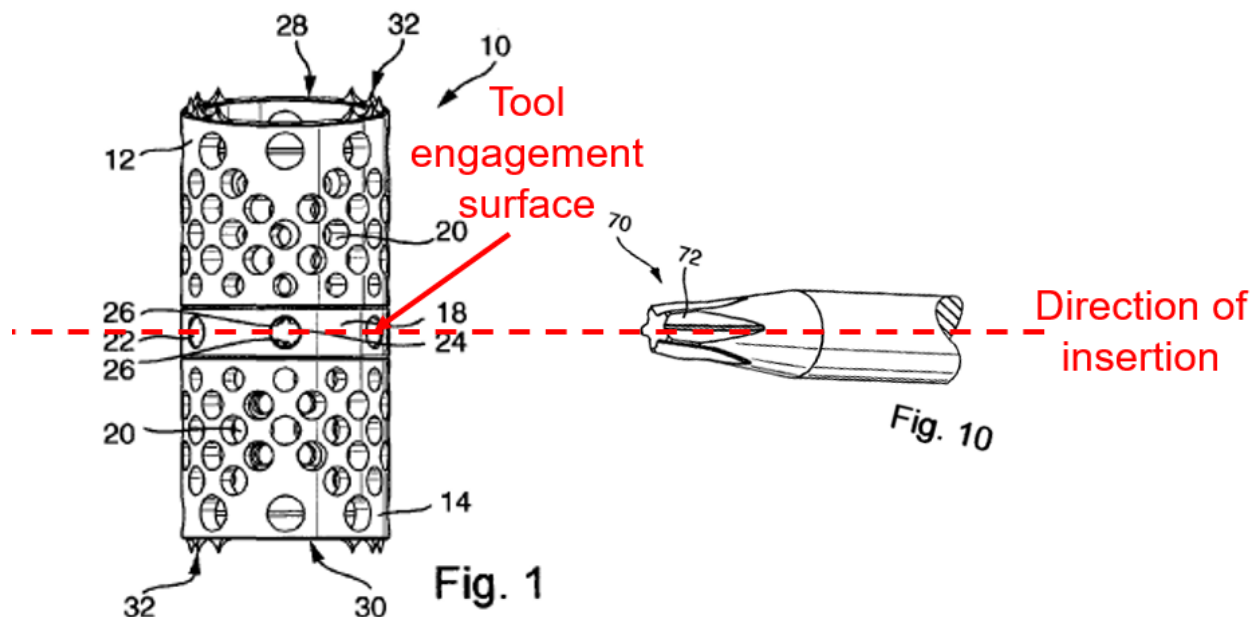
(*Id.*, Fig. 10.)

- viii) [1.h] “wherein the artificial expansile spinal implant is configured to be introduced into a spine with the first set of engagement features of the first vertebral-engaging surface and the second set of engagement features of the second vertebral-engaging surface engaging opposing vertebral bodies to hold the artificial expansile spinal implant in place;”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [1.h].) Schäfer discloses that spinous extensions 32, *i.e.*, the **first and second set of engagement features**, “penetrate the contact surfaces of the neighboring vertebrae and [] anchor the two outer sleeves 12 and 14,” *i.e.*, the spinous extensions 32 are **engaging opposing vertebral bodies to hold the artificial expansile spinal implant in place**. (Ex. 1010, 4:47-53.)

- ix) [1.i] “wherein the tool-engagement surface of the expansion mechanism is positioned and configured to be engaged by the tool extending along a direction of insertion; and”

Schäfer discloses this limitation. (Ex. 1002, ¶41, Appendix A [1.i].) The surface of opening 22 (the **tool-engagement surface**) engages with the tool 70 by guiding and supporting insertion of the tool into the supporting ring and by “mov[ing] it to the front surface of the inner sleeve.” (Ex. 1010, 2:63-67, 5:41-51.) As shown in figures 1 and 10 below, a POSITA would have understood that tool 70 goes through opening 22 along the direction of the tool’s insertion such that “**the tool-engagement surface of the expansion mechanism is positioned and configured to be engaged by the tool extending along a direction of insertion.**”

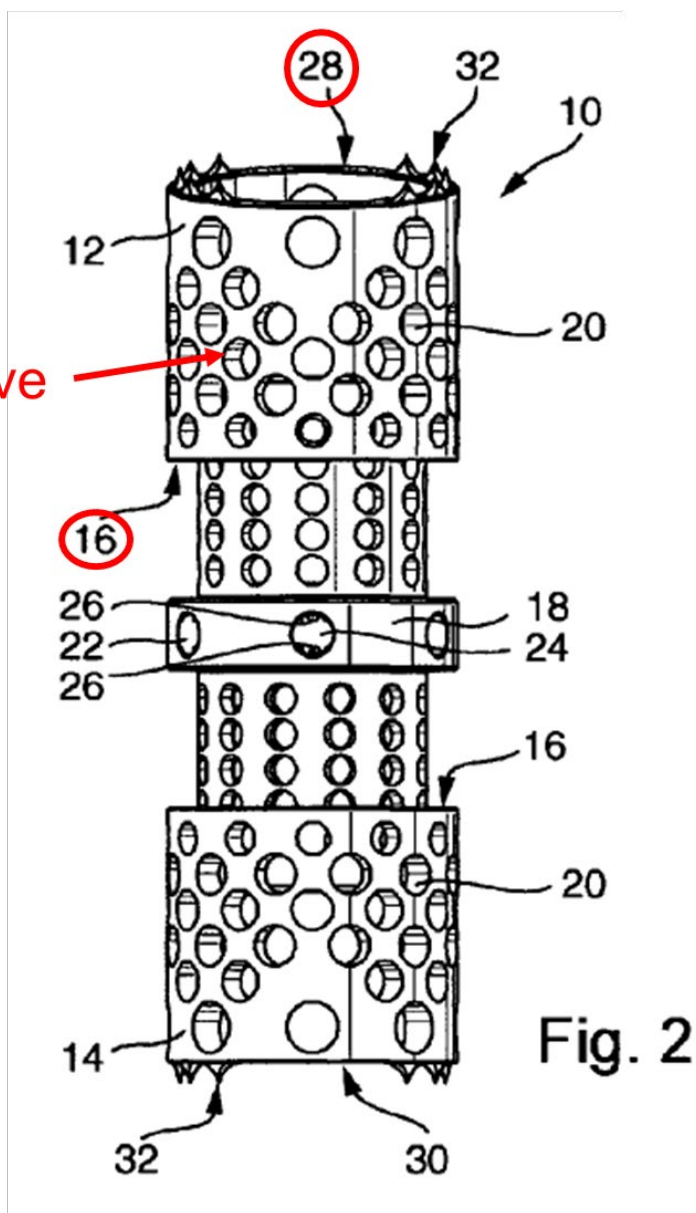


(*Id.*, Figs. 1, 10 (both annotated).)

- x) [1.j] “wherein the first shell comprises a first cavity extending from the first vertebral-engaging surface through the first shell to the first opposite surface, and”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [1.j].) As shown in figures 2 and 4 below, the upper outer sleeve 12 has a cavity extending from top surface 28 (**first vertebral-engaging surface**) to surface 16 of the upper outer sleeve 12 (**first opposite surface**). In fact, inner sleeve 34 can screw completely inside upper outer sleeve 12 (**first shell**). (Ex. 1010, 4:53-55; Figs. 1, 3.) Schäfer thus discloses “**wherein the first shell comprises a first cavity extending from the first vertebral-engaging surface [28] through the first shell to the first opposite surface [16].**”

Outer sleeve



(*Id.*, Fig. 2 (annotated).)

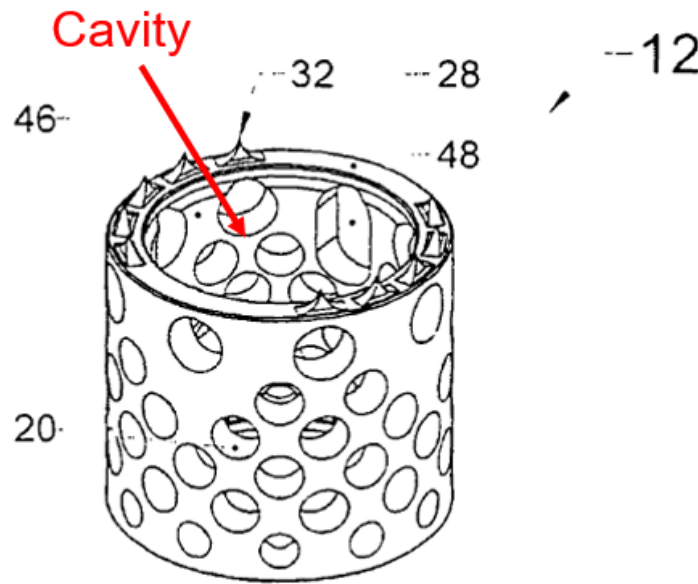


Fig. 4

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

- xi) [1.k] “wherein the first set of engagement features are positioned on the first vertebral-engaging surface circumferentially about the first cavity.”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [1.k].) As shown in figure 4 below, spinous extensions 32 on upper outer shell 12 (**first set of engagement features**) are positioned on surface 28 (**first vertebral-engaging surface**) around the circular perimeter of the **first cavity**. (Ex. 1010, 4:47-52. Fig. 4.) Schäfer thus discloses “**wherein the first set of engagement features are positioned on the first vertebral-engaging surface circumferentially about the first cavity.**”

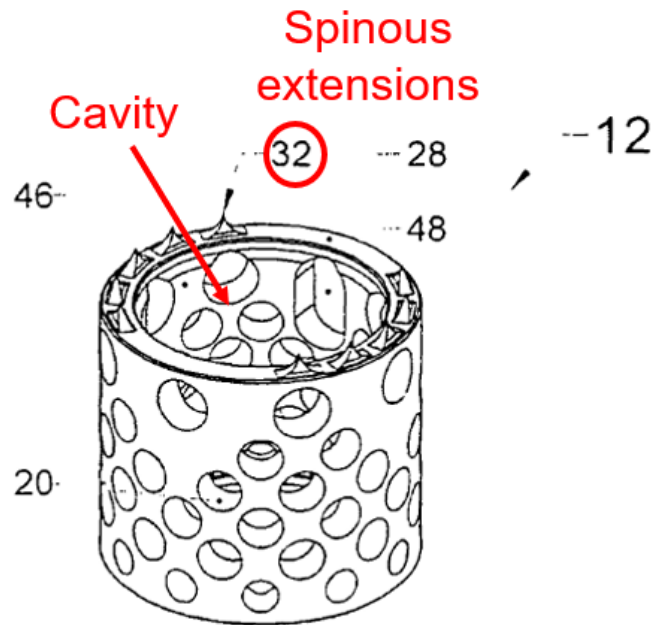


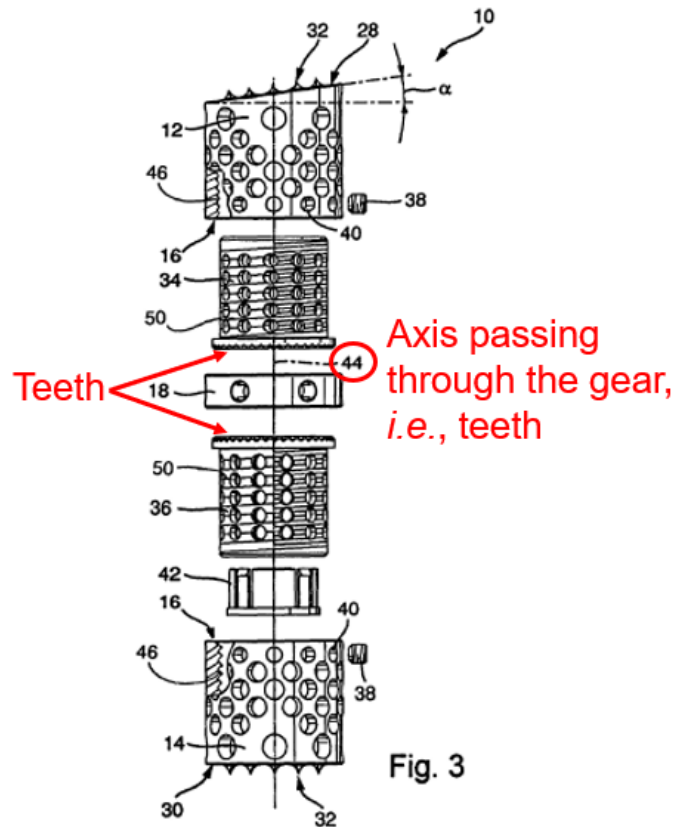
Fig. 4

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

2. Claim 8

- i) **“The artificial spinal implant system of claim 1, wherein the expansion mechanism further comprises a rotatable gear.”**

Schäfer discloses this limitation. (Ex. 1002, Appendix A [8].) According to Schäfer, each inner sleeve 34, 36 has “bevel teeth,” 26 *i.e.*, a “**gear.**” (Ex. 1010, 2:57-59, 5:23-29.) When the teeth 26 are turned by teeth 72 on tool 70, teeth 26 rotate about the longitudinal axis 44. (Ex. 1010, 2:57-62, 5:4-7, 5:52-54, Fig. 3.) Schäfer thus discloses “**a rotatable gear.**”



(*Id.*, Fig. 3 (annotated).)

3. Claim 10

- i) “The artificial spinal implant system of claim 1, wherein the artificial expansile spinal implant further comprises means for placement of a bone fusion material.”

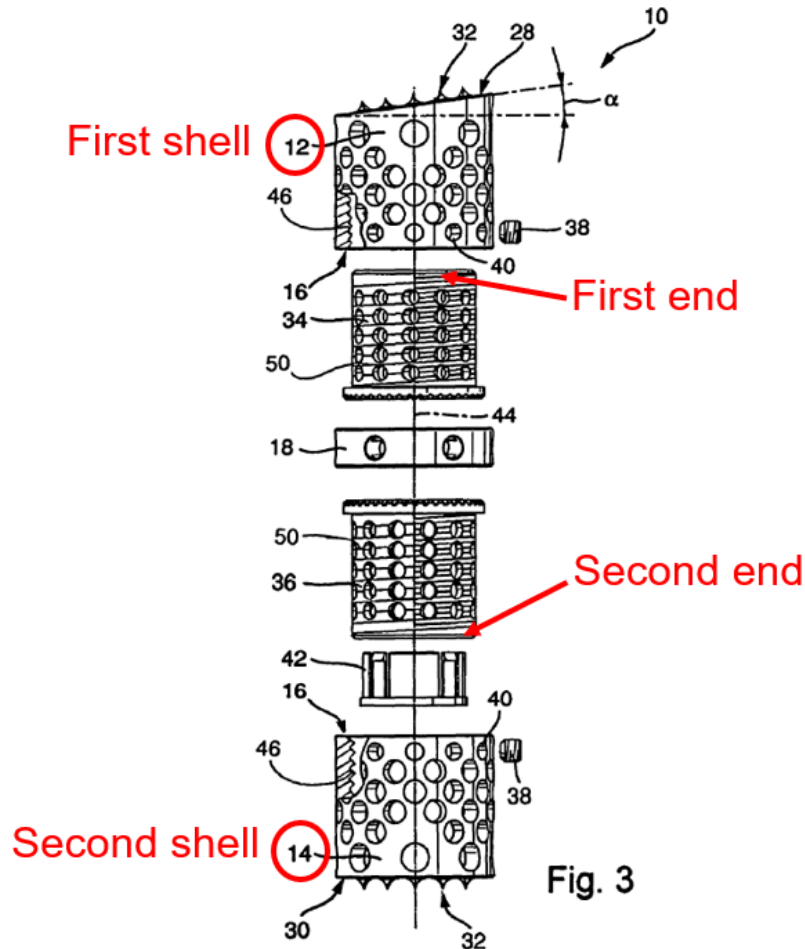
Schäfer discloses this limitation. (Ex. 1002, ¶34, Appendix A [10].) As discussed in Section IX, to the extent this limitation is construed as an orifice in the implant that can receive bone fusion material, Schäfer discloses “perforations 20 through which bone tissue can grow into the inside of the spinal implant 10,” and “a relatively large oblong perforation 48 is provided in the walls of outer sleeves 12

and 14,” which allows “bone tissue [to be] filled into the inside of the spinal implant.” (Ex. 1010, 4:41-44, 5:15-18.) Schäfer thus discloses claim 10.

4. Claim 11

- i) **“The artificial spinal implant system of claim 1, wherein the first end of the threaded body is coupled to the first shell and the second end of the threaded body is coupled to the second shell, and the turning mechanism engages threads of the threaded body.”**

Schäfer discloses this limitation. (Ex. 1002, Appendix A [11].) According to Schäfer, the “drive element which is located between the two outer sleeves is preferably formed by two inner sleeves that are screwed into the two outer sleeves.” (Ex. 1010, 2:42-44, 4:53-55.) As discussed in Section X.A.1.iv, the two inner sleeves 34, 36, and locking element 42, comprise a **threaded body**. Additionally, as discussed in Section X.A.1.iv, outer sleeves 12, 14 are coupled to inner sleeves 34, 36 by their threads. (*Id.*, 1:32-38.) As shown in figure 3 below, Schäfer thus discloses that **“the first end of the threaded body is coupled to the first shell and the second end of the threaded body is coupled to the second shell.”**



(*Id.*, Fig. 3 (annotated).)

As discussed in Section X.A.1.iv, Schäfer’s turning mechanism includes teeth 26 on inner sleeves 34, 36 and supporting ring 18. While the locking mechanism 42 holds the inner sleeves 34, 36 together, teeth 26 “carry out the screwing motion” between the threaded body and the threading inside the outer sleeves. (*Id.*, 2:57-62, 5:30-40.) Schäfer thus discloses that “**the turning mechanism engages threads of the threaded body.**”

5. Claim 12

- i) **[12.a] “An artificial spinal implant system comprising: an artificial expansile spinal implant comprising:”**

Schäfer discloses this limitation for reasons similar to those discussed above for claim [1.a]. (*Supra*, Section X.A.1.i; Ex. 1002, Appendix A [12.a].)

- ii) **[12.b] “a first shell having a first vertebral-engaging surface and a first opposite surface, the first shell comprising a first set of engagement features extending from the first vertebral-engaging surface; and”**

Schäfer discloses this limitation for reasons similar to those discussed above for claim [1.b]. (*Supra*, Section X.A.1.ii; Ex. 1002, Appendix A [12.b].)

- iii) **[12.c] “a second shell having a second vertebral-engaging surface and a second opposite surface, the second shell comprising a second set of engagement features extending from the second vertebral-engaging surface; and”**

Schäfer discloses this limitation for reasons similar to those discussed above for claim [1.c]. (*Supra*, Section X.A.1.iii; Ex. 1002, Appendix A [12.c].)

- iv) **[12.d] “an expansion mechanism positioned between the first shell and the second shell and configured to expand the artificial expansile spinal implant, the expansion mechanism coupled to the first opposite surface and the second opposite surface, the expansion mechanism comprising a tool-engagement surface and at least one rotating gear that is configured to rotate about an axis passing through the gear;”**

Schäfer discloses this limitation for reasons similar to those discussed above for claims [1.d] and [8]. (*Supra*, Sections X.A.1.iv, X.A.2; Ex. 1002, Appendix A [12.d].) In particular, inner sleeves 34, 36, supporting ring 18, and locking element 42 comprise the claimed **expansion mechanism**, where the bevel teeth 26 on each inner sleeve 34 constitute a **rotatable gear**. The contours of opening 22 in supporting ring 18 constitute a **tool-engagement surface**.

- v) **[12.e] “wherein the expansion mechanism is configured to drive expansion between the first shell and the second shell in response to rotating of a tool engaged with the tool-engagement surface,”**

Schäfer discloses this limitation for reasons similar to those discussed above for claim [1.f]. (*Supra*, Section X.A.1.vi; Ex. 1002, Appendix A [12.e].)

- vi) **[12.f] “wherein rotating the tool comprises rotating the tool about a longitudinal axis of the tool while the tool is engaged with the tool-engagement surface, and wherein the rotating of the tool causes a rotation of the at least one rotating gear such that the at least one rotating gear rotates about the axis passing through the gear;”**

Schäfer discloses this limitation for reasons similar to those discussed above for claims [1.g] and [8]. (*Supra*, Sections X.A.1.vii, X.A.2; Ex. 1002, Appendix A [12.f].)

- vii) **[12.g] “wherein the artificial expansile spinal implant is configured to be introduced into a spine with the first set of engagement features of the first vertebral-engaging surface and the second set of engagement features of the second vertebral-engaging surface**

**engaging opposing vertebral bodies to hold the
artificial expansile spinal implant in place;”**

Schäfer discloses this limitation for reasons similar to those discussed above
for claim [1.h]. (*Supra*, Section X.A.1.viii; Ex. 1002, Appendix A [12.g].)

- viii) [12.h] “wherein the tool-engagement surface of the
expansion mechanism is positioned and configured to
be engaged by the tool extending along a direction of
insertion; and”**

Schäfer discloses this limitation for reasons similar to those discussed above
for claim [1.i]. (*Supra*, Section X.A.1.ix; Ex. 1002, Appendix A [12.h].)

- ix) [12.i] “wherein the first shell comprises a first cavity
extending from the first vertebral-engaging surface
through the first shell to the first opposite surface,
and”**

Schäfer discloses this limitation for reasons similar to those discussed above
for claim [1.j]. (*Supra*, Section X.A.1.x; Ex. 1002, Appendix A [12.i].)

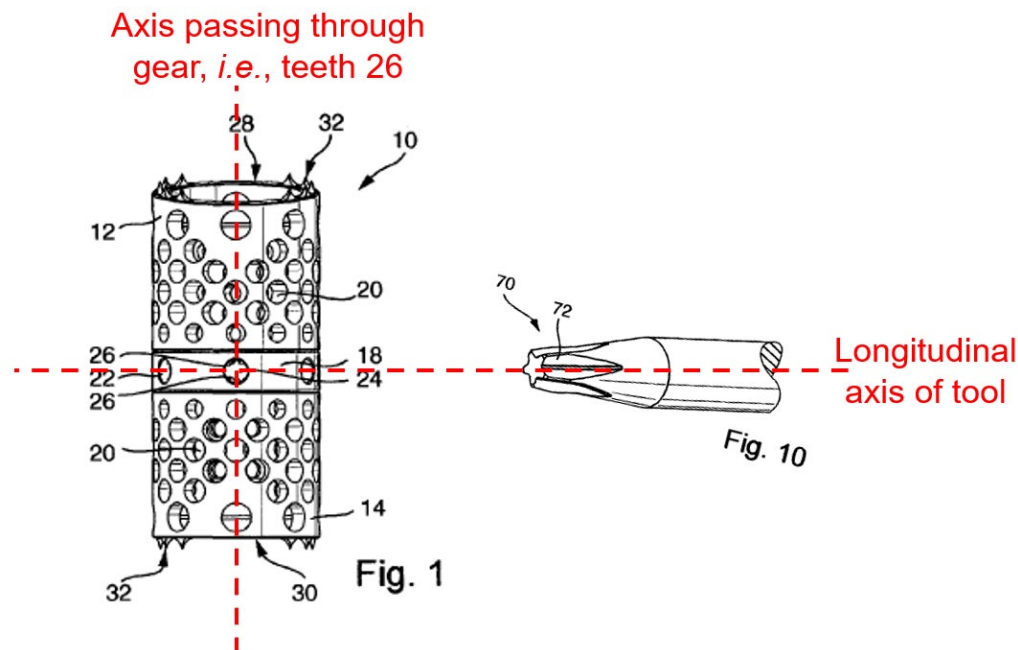
- x) [12.j] “wherein the first set of engagement features
are positioned on the first vertebral-engaging surface
circumferentially about the first cavity.”**

Schäfer discloses this limitation for reasons similar to those discussed above
for claim [1.k]. (*Supra*, Section X.A.1.xi; Ex. 1002, Appendix A [12.j].)

6. Claim 17

- i) “The artificial spinal implant system of claim 12,
wherein the axis passing through the gear is
perpendicular to the longitudinal axis of the tool.”**

Schäfer discloses this limitation. (Ex. 1002, Appendix A [17].) Based on claim 12, **the axis passing through the gear** relates to the “**at least one rotating gear that . . . rotates about an axis passing through the gear.**” As discussed in Section X.A.2, the “**rotating gear**” is formed by teeth 26 of the inner sleeves 34, 36. As shown in figures 1 and 10 below, the axis passing through the gear formed by teeth 26 is perpendicular to the longitudinal axis of the tool. (*Id.*) Schäfer thus discloses “**wherein the axis passing through the gear is perpendicular to the longitudinal axis of the tool.**”



(Ex. 1010, Figs. 1, 10 (both annotated).)

7. Claim 18

- i) “The artificial spinal implant system of claim 12, wherein the first shell curves continuously around a first perimeter of the first shell.”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [18].) As shown in figure 4 below, outer sleeve 12 is cylindrical, *i.e.*, the surface 28 has a circular perimeter. (*Id.*) Schäfer thus discloses that “**the first shell curves continuously around a first perimeter of the first shell.**”

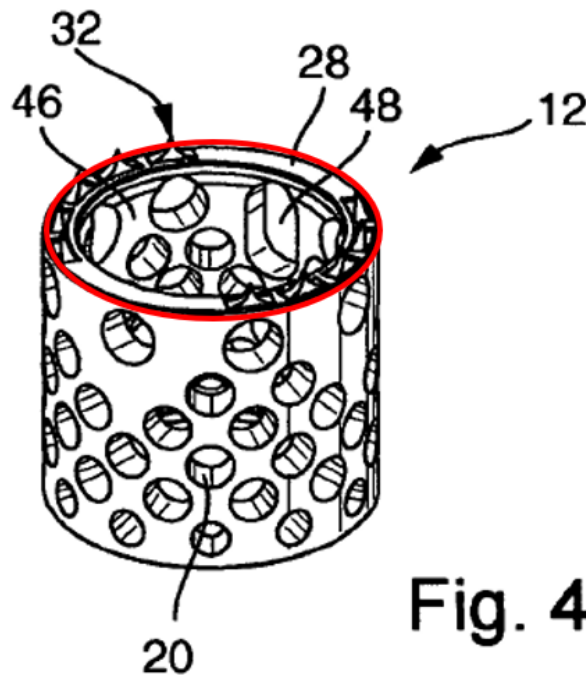


Fig. 4

(Ex. 1010, Fig. 4 (annotated).)

8. Claim 19

- i) “The artificial spinal implant system of claim 18, wherein the first perimeter is shaped to correspond to a shape of a vertebral body.”

Schäfer discloses this limitation. (Ex. 1002, Appendix A [19].) As discussed in Section X.A.7, Schäfer’s first shell is also cylindrical, such that the **first perimeter** of the first shell is circular. Such a circular perimeter is “**shaped to correspond to a shape of a vertebral body**” consistent with Patent Owner’s

infringement contentions (Ex. 1051, 34-36) and the '755 patent's disclosure, discussed below.

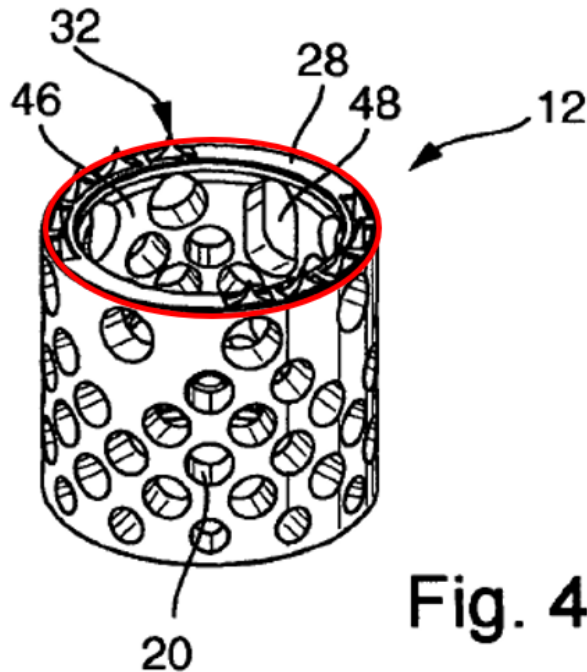
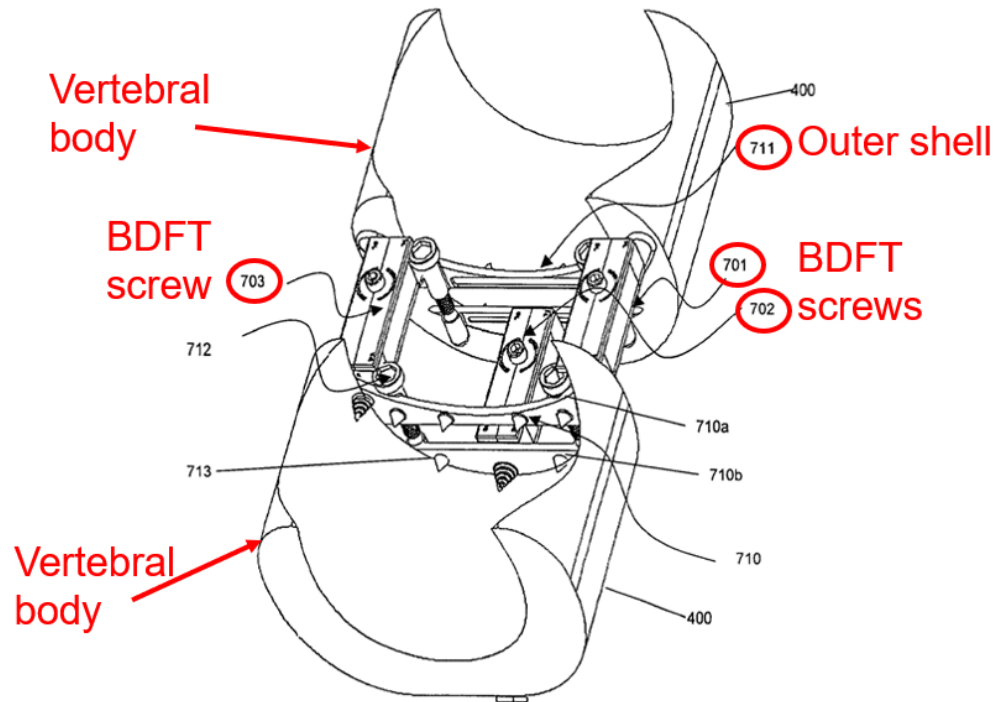


Fig. 4

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

For example, in figures 7A and 7B of the '755 patent, IBFD 700 has “shells 700, 711” and three sets of screws, called bi-directional fixating transvertebral (“BDFT”) screws 701, 702, 703, which point in two different directions. (Ex. 1001, 7:22-27.) The shells have “spikes 713,” which contact adjacent vertebral bodies 400 to help secure “permanent integration into the vertebral endplates.” (*Id.*, 7:27-31.) While no specific shape of the perimeter of the shells is described, the spikes are arranged on a portion that has some circular curvature.

FIG. 7A



(*Id.*, Fig. 7A (annotated).)

B. Ground 2: Schäfer and Yeh Render Obvious Claims 2-6 of the '755 Patent

1. Claim 2

- i) **“The artificial spinal implant system of claim 1, wherein the first set of engagement features have substantially conical tips configured for piercing endplates of the opposing vertebral bodies when introduced into the spine and expanded.”**

Schäfer or Schäfer in view of Yeh discloses this limitation. (Ex. 1002, ¶¶44-46, Appendix B [2].) As shown in figure 4 of Schäfer, spinous extensions 32 (**first set of engagement features**) are wider at the base and taper at the top. (*Id.*, ¶44.) As discussed in Section X.A.1.ii, “spinous extensions 32 penetrate the contact

surfaces of the neighboring vertebrae” (Ex. 1010, 4:47-52.) Schäfer thus discloses “**wherein the first set of engagement features [are] configured for piercing endplates of the opposing vertebral bodies when introduced into the spine and expanded.**” Schäfer’s spinous extensions, as seen in figure 4 below, also have “**substantially conical**” tips at least in view of Patent Owner’s infringement contentions. (See Ex. 1051, 3.)

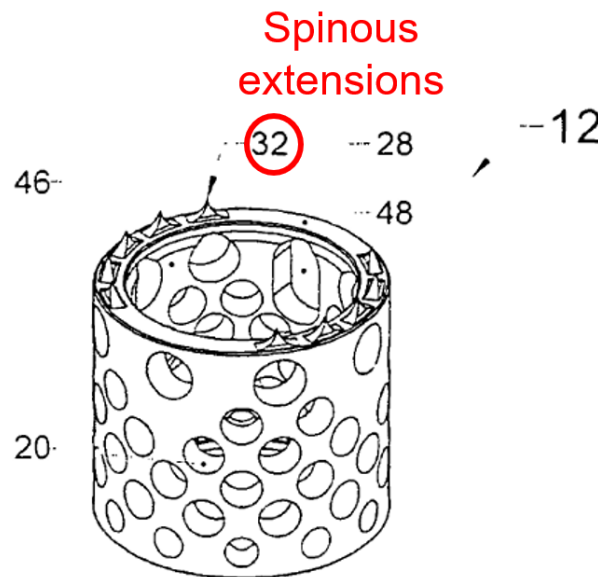
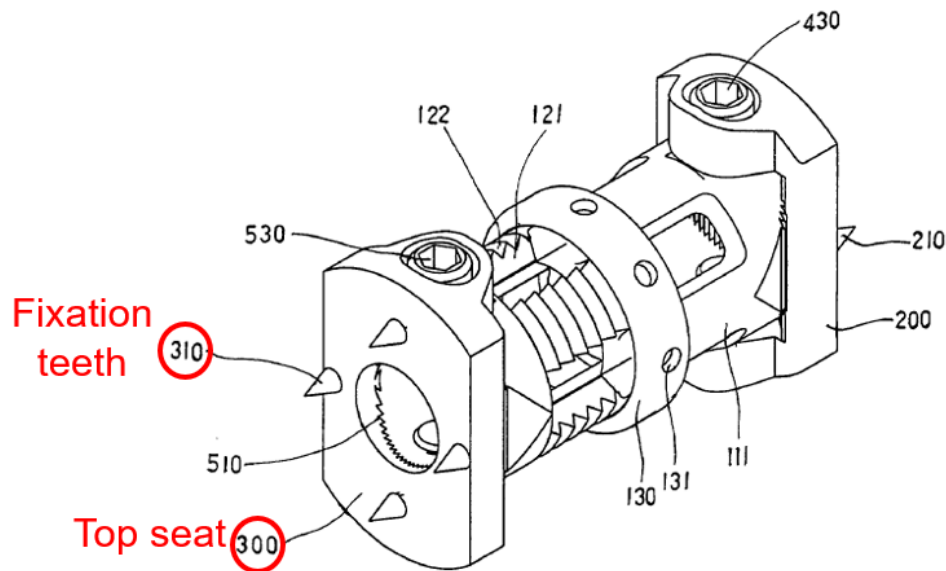


Fig. 4

(Ex. 1010, Fig. 4 (annotated).)

Yeh additionally discloses engagement features that are “**substantially conical.**” As discussed in Section X.D.1.ii, Yeh discloses an expandable intervertebral device similar to Schäfer, comprising a top seat 300 (**first shell**) with fixation teeth 310 (**a first set of engagement features**). (Ex. 1008, ¶21.) As shown in figure 3 below, Yeh’s fixation teeth are “**substantially conical.**” Because Yeh’s

fixation teeth 310 are located on the outer surface of the top seat 300, a POSITA would have understood that they are “**configured for piercing endplates of the opposing vertebral bodies when introduced into the spine and expanded.**” (Ex. 1002, ¶45.)



(Ex. 1008, Fig. 3 (annotated).)

A POSITA would have been motivated to substitute Schäfer’s spinous extensions with Yeh’s fixation teeth 310 because Yeh’s fixation teeth serve the same function as Schäfer’s spinous extensions, namely penetrating the contact surfaces of the neighboring vertebrae, and have merely a slightly different shape such that both constitute an interchangeable design choice. (Ex. 1002, ¶46.) Indeed, “when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an

arrangement, the combination is obvious.” *See KSR Intern. Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) (citation and internal quotation marks omitted).

A POSITA would have also had a reasonable expectation of success using Yeh’s conical tips with Schäfer’s implant. (Ex. 1002, ¶46.) Both Schäfer’s spinous extensions and Yeh’s fixation teeth are located on the outer surfaces of their respective implants, such that they function similarly by engaging and fixing the implant to adjacent vertebral surfaces. (Ex. 1010, 4:50-52 (“spinous extensions 32 penetrate the contact surfaces of the neighboring vertebrae and [] anchor the two outer sleeves 12 and 14”).)

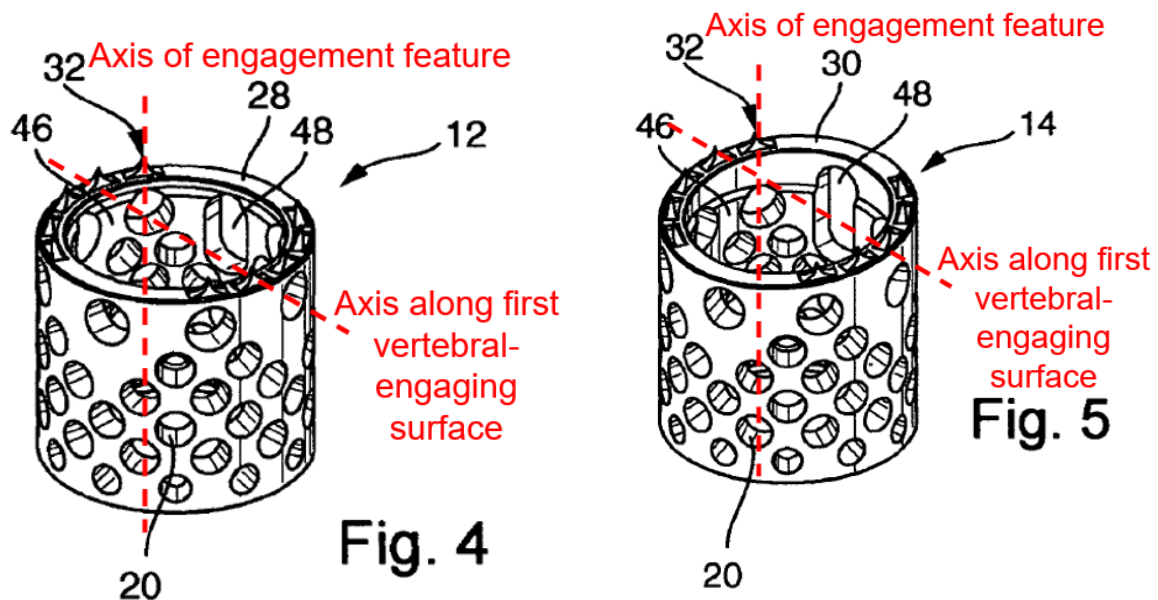
Schäfer or Schäfer in view of Yeh thus discloses **“the first set of engagement features have substantially conical tips configured for piercing endplates of the opposing vertebral bodies when introduced into the spine and expanded.”**

2. Claim 3

- i) **“The artificial spinal implant system of claim 2, wherein the first set of engagement features and the second set of engagement features extend from the first vertebral-engaging surface and the second vertebral-engaging surface in directions perpendicular to the first and second vertebral-engaging surfaces.”**

Schäfer discloses this limitation. (Ex. 1002, Appendix B [3].) As discussed in Sections X.A.1.ii-iii, Schäfer’s spinous extensions 32 are the **first** and **second set**

of engagement features that extend from first and second vertebral-engaging surfaces. Schäfer discloses that “spinous extensions 32 project in axial direction” from “outwardly oriented front surfaces 28 and 30” of the upper and lower outer sleeves 12, 14. (Ex. 1010, 4:47-49.) As shown in figures 4 (upper outer sleeve 12) and 5 (lower outer sleeve 14) below, Schäfer discloses “the first set of engagement features and the second set of engagement features extend from the first vertebral-engaging surface and the second vertebral-engaging surface in directions perpendicular to the first and second vertebral-engaging surfaces.”



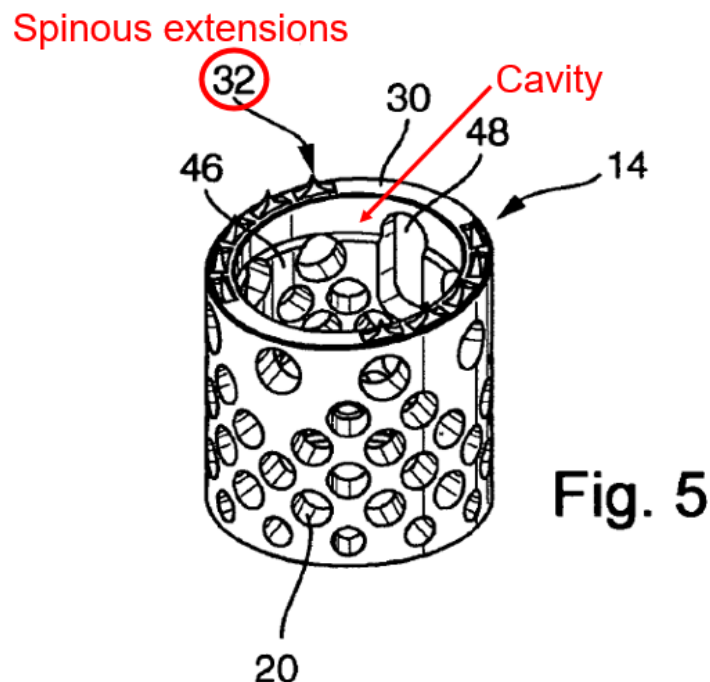
(*Id.*, Figs. 4-5 (both annotated).)

3. Claim 4

- i) “The artificial spinal implant system of claim 3, wherein the second shell comprises a second cavity extending from the second vertebral-engaging surface through the second shell to the second opposite surface and wherein the second set of

engagement features are positioned on the second vertebral-engaging surface circumferentially about the second cavity.”

Schäfer discloses this limitation. (Ex. 1002, Appendix B [4].) As shown in figure 5 below, the lower outer sleeve 14 has a cavity extending from top surface 30 (second vertebral-engaging surface) to surface 16 of lower outer sleeve 14 (second opposite surface). In fact, inner sleeve 36 can screw completely inside lower outer sleeve 14 (second shell). (Ex. 1010, 4:53-55, Fig. 1.) As shown in figure 5 below, spinous extensions 32 on lower outer shell 14 (second set of engagement features) are positioned on surface 30 (second vertebral-engaging surface) around the circular perimeter about the second cavity. Schäfer thus discloses claim 4.



(*Id.*, Fig. 5 (annotated).)

4. **Claim 5**

- i) **“The artificial spinal implant system of claim 4, wherein the first shell curves continuously around a first perimeter of the first shell and the second shell curves continuously around a second perimeter of the second shell.”**

See above analysis for claim [18]. (Supra, Section X.A.7.)

5. **Claim 6**

- i) **“The artificial spinal implant system of claim 5, wherein the first perimeter is shaped to correspond to a shape of a vertebral body.”**

See above analysis for claim [19]. (Supra, Section X.A.8.)

C. **Ground 3: Schäfer and Suddaby Render Obvious Claims 9 and 20 of the '755 Patent**

1. **Claim 9**

- i) **“The artificial spinal implant system of claim 1, wherein the first shell and the second shell each comprise titanium.”**

Schäfer in view of Suddaby discloses this limitation. (Ex. 1002, Appendix C [9].) Schäfer’s specification does not delimit the material used to make outer sleeves 12, 14 (**first shell** and **second shell**). As discussed in Section VIII.D, however, Suddaby discloses an intervertebral implant that is “made of titanium” with two shells and a similar rotational expansion mechanism containing a threaded body. (Ex. 1011, 2:64-66, 4:34-38.) Suddaby thus discloses **“the first shell and the second shell each comprise titanium.”**

A POSITA would have been motivated to use titanium shells for Schäfer's implant because titanium was known to have "outstanding features" for implants for more than two decades. (*See* Ex. 1050, 1 ("Commercially pure (c.p.) titanium has proven its suitability as an implant material in bone surgery over many years in the fields of osteosynthesis, oral implantology, and in certain applications in joint prosthetics. Excellent biocompatibility and corrosion resistance are outstanding features.")) Additionally, a POSITA would have been motivated to use titanium because, according to Suddaby, its implant is "easy to manufacture from common materials." (Ex. 1011, 2:26-28.)

A POSITA would have reasonably expected success in combining the implant system of Schäfer with titanium disclosed in Suddaby because titanium spinal implants have been made and used clinically for decades. (Ex. 1002, Appendix C [9].) As of the priority date of the '755 patent, titanium was the standard material used for intervertebral implants like the one disclosed in Schäfer due to its strength, weight, and biocompatibility. (*Id.*)

2. Claim 20

- i) "The artificial spinal implant system of claim 12, wherein the first shell and the second shell each comprise titanium."**

See above analysis for claim [9]. (*Supra*, Section X.C.1.)

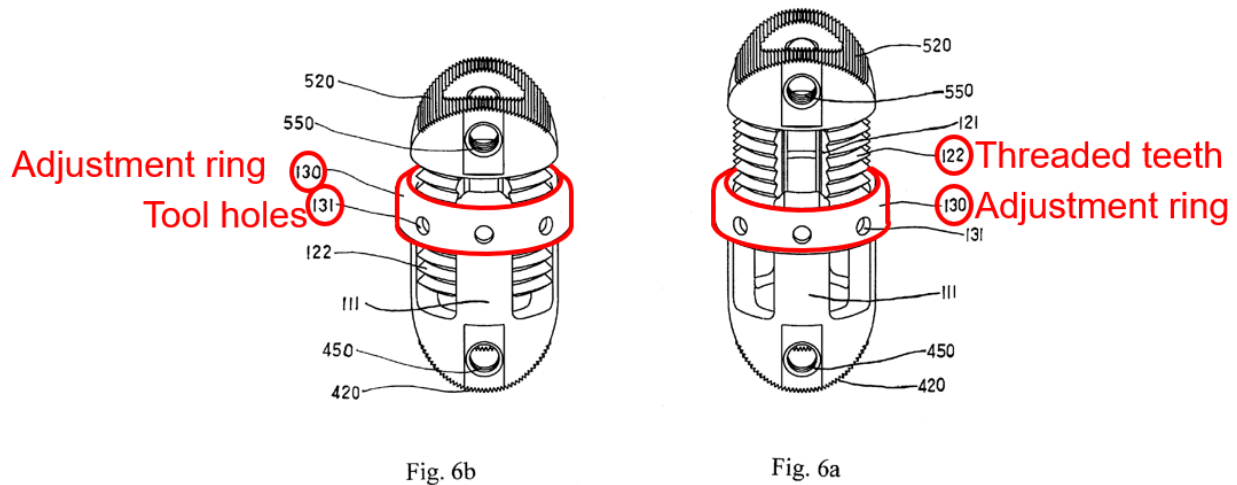
D. Ground 4: Yeh and Berry Render Obvious Claims 1-4, 8, 10-12, and 17 of the '755 Patent

1. Claim 1

i) [1.a]⁶

Yeh discloses this limitation. (Ex. 1002, Appendix D [1].) Yeh discloses a “spinal column fixation device” with “a top seat fastened at the top end with the support member, and a bottom seat fastened at the bottom end with the support member.” (Ex. 1008, Abstract.) The support member has a “height adjustment mechanism,” which allows for adjusting the overall height of the spinal fixation device. (*Id.*, ¶¶4, 11, 26, Figs. 6a, 6b, claims 2, 4.) Moreover, as demonstrated by its man-made parts, the Yeh implant is “**artificial.**” Yeh thus discloses “**an artificial expansile spinal implant.**”

⁶ From here onwards, claim language is not included in the headings but can be found in Sections X.A-X.C.



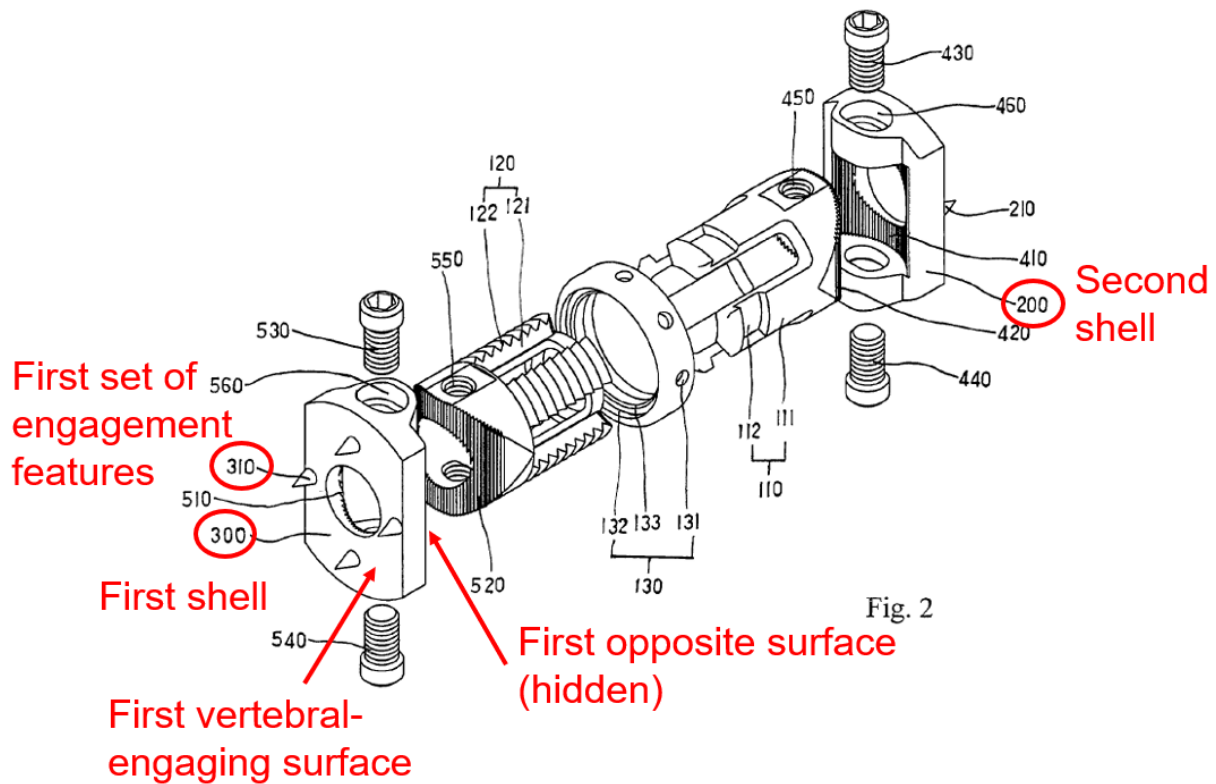
(*Id.*, Figs. 6a, 6b (both annotated).)

Yeh further discloses a “tool” for adjusting the height of the implant. (*Id.*, ¶26.) Thus, Yeh discloses an **“artificial spinal implant system.”**

ii) [1.b]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.b].) As shown in figure 2 below, Yeh’s spinal implant includes a top seat 300 and a bottom seat 200, which are hollow structures that are designed to receive and cover the rounded surfaces 520, 420 of the upper and lower support bodies 120, 110, respectively. (Ex. 1008, ¶21.) Yeh thus discloses an implant with a **“first shell”** (top seat 300) and a **“second shell”** (bottom seat 200).⁷

⁷ In the Globus Medical litigation, the district court construed the term “shell” in the grandparent ’643 patent as an “exterior structure of the artificial expansile spinal



(*Id.*, Fig. 2 (annotated).)

Because the top seat 300 and bottom seat 200 are the outermost portions of Yeh's implant and include "fixation teeth" 210 and 310 (*id.*, ¶21), a POSITA would have understood that these components contact the vertebral surfaces. (Ex. 1002, Appendix D [1.b].) As shown in figure 2 above, the top seat 300 also has a "recessed curved surface . . . (510)" that is opposite the vertebral-engaging surfaces. (Ex. 1008,

implant." (Ex. 1052, 16.) Top seat 300 and bottom seat 200 are "shell[s]" under this construction because they form the exterior structure of the implant and have fixation teeth that contact the vertebrae.

¶21.) Yeh thus discloses a “**first shell having a first vertebral-engaging surface**” and a recessed curved surface 510, which is the “**first opposite surface.**”

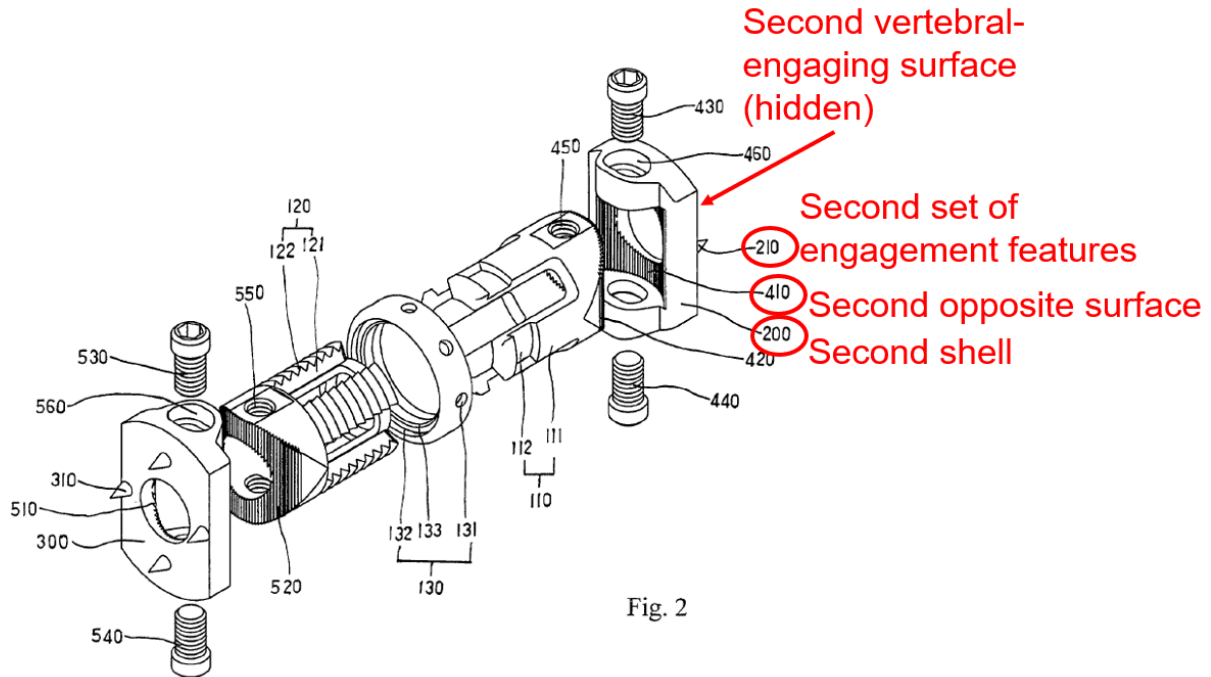
Top seat 300 is “provided with fixation teeth 310,” *i.e.*, a set of structures extending from the top seat to engage the vertebrae. (*Id.*) As shown in figure 2 above, the fixation teeth 310 are also arranged in a circular manner around a hole, or cavity, in the top seat. Yeh thus discloses limitation [1.b].

iii) [1.c]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.c].) As described in Section X.D.1.ii, Yeh’s implant has a top seat 300 (**first shell**) and a bottom seat 200 (**second shell**). (Ex. 1008, ¶21.) Because the top seat 300 and bottom seat 200 are the outermost portions of Yeh’s implant and include “fixation teeth” 210 and 310, a POSITA would have understood that these components of the implant contact the surfaces of the vertebrae. (Ex. 1002, Appendix D [1.c].) As shown in figure 2 below, the bottom seat 200 also has a “serrated recessed curved surface 410” that is opposite the vertebral-engaging surfaces. (Ex. 1008, ¶21.) Yeh thus discloses a “**second shell having a second vertebral-engaging surface,**” and a recessed curved surface 410 that is the “**second opposite surface.**”

The bottom seat 200 is “provided with fixation teeth 210,” *i.e.*, a set of structures that extends from the top seat to engage the vertebrae. (*Id.*; *see also id.*,

Fig. 2.) Yeh thus discloses a “**second set of engagement features extending from the second vertebral-engaging surface.**”



(*Id.*, Fig. 2 (annotated).)

iv) [1.d]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.d].) Yeh explains that “the height adjusting mechanism,” *i.e.*, the **expansion mechanism**, “is formed of the upper support body 120, the lower support body 110 and the adjustment ring 130” (Ex. 1008, ¶21.) “The adjustment of height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (*Id.*, ¶26.) As shown by figure 3 below, the **expansion mechanism**, which comprises the upper support body 120, the lower support body 110, and the

adjustment ring 130, is positioned between the bottom seat 200 and top seat 300.

(*Id.*, ¶21.) Yeh thus discloses “**an expansion mechanism positioned between the first shell and the second shell.**”

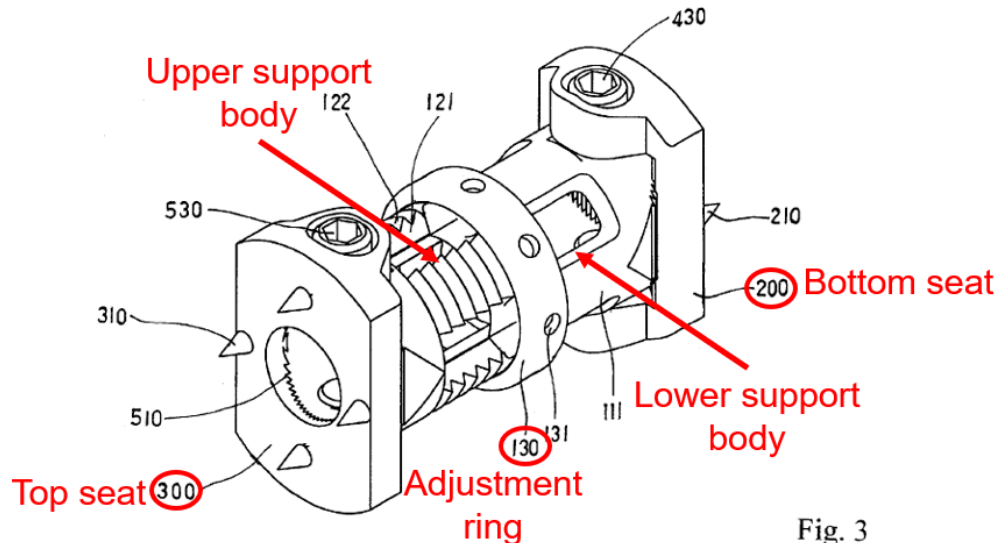
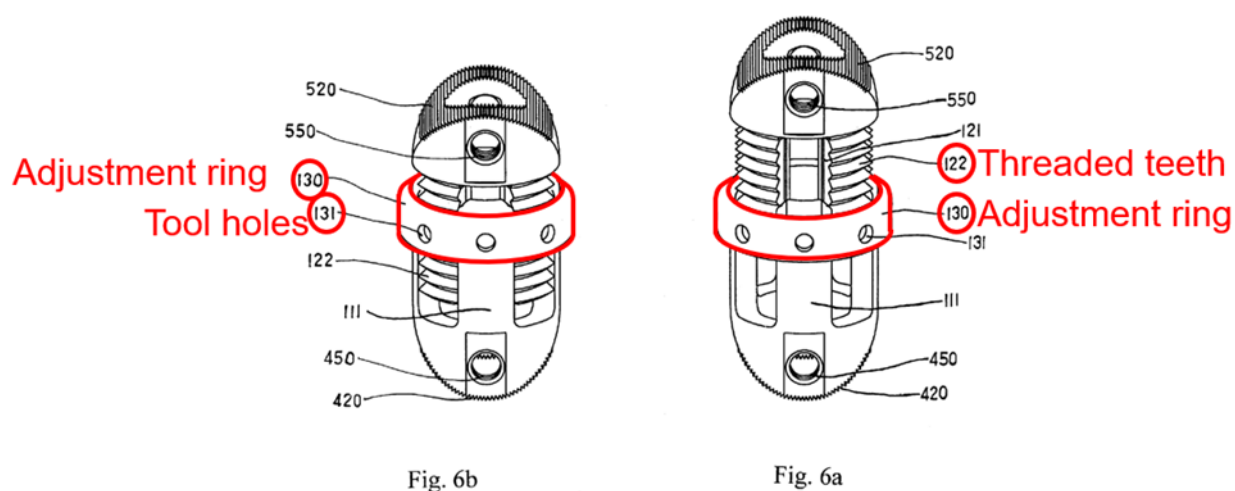


Fig. 3

(*Id.*, Fig. 3 (annotated).)

Further, as shown in figures 6a and 6b below, the adjustment ring 130 has “threaded teeth 132 (shown in Fig. 2)” which engage with “threaded teeth 122” of the upper support body 120, holding the ring and upper support body together and allowing “the adjustment of [the] height of the support member” by “rotat[ing] the adjustment ring 130.” (*Id.*, ¶¶21, 26.) Yeh thus discloses an expansion mechanism that is “**configured to expand the artificial expansile spinal implant.**”



(*Id.*, Figs. 6a, 6b (both annotated).)

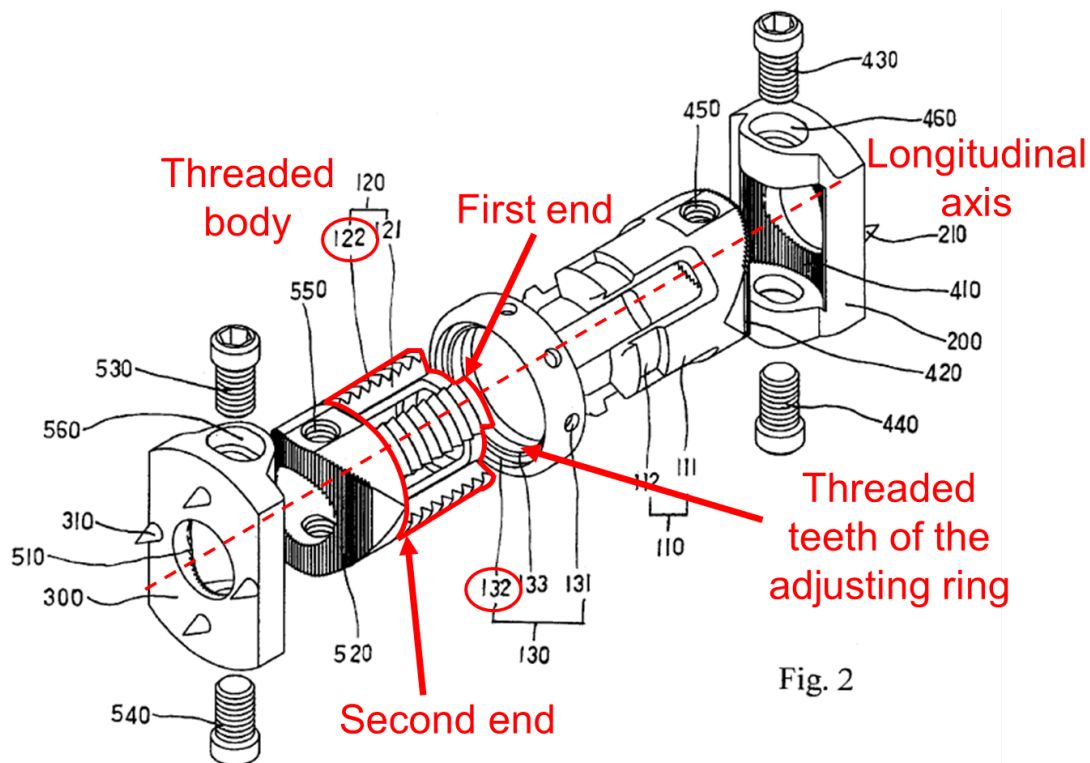
Moreover, the upper support body 120 (which is part of **the expansion mechanism**) is coupled to the recessed curved surface 510 (**first opposite surface**) by fixation screws 530 and 540. (*Id.*, Fig. 2, ¶¶21-25.) Similarly, the lower support body 110 (which is also part of **the expansion mechanism**) is coupled to the recessed curved surface 410 (**the second opposite surface**) by fixation screws 430 and 440. (*Id.*) Thus, “**the expansion mechanism [is] coupled to the first opposite surface and the second opposite surface.**”

Further, “[t]he adjustment of height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (*Id.*, ¶26.) Yeh thus discloses an “**expansion mechanism comprising a tool-engagement surface,**” *i.e.*, the contours of “tool holes 131,” and “**a turning mechanism,**” *i.e.*, the “adjustment ring 130.” Yeh further discloses that the upper

support body 120 includes “threaded teeth 122 on the support legs 121,” *i.e.*, the expansion mechanism also comprises a “**threaded body.**” (*Id.*, ¶21.)

v) [1.e]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.e].) As explained in Sections X.D.1.ii-iii, the top seat 300 and bottom seat 200 are the **first** and **second shells**, respectively. Figure 2 below illustrates **the threaded body** (*i.e.*, upper support body 120) having “**a first end, a second end, and a longitudinal axis** between the first end and the second end, the longitudinal axis extending in a **direction from the first shell to the second shell.**”

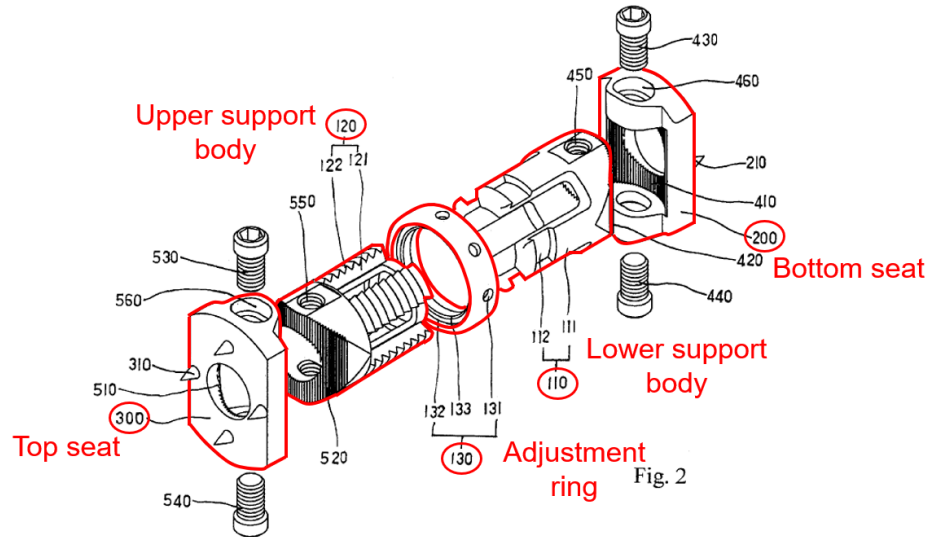


(Ex. 1008, Fig. 2 (annotated).)

vi) [1.f]

Yeh discloses this limitation. (Ex. 1002, ¶¶51-53, Appendix D [1.f].) As shown in figure 2 below, the adjustment ring 130, which drives the expansion of Yeh's implant, is positioned between the top seat 300 (**first shell**) and the bottom seat 200 (**second shell**). (Ex. 1008, ¶21.) The height of the implant is adjusted "by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130." (*Id.*, ¶26, Figs. 6A, 6B.) To rotate the adjustment ring 130, the tool engages with the tool holes 131. (Ex. 1002, Appendix D [1.f].) Because the tool is inserted in the tool holes 131 while the adjustment ring 130 rotates, a POSITA would have understood that the tool also rotates in order to rotate the adjustment ring 130. Yeh thus discloses an "**expansion mechanism [that] is configured to drive expansion between the first shell and the second shell in response to rotating of a tool engaged with the tool-engagement surface.**" In fact, as explained below in Section X.D.1.vii, a POSITA would have combined Yeh with Berry, and that combination

discloses a tool that rotates to drive expansion between the first shell and the second shell.



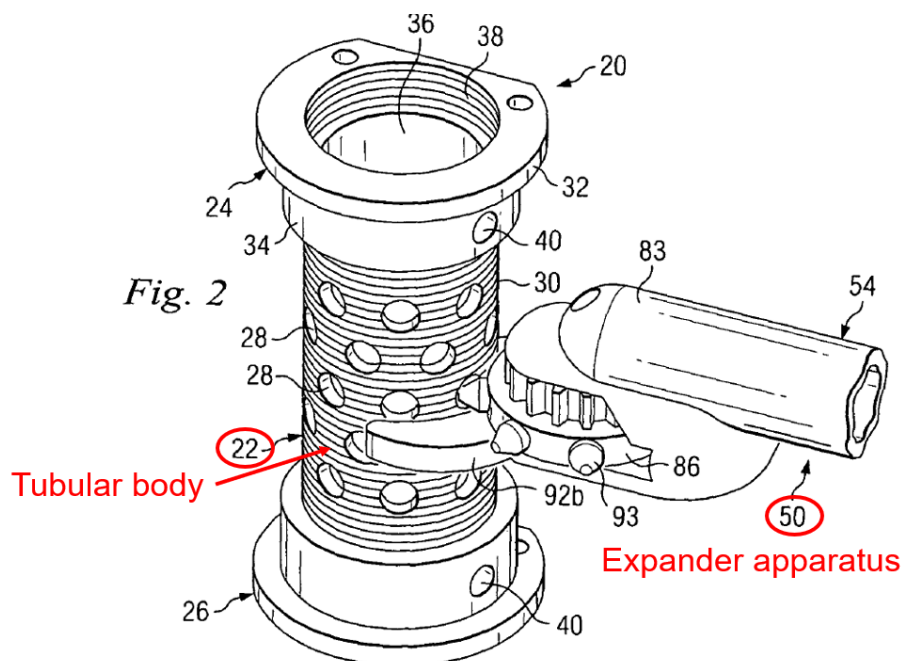
(Ex. 1008, Fig. 2 (annotated).)

vii) [1.g]

Yeh in combination with Berry discloses or suggests this limitation. (Ex. 1002, ¶¶51-61, Appendix D [1.g].) As explained in Section VIII.B, Yeh discloses that “[t]he adjustment of height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (Ex. 1008, ¶26.) Yeh therefore discloses that a **“tool is engaged with the tool-engagement surface”** and **“wherein the rotating of the tool causes a rotation of the turning mechanism.”** But Yeh does not disclose the specific design of the

tool that expands the lower (110) and upper (120) support bodies. Berry, however, discloses a tool that satisfies limitation [1.g].

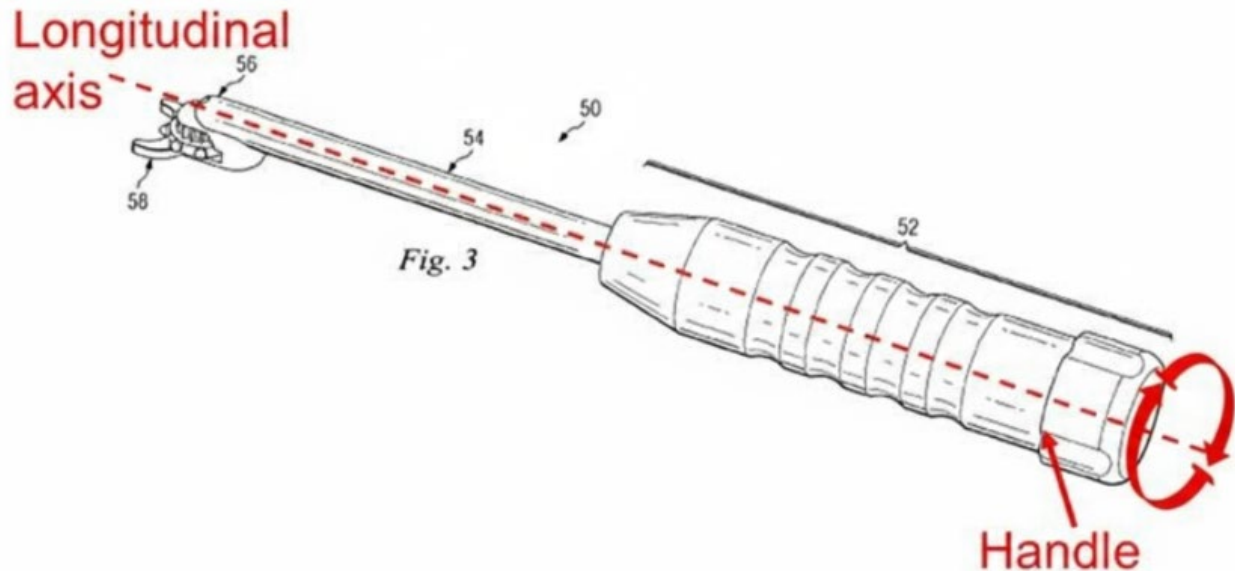
As discussed in Section VIII.C, Berry discloses an expanding implant assembly with a tubular body 22 that expands upon rotation of the tubular body.



(Ex. 1009, Fig. 2 (annotated).)

In particular, as shown in figure 3 below, Berry discloses a **tool**, *i.e.*, expander apparatus 50, that can expand the implant assembly **while the tool is engaged with the tool-engagement surface**, *i.e.*, apertures 28. The expander apparatus 50 “may include a plurality of teeth 93 that are sized, spaced, and shaped to engage the apertures 28 on the tubular body 22” (*Id.*, ¶31.) By rotating the handle about the expander apparatus 50’s longitudinal axis, the apparatus causes “expansion of the assembly . . . by rotating the tubular body” (*Id.*, ¶22.) Berry thus discloses

a “tool . . . wherein rotating the tool comprises rotating the tool about a longitudinal axis of the tool while the tool is engaged with the tool-engagement surface.”



(*Id.*, Fig. 3 (annotated).)

As explained above in Section VIII.C, due to Berry’s bevel gear mechanism, “rotating of the tool,” *i.e.*, turning handle 64 of Berry’s expander apparatus 50, “causes a rotation of the turning mechanism,” *i.e.*, Berry’s tubular body, expanding the implant. (*See id.*, ¶¶21-22.) Berry thus discloses “wherein the rotating of the tool causes a rotation of the turning mechanism.”

It would have been obvious for a POSITA to combine the teachings of Yeh and Berry to utilize a tool like Berry’s to rotate Yeh’s adjustment ring 130. (Ex. 1002, ¶57.) For example, a POSITA would have been motivated to use Berry’s expander apparatus 50 with Yeh’s spinal column fixation device, which includes an

adjustment ring 130, because of the benefits that Berry's expander apparatus 50 provides. (*Id.*) As discussed in Section VI.A.2, while increasing the height of the implant, a surgeon would have tried to avoid surgical complications by minimally disturbing the surgical site. The prior art specifically recognized this motivation. For example, Schäfer specifically recognized the undesirability of using a tool for turning a rotating mechanism like Yeh's adjustment ring 30, where the tool "has to be removed and reinserted after it has made a certain turn, e.g., after a quarter turn, which is difficult or even impossible in a great number of surgical interventions." (Ex. 1010, 1:19-23.) Similarly, Berry taught that the use of prior art tools such as a wrench, "requires lateral translation which, in the confined area of the wound, can require an enlarged wound and increased labor and time." (Ex. 1009, ¶6.)

As Mr. Culbert explains, a POSITA would have been motivated to minimize trauma to the patient by using a tool with a handle that a surgeon could rotate about the tool's longitudinal axis to rotate the adjustment ring 130, like Berry's expander apparatus 50. (Ex. 1002, ¶58.) According to Berry, actuation of its tool, "without the use of lateral movement[,] . . . reduc[es] the size of a patient's wound and decreas[es] the time and labor involved to complete the procedure." (Ex. 1009, ¶23.)

Additionally, as Mr. Culbert explains, a POSITA would have known that an insertion tool would be needed to deliver the implant to the intervertebral space. (Ex. 1002, ¶59.) A tool that could be used for both insertion and expansion of the

implant would be preferred because the use of multiple, separate tools could disrupt the patient's surgical opening and require more time and effort by the surgeon. (*Id.*) Berry discloses that the "expander apparatus 50 can be used to facilitate the placement of the assembly 20 inside the vertebral column," and does so by engaging the engager 58 with the tubular body 22, with at least one tooth 93 engaging one of the apertures 28. (Ex. 1009, ¶34.) Similar to Berry's apertures 28, Yeh's implant has tool holes 131 that the teeth 93 could engage. (*See* Ex. 1008, Fig. 3.) Yeh's implant is also cylindrical like Berry's implant such that the c-shaped engager 58 (*see* Ex. 1009, Fig. 3) could fit around the body of Yeh's implant. (Ex. 1002, ¶59.) Because Berry discloses a tool capable of expanding an implant through the same mechanism disclosed in Yeh, and further capable of inserting the implant, a POSITA would have been motivated to use Berry's expander apparatus 50 with Yeh's implant.

A POSITA would also have been motivated to use Yeh's implant over the implant disclosed in Berry, which was previously disclosed on May 5, 1998. In contrast to the fixed endplates of Berry's implant, Yeh's later disclosed implant has top and bottom seats 300, 200 that a surgeon can adjust the angle of to match the curvature of the spine. (*See* Ex. 1008, ¶¶1-2 (disclosing that Yeh is an improvement over a conventional backbone fixation device that cannot be adjusted in angle in relation to the curvature of the spine).) This capability increases the likelihood of

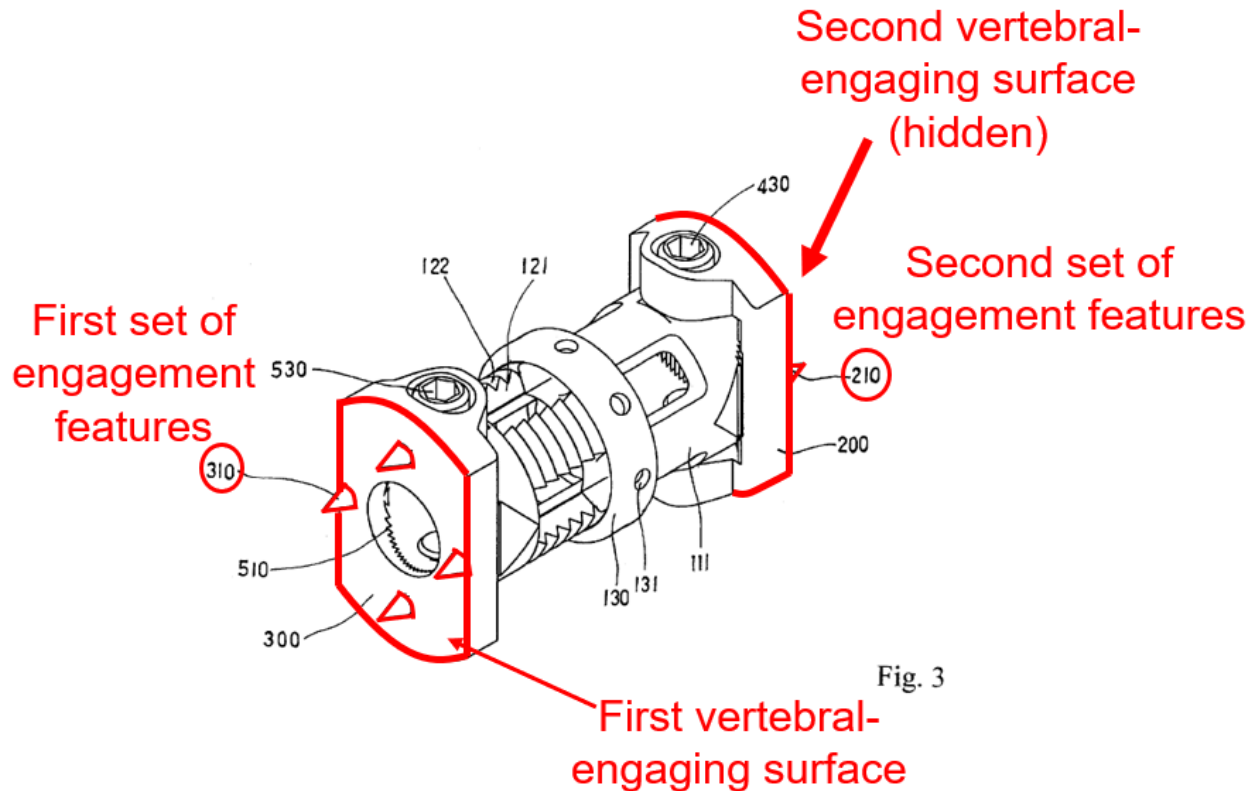
proper fixation over earlier implant designs, such as Berry’s implant. (*See id.*, ¶2; Ex. 1002, ¶60.)

A POSITA would have reasonably expected success in combining Berry’s expander apparatus 50 with Yeh’s spinal column fixation device, which includes an adjustment ring 130. For example, just as the apertures 28 in Berry’s tubular body 22 allow the expander apparatus 50 to rotate the tubular body 22, Yeh’s adjustment ring 130 also has openings in its tool-engagement surface 131. Thus, as Mr. Culbert explains, little to no modifications would be needed to the design of Yeh’s adjustment ring 130 for use with Berry’s expander apparatus 50. (Ex. 1002, ¶61.) But even if any adjustments were needed, those cannot defeat obviousness because obviousness does not require bodily incorporating the teachings of Berry into Yeh. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) (“[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.”).

viii) [1.h]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.h].) As explained in Sections X.D.1.i-iii, Yeh discloses an “**artificial expansile spinal implant**” with a top seat 300 and a bottom seat 200, which include a top surface that forms the “**first vertebral-engaging surface**” and the “**second vertebral-engaging surface**,” respectively. As shown in figure 3 below, Yeh’s vertebral-engaging surfaces include

fixation teeth 310, 210, which are “**the first set**” and “**the second set of engagement features**,” respectively. A POSITA would have understood that Yeh’s fixation teeth 310, 210 are for “**hold[ing] the artificial expansile spinal implant in place.**” (*Id.*)

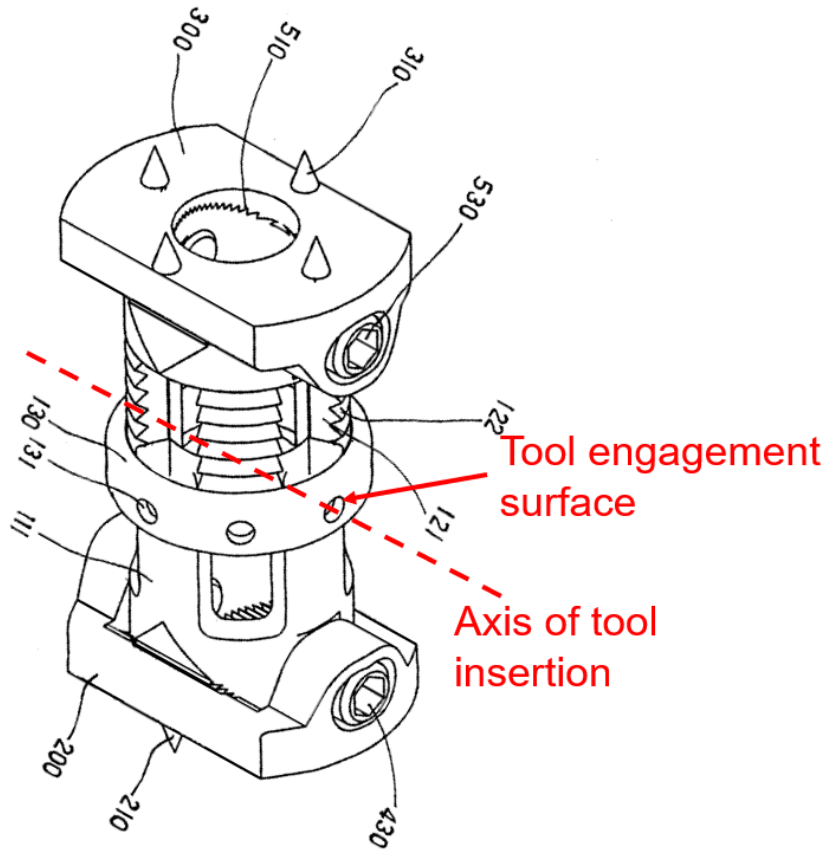


(Ex. 1008, Fig. 3 (annotated).)

Yeh’s “primary objective is to provide a spinal column fixation device” and the implant is intended to be “**introduced into a spine**” between “**opposing vertebral bodies.**” (*Id.*, ¶3; Ex. 1002, Appendix D [1.h].) Yeh thus discloses that the fixation teeth “**engag[e] opposing vertebral bodies to hold the artificial expansile spinal implant in place.**”

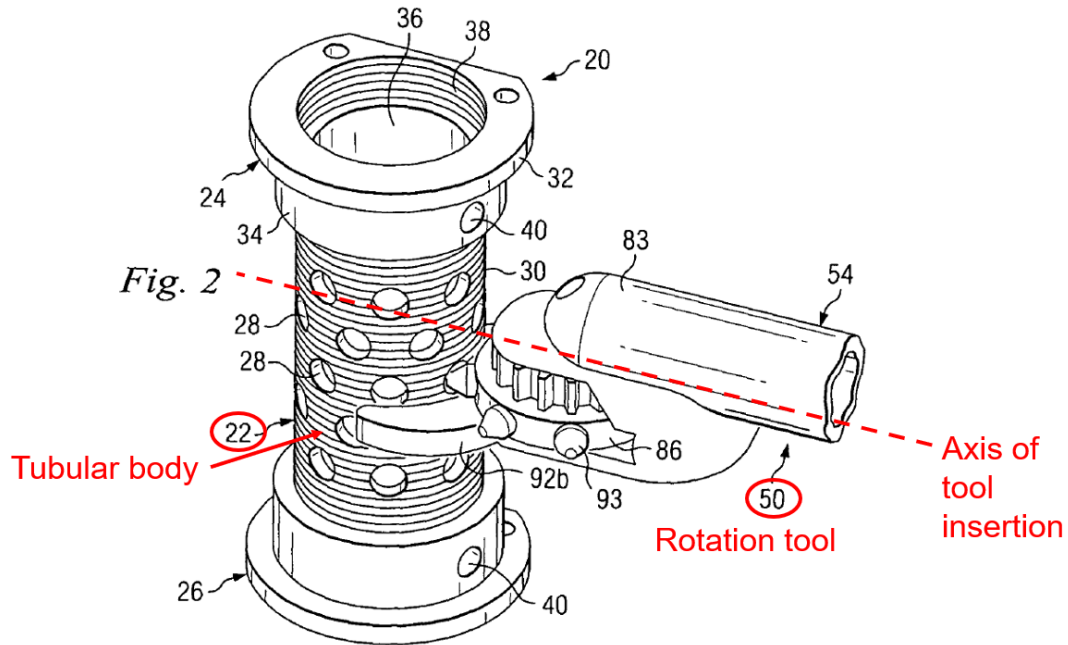
ix) [1.i]

Yeh, either alone or in combination with Berry, discloses this limitation. (Ex. 1002, Appendix D [1.i].) Yeh discloses that “[t]he adjustment of [the] height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (Ex. 1008, ¶26.) As explained in Section X.D.1.iv, the tool holes 131 on the adjustment ring 130 comprise the “**tool-engagement surface of the expansion mechanism.**” Moreover, as shown in figure 3 below, tool holes 131 are “**positioned and configured to be engaged by the tool extending along a direction of insertion,**” because the tool engages with the tool holes on the same longitudinal axis as the tool. (Ex. 1002, Appendix D [1.i].)



(*Id.*, Fig. 3 (annotated).)

As also discussed in Section X.D.1.vii, and as shown in figure 2 below, Berry also discloses a tool that engages “**the tool-engagement surface of the expansion mechanism** [*i.e.*, holes of Yeh’s adjustment ring 130] . . . **along a direction of insertion.**”



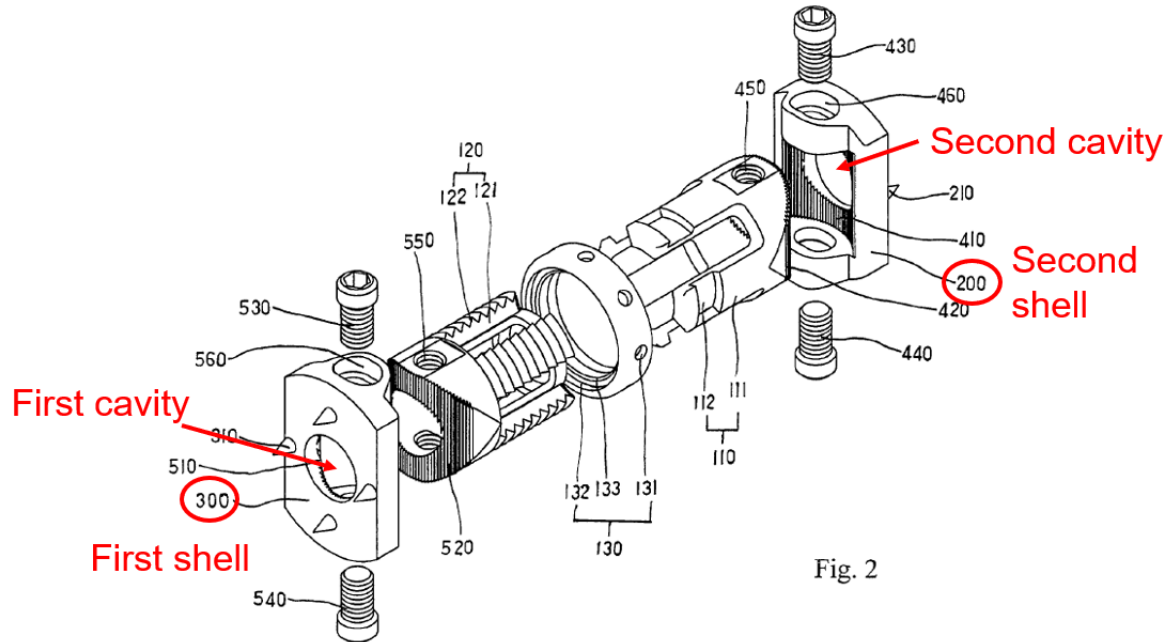
(Ex. 1009, Fig. 2 (annotated).)

Moreover, Berry's tool combined with Yeh's implant also discloses limitation [1.j] because the rotation tool 50 would engage with the tool holes 131 in a similar orientation as shown in figure 2 of Berry.

x) [1.j]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.j].) Yeh discloses that the top seat 300 (**first shell**) includes a “serrated recessed curved surface 510.” (Ex. 1008, ¶21.) The serrated recessed curved surface 510 forms the “**first opposite surface**.” As shown in figure 2 below, both the top and bottom seats 300, 200 have an opening that extends from the top surface of the seat to the serrated recessed curved surface, e.g., 510, 410. Yeh thus discloses a “**first cavity**” that “**extend[s]**

from the first vertebral-engaging surface through the first shell to the first opposite surface.”



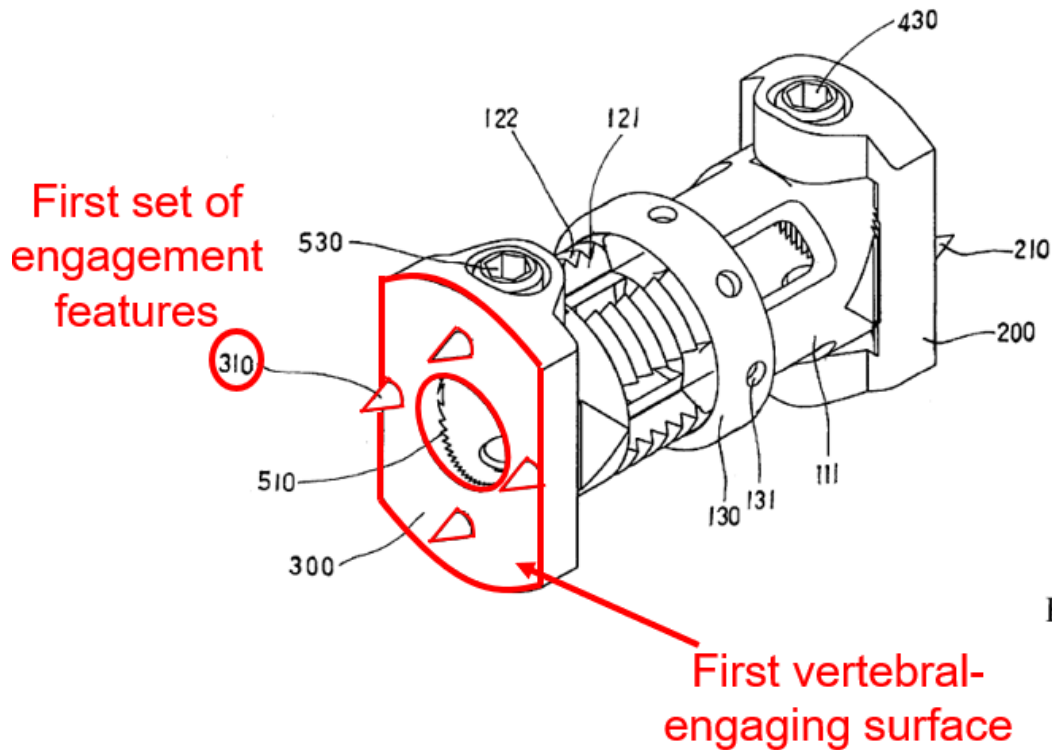
(*Id.*, Fig. 2 (annotated).)

xi) [1.k]

Yeh discloses this limitation. (Ex. 1002, Appendix D [1.k]; *supra*, Section X.D.1.ii.)

2. Claim 2

Yeh discloses this limitation. (Ex. 1002, Appendix D [2].) As discussed in Section X.D.1.ii, Yeh discloses a top seat 300 with a top surface that forms the “**first vertebral-engaging surface.**” The top surface includes fixation teeth 310, which form the “**first set of engagement features.**” (Ex. 1008, ¶21.) As shown in figure 3 below, the fixation teeth 310 have “**substantially conical tips.**”



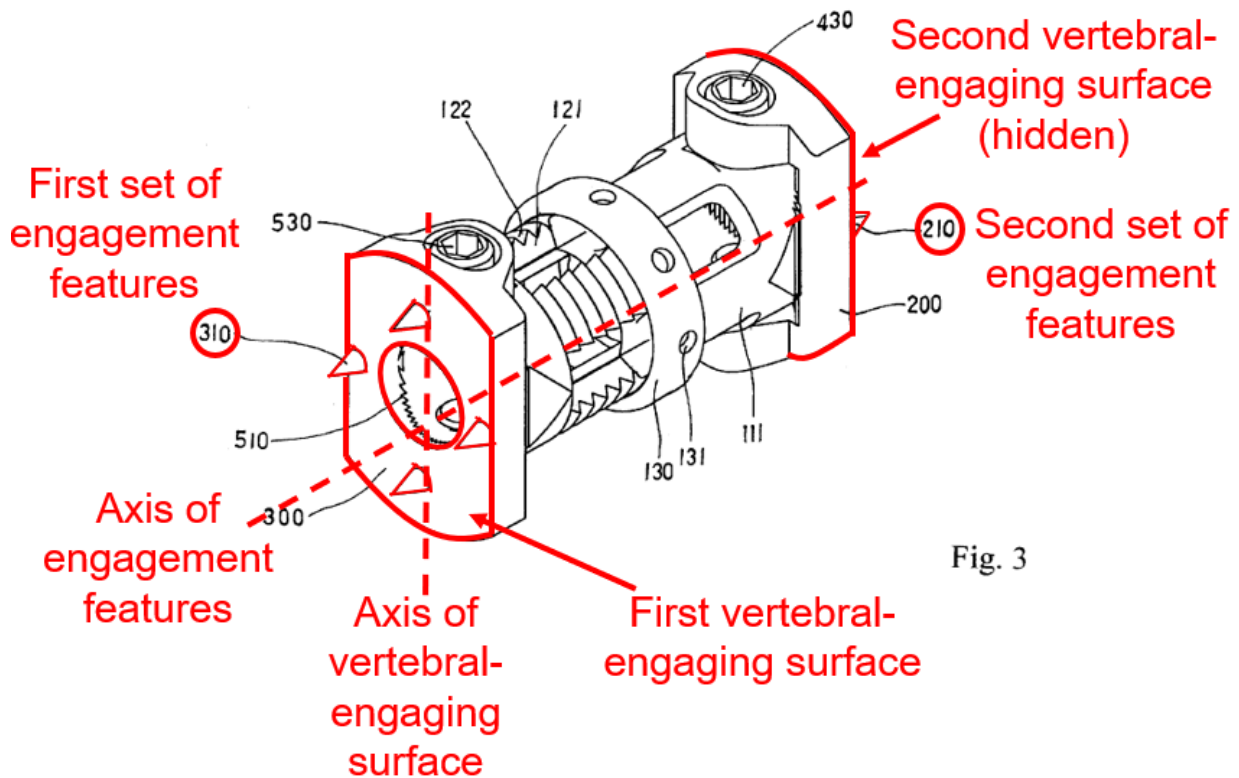
(*Id.*, Fig. 3 (annotated).)

As explained in Section X.D.1.viii, Yeh’s “primary objective is to provide a spinal column fixation device” and Yeh’s implant is intended to be “**introduced into a spine and expanded.**” (*Id.*, ¶3.) The fixation teeth 310 have “**substantially conical tips**” so that they may “**pierce [the] endplates of the opposing vertebral bodies when introduced into the spine and expanded.**” (Ex. 1002, Appendix D [2].)

3. Claim 3

Yeh discloses this limitation. (Ex. 1002, Appendix D [3].) As discussed in Section X.D.1.ii, Yeh discloses a top seat 300, which includes an outer surface that forms the “**first vertebral-engaging surface.**” The top surface also includes fixation teeth 310, which form the “**first set of engagement features.**” (Ex. 1008, ¶21.) Yeh also discusses a bottom seat 200, which includes an outer surface that forms the “**second vertebral-engaging surface.**” (*See supra* Section X.D.1.iii.) Like the first vertebral-engaging surface, the second vertebral-engaging surface includes fixation teeth 210, which form the “**second set of engagement features.**” (*Id.*)

As shown in figure 3 below, fixation teeth 310 “**extend from the [] vertebral-engaging surface[s] in directions perpendicular to the first . . . vertebral engaging surfaces.**” For the same reasons, fixation teeth 210 also “**extend from the [] vertebral-engaging surface[s] in directions perpendicular to the . . . second vertebral engaging surfaces.**”



(Ex. 1008, Fig. 3 (annotated).)

4. Claim 4

Yeh discloses this limitation. (Ex. 1002, Appendix D [4].) Yeh discloses that the bottom seat 200 (**second shell**) includes a serrated recessed surface 410 which forms the **second opposite surface**. (Ex. 1008, ¶21.) As shown in figure 2 below, both the top and bottom seats 300, 200 have an opening that extends from the vertebrae-contacting surface of the seat to the serrated recessed curved surface, *e.g.*, 410. A POSITA would have thus understood that the opening in the bottom seat 200 comprises the “**second cavity extending from the second vertebral-engaging**

surface through the second shell to the second opposite surface.” (Ex. 1002, Appendix D [4].)

Based on the disclosure of teeth 210 and 310, a POSITA would have also understood that fixation teeth 210 are positioned “**circumferentially about the second cavity,**” as fixation teeth 310 are about the first cavity. (*See supra* Section X.D.1.xi; Ex. 1002, Appendix D [4].) In other words, a POSITA would have understood that the configuration of the **second set of engagement features** on the vertebral-engaging surface of seat 200 would be the same as that of the **first set of engagement features**, since they both serve the same purpose, *i.e.*, engaging opposing vertebrae, and there is no disclosure to the contrary in Yeh. (Ex. 1002, Appendix D [4].) This understanding is confirmed by figure 4a below, which shows a front view of bottom seat 200 with multiple fixation teeth 210. When considered in the context of figure 2 and the specification disclosure, Yeh discloses a “**second set of vertebral engaging features [] positioned on the second vertebral-engaging surface circumferentially about the second cavity.**” (*Id.*)

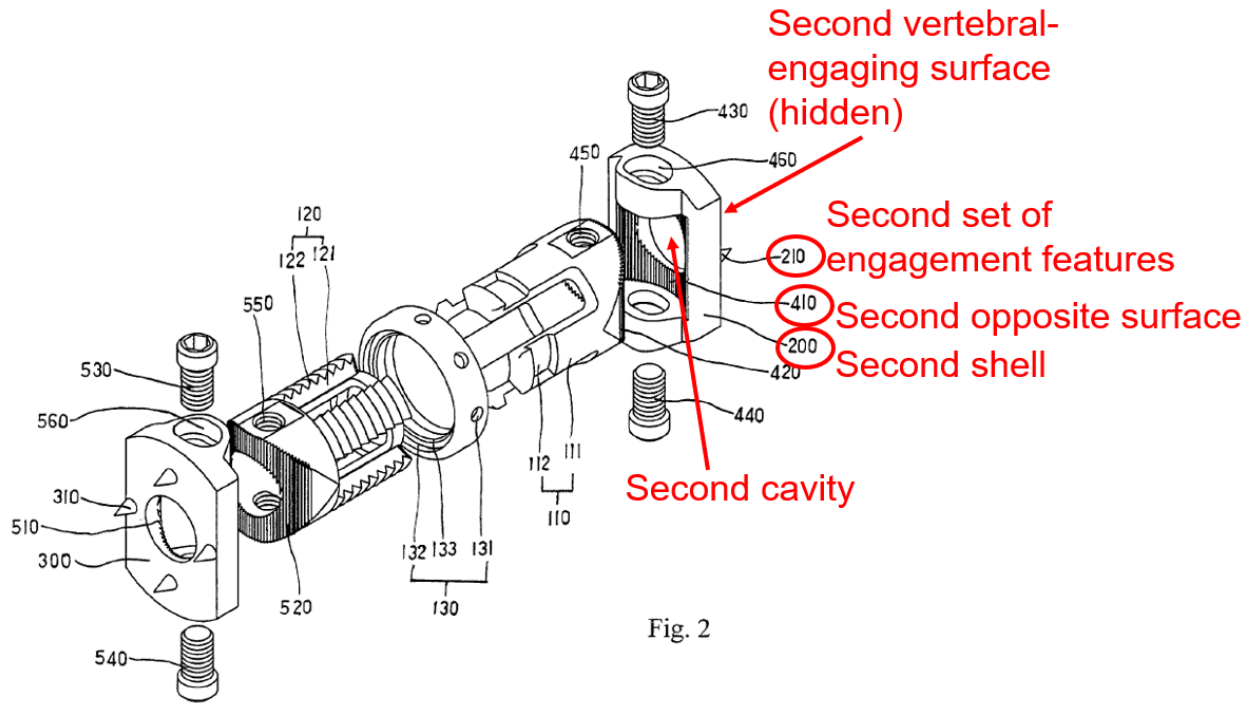


Fig. 2

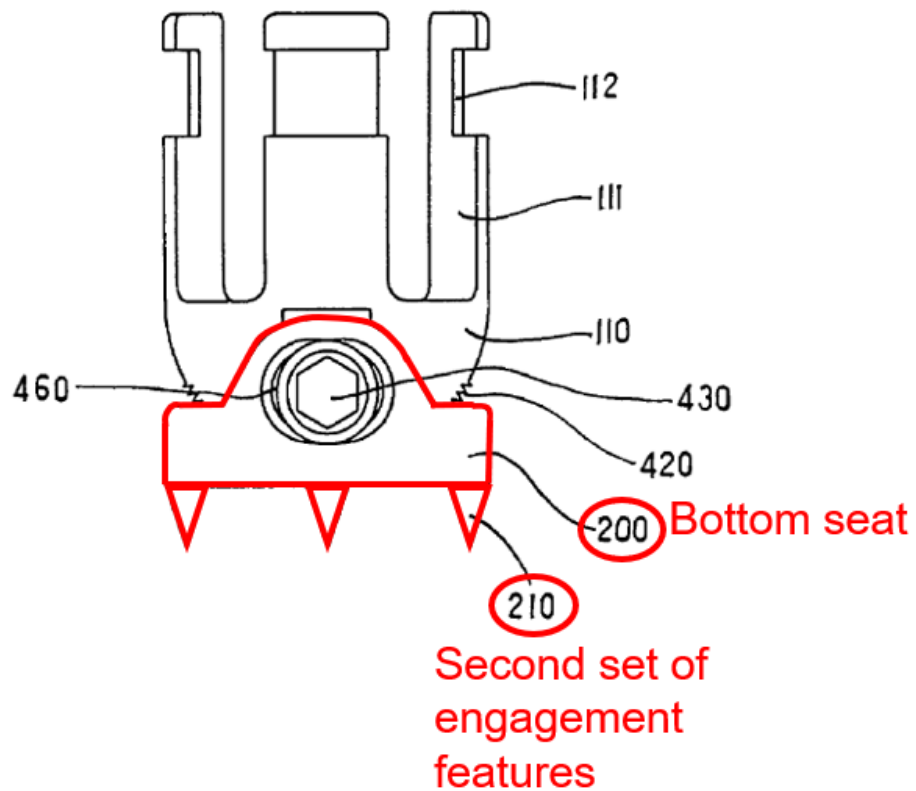
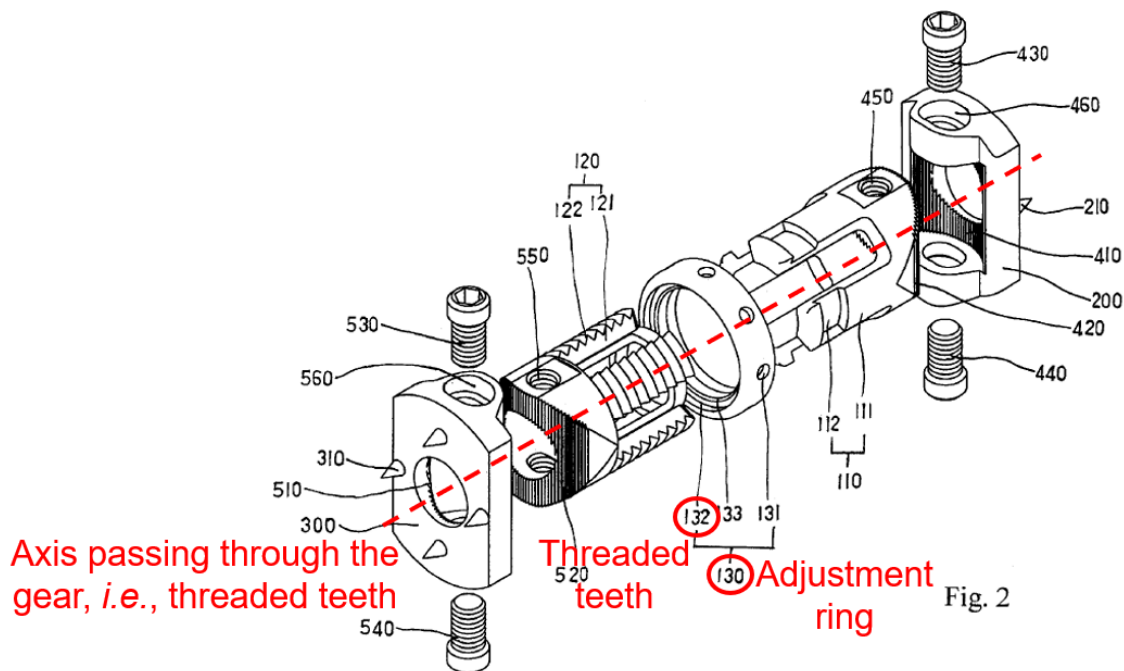


Fig. 4a

(Ex. 1008, Figs. 2, 4a (both annotated).)

5. Claim 8

Yeh discloses this limitation. (Ex. 1002, Appendix D [8].) The adjustment ring 130 in combination with the upper and lower support members comprise the **expansion mechanism**. (See *supra* Section X.D.1.iv.) Yeh further discloses that adjustment ring 130 has “threaded teeth 132.” (Ex. 1008, ¶21.) Adjustment ring 130, and with it, threaded teeth 132, rotate about a longitudinal axis passing through the implant (*see supra* Section X.D.1.iv). Thus, consistent with Patent Owner’s infringement contentions (Ex. 1051, 6, 19), Yeh’s threaded teeth 132 constitute a **rotatable gear**. (Ex. 1008, ¶26.) Alternatively, the adjustment ring 130 is a **rotatable gear**. Yeh thus discloses an expansion mechanism “**wherein the expansion mechanism further comprises a rotatable gear.**”



(*Id.*, Fig. 2 (annotated).)

6. Claim 10

Yeh discloses this limitation. (Ex. 1002, Appendix D [10].) As discussed in Section IX, to the extent this limitation is construed as an orifice in the implant that can receive bone fusion material, Yeh's implant has a cavity in the top and bottom seats. (*See supra* Sections X.D.1.x and X.D.4.) As Mr. Culbert explains, a POSITA would have understood that bone fusion material could be placed into the first and second cavities of Yeh's implant. (Ex. 1002, Appendix D [10].) Yeh thus discloses **“the artificial expansile spinal implant further comprises means for placement of a bone fusion material.”**

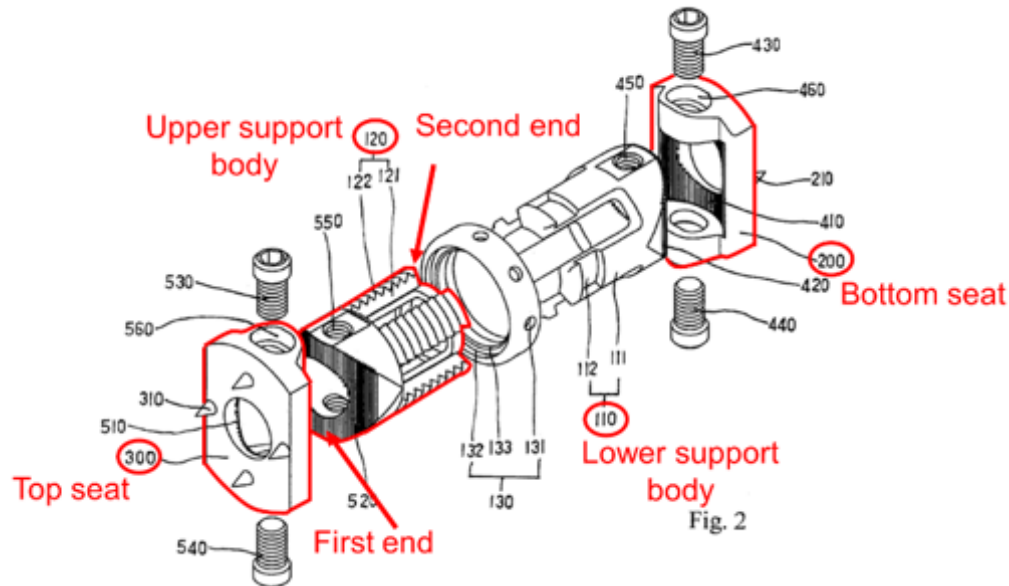
7. Claim 11

Yeh discloses this limitation. (Ex. 1002, Appendix D [11].) As discussed in Section X.D.1.iv, Yeh's upper support body 120 comprises **“the threaded body.”** Further, as shown in figures 6a and 6b of Yeh, the adjustment ring 130 has “threaded teeth 132 (shown in Fig. 2)” which engage with “threaded teeth 122” of the upper support body 120 to enable “the adjustment of height of the support member” by “rotat[ing] the adjustment ring 130.” (Ex. 1008, ¶¶21, 26.) Thus, **“the turning mechanism,”** *i.e.*, the adjustment ring 130, **“engages threads of the threaded body.”**

As discussed in Section X.D.1.iv, Yeh also discloses that **“the first end of the threaded body is coupled to the first shell,”** because the “upper seat 300 and the

upper support body 120 are joined together . . . [with] fixation screw[s]” 530, 540 at one end of the upper support body. (*Id.*, ¶24, Figs. 2, 3.) Yeh also discloses that consistent with Patent Owner’s contention (Ex. 1051, 7), “**the second end of the threaded body is coupled to the second shell**” because the lower seat 200 and the lower support body 110 are joined together with fixation screws 430, 440, and the

lower support body 110 is further coupled to the second end of the upper support body 120 via adjustment ring 130. (*Id.*, ¶22, Figs. 2, 3.⁸)



(*Id.*, Fig. 2 (annotated).)

8. Claim 12

i) [12.a], [12.b], [12.c]

Yeh discloses these limitations for reasons similar to those discussed above for claim for claim limitations [1.a], [1.b], and [1.c]. (*Supra*, Sections X.D.1.i-iii; Ex. 1002, Appendix D [12.a]-[12.c].)

ii) [12.d]

⁸ The above analysis is consistent with Patent Owner's infringement contentions.

(*See* Ex. 1051, 7.)

Yeh discloses these limitations for reasons similar to those discussed above for claims [1.d] and [8]. (*Supra*, Sections X.D.1.iv, X.D.5; Ex. 1002, Appendix D [12.d].) In particular, Yeh discloses an **expansion mechanism**, comprising the upper support body 120, the lower support body 110, and the adjustment ring 130, that is positioned between the bottom seat 200 and top seat 300. (Ex. 1008, ¶21, Figs. 2, 3.) The adjustment ring 130 is a **rotating gear** and the contours of the tool holes 131 constitute a **tool-engagement surface**.

iii) [12.e]

Yeh discloses this limitation for reasons similar to those discussed above for claims for claim [1.f]. (*Supra*, Section X.D.1.vi; Ex. 1002, Appendix D [12.e].)

iv) [12.f]

Yeh discloses these limitations for reasons similar to those discussed above for claims [1.g] and [8]. (*Supra*, Sections X.D.1.vii, X.D.5; Ex. 1002, Appendix D [12.f].)

v) [12.g]

Yeh discloses this limitation for reasons similar to those discussed above for claim [1.h]. (*Supra*, Section X.D.1.viii; Ex. 1002, Appendix D [12.g].)

vi) [12.h]

Yeh discloses this limitation for reasons similar to those discussed above for claims for claim [1.i]. (*Supra*, Section X.D.1.ix; Ex. 1002, Appendix D [12.h].)

vii) [12.i]

Yeh discloses this limitation for reasons similar to those discussed above for claims for claim [1.j]. (*Supra*, Section X.D.1.x; Ex. 1002, Appendix D [12.i].)

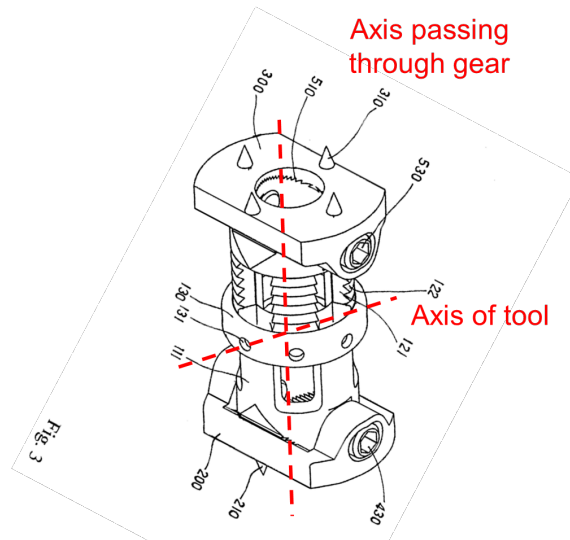
viii) [12.j]

Yeh discloses this limitation for reasons similar to those discussed above for claims for claim [1.k]. (*Supra*, Section X.D.1.xi; Ex. 1002, Appendix D [12.j].)

9. Claim 17

Yeh in combination with Berry discloses this limitation. (Ex. 1002, Appendix D [17].) Yeh discloses that “[t]he adjustment of [the] height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (Ex. 1008, ¶26.) As shown in figure 3 below, the axis passing

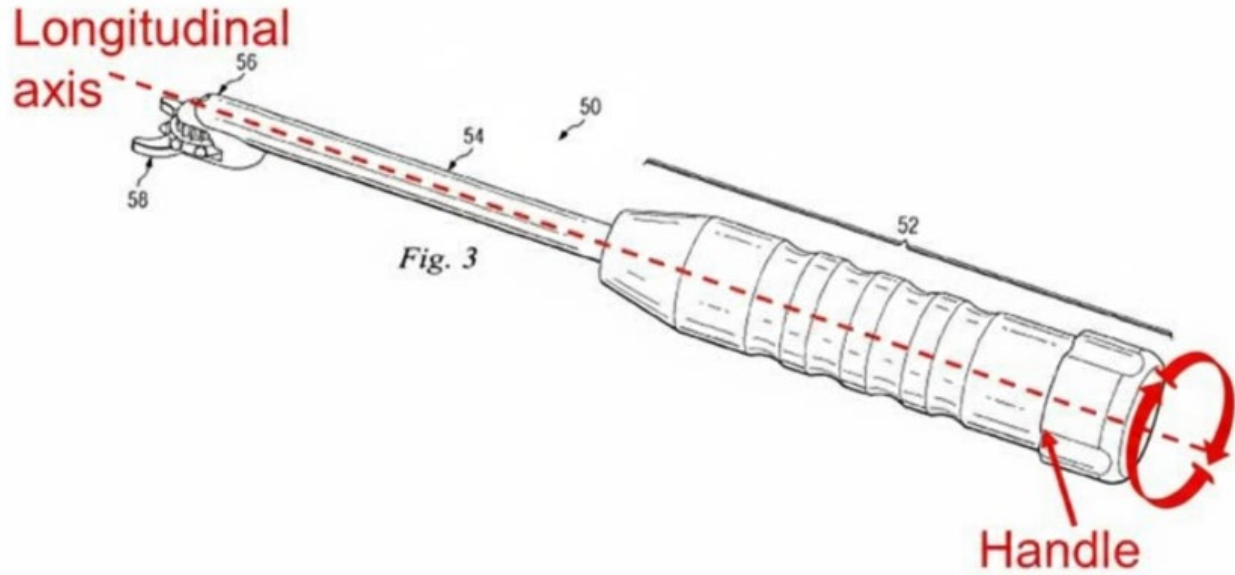
through the adjustment ring 130 (**the gear**) extends from the top seat to the bottom seat. (Ex. 1002, Appendix D [17].)



(Ex. 1008, Fig. 3 (annotated).)

As discussed in Section X.D.1.vii, Berry discloses a tool, *i.e.*, expander apparatus 50, that can expand the implant assembly while the tool is engaged with the tool-engagement surface, *i.e.*, apertures 28. Berry's tool would similarly interact with the holes in Yeh's adjustment ring such that the longitudinal axis of the tool is

perpendicular to the axis of Yeh's adjustment ring 130. (Ex. 1002, Appendix D [17];
see supra Section X.D.1.vii; Ex. 1009, Fig. 2.)



(Ex. 1009, Fig. 3 (annotated).)

Yeh in combination with Berry thus discloses a tool “**wherein the axis passing through the gear is perpendicular to the longitudinal axis of the tool.**”

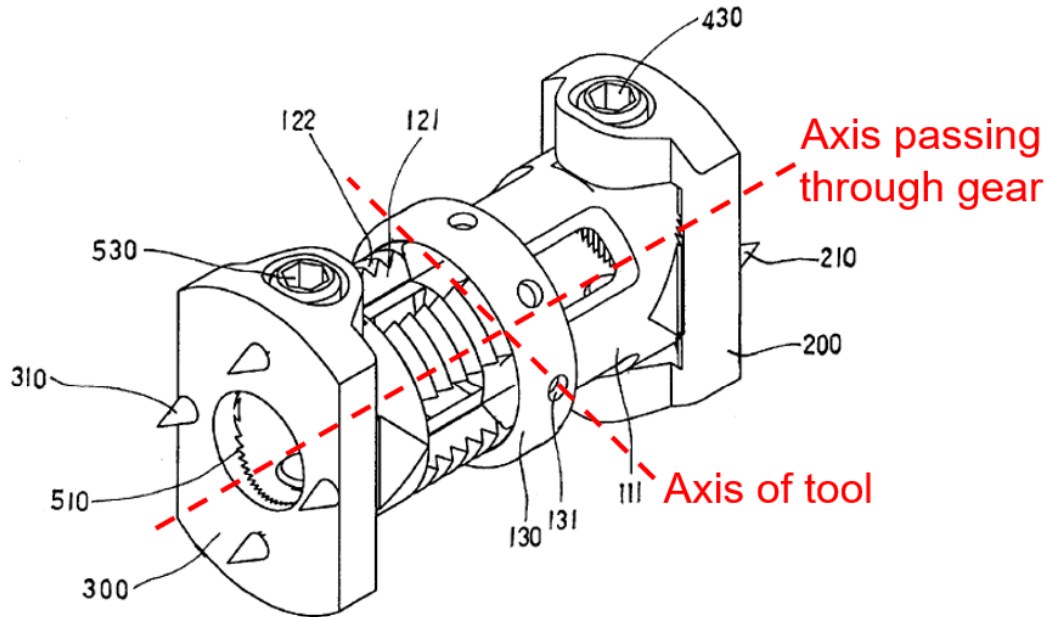


Fig. 3

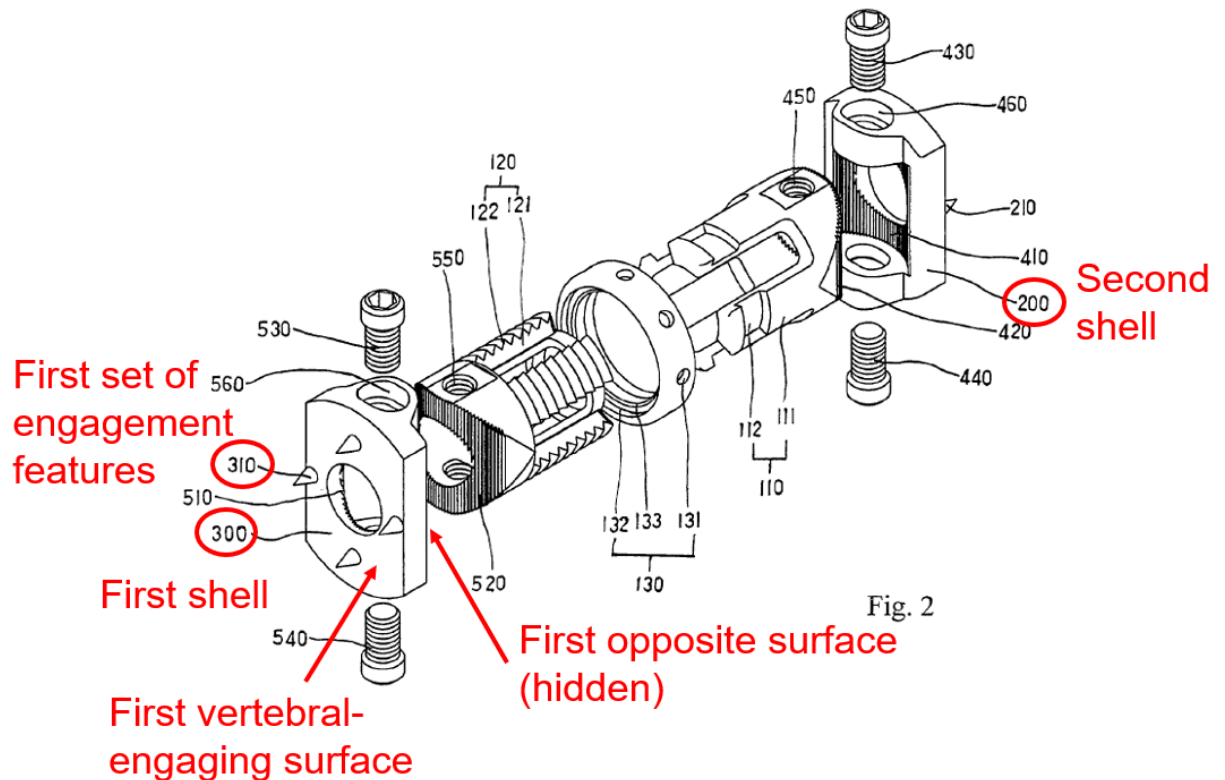
(Ex. 1008, Fig. 3 (annotated).)

E. Ground 5: Yeh, Berry, and Schäfer Render Obvious Claims 5-6 and 18-19 of the '755 Patent

1. Claim 5

The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation. (Ex. 1002, ¶¶62-66, Appendix E [5].) As shown in figure 2 below, the perimeters of the first and second vertebral-engaging surfaces, which constitute the **first perimeter of the first shell** and the **second perimeter of the second shell**, are not circular. Consistent with the '755 patent in which the perimeter

of the shells of the implant is only partially circular (*see* Ex. 1001, Figs. 7A, 7B),
Yeh discloses claim 5.



(Ex. 1008, Fig. 2 (annotated).)

Moreover, a POSITA would have understood that the perimeters of Yeh's top and bottom seats could have been easily modified to be circular. (Ex. 1002, ¶63.) Schäfer discloses such a configuration. (*See* above analysis for claim [5] in Section X.B.4.)

A POSITA would have found it obvious to modify the vertebral engagement surfaces in Yeh to have a continuous curve in view of Schäfer. (Ex. 1002, ¶64.) Both Yeh and Schäfer disclose expandable intervertebral implants that rotate to

expand and that engage with the vertebral surfaces. As Mr. Culbert explains, the continuous curve of Schäfer's shells would have been interchangeable with the partial curve of Yeh's shells for a POSA seeking an implant that follows the curve of the vertebrae. (*Id.*) Additionally, a POSITA would have understood that changing the perimeter shape of an intervertebral device is a routine type of modification. (*Id.*)

In fact, a POSITA would have been motivated to configure the vertebral engagement surfaces of the shells in Yeh such that they continuously curve like in Schäfer because such shells would help mitigate the risk of subsidence. (*Id.*, ¶65.⁹) As explained by Mr. Culbert, because the vertebral end plates, *i.e.*, the part of the vertebral body that contacts the implant, are "oval-shaped," a POSITA would have known that shells shaped-like Schäfer's would contact more of the oval-shaped peripheral part of the endplate, thereby mitigating the risk of subsidence. (*Id.*)

A POSITA would have reasonably expected success in combining the continuously curving shell shape of Schäfer with Yeh's implant. (*Id.*, ¶66.) Changing the shape of the vertebral engaging surfaces of the top and bottom seat

⁹ 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."

would not have hindered or altered the operation of Yeh's expandable device. For example, the fixation teeth 310 would continue to be arranged in a circular manner around a hole, or cavity, in the top and bottom seats. (*Id.*)

2. Claim 6

The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation. (Ex. 1002, Appendix E [6].) As discussed above in Section X.E.1, Yeh's implant is modified to have a circular outer perimeter on the vertebral body engagement surface. Such a perimeter is shaped to **correspond to a shape of a vertebral body**. (*See supra* Section X.A.19.)

3. Claim 18

The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation for the reasons discussed above with respect to claim 5. (Ex. 1002, ¶¶62-66, Appendix E [18]; *see supra* Section X.E.1.)

4. Claim 19

The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation for the reasons discussed above with respect to claim 6. (Ex. 1002, Appendix E [19]; *see supra* Section X.E.2.)

F. Ground 6: Yeh, Berry, and Suddaby Render Obvious Claims 9 and 20 of the '755 Patent

1. Claim 9

Yeh and Berry in view of Suddaby discloses this limitation. (Ex. 1002, Appendix F [9].) Yeh's specification is silent as to the material of the implant. As discussed in Section VIII.D, however, Suddaby discloses an intervertebral implant that is "made of titanium" with two shells and a rotational expansion mechanism containing a threaded body. (Ex. 1011, 2:29-33, 2:64-66, 4:9-19.) Suddaby thus discloses that **"the first shell and the second shell each comprise titanium."**

A POSITA would have been motivated to use titanium shells for Yeh's implant because titanium was known to have "outstanding features" for implants *see* Ex. 1050, 1 and according to Suddaby, its implant is "easy to manufacture from common materials." (Ex. 1011, 2:26-28.) A POSITA would have reasonably expected success in combining the implant system of Yeh with titanium disclosed in Suddaby because titanium spinal implants have been made and used clinically for decades. As Mr. Culbert explains, as of the priority date of the '755 patent, titanium was the standard material used for intervertebral implants like the one disclosed in Yeh due to its strength, weight, and biocompatibility. (Ex. 1002, Appendix F [9].)

2. Claim 20

Yeh and Berry in view of Suddaby discloses this limitation. (Ex. 1002, Appendix F [20].) (*See supra* Section X.F.1.)

XI. CONCLUSION

Petitioner requests institution of IPR for claims 1-6, 8-12, and 17-20 of the '755 patent based on the grounds specified in this petition.

Respectfully submitted,

Dated: November 10, 2025

By: /Naveen Modi/
Naveen Modi (Reg. No. 46,224)
Counsel for Petitioner

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing
Petition for *Inter Partes* Review of U.S. Patent No. 11,864,755 contains, as
measured by the word-processing system used to prepare this paper, 13,952 words.
This word count does not include the items excluded by 37 C.F.R. § 42.24 as not
counting towards the word limit.

Respectfully submitted,

Dated: November 10, 2025

By: /Naveen Modi/
Naveen Modi (Reg. No. 46,224)
Counsel for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on November 10, 2025, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 11,864,755 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on Patent Center:

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Naveen Modi (Reg. No. 46,224)