

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

**DECLARATION OF MR. BRAD CULBERT
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,864,755**

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	BACKGROUND AND QUALIFICATIONS	1
III.	MATERIALS REVIEWED	4
IV.	PERSON OF ORDINARY SKILL IN THE ART	7
V.	TECHNICAL BACKGROUND	8
A.	Anatomy of the Spine and Vertebral Bodies.....	8
B.	Vertebral Body Replacement Device.....	9
VI.	THE '755 PATENT	14
VII.	CLAIM CONSTRUCTION	16
VIII.	THE PRIOR ART	17
A.	Schäfer.....	17
1.	Overview	17
2.	Schäfer Discloses a “Tool” that Rotates “About a Longitudinal Axis of the Tool”to “Cause[] a Rotation of the Turning Mechanism”.....	20
3.	Schäfer in Combination with Yeh Discloses“Substantially Conical Tips”	26
B.	Yeh & Berry	29
1.	Overview of Yeh	29
2.	Overview of Berry.....	30
3.	Yeh in Combination with Berry Discloses or Suggests a “Tool” That Rotates “About a Longitudinal Axis of the Tool”to “Cause[] a Rotation of the Turning Mechanism”	33
4.	A POSITA Would Have Been Motivated to Configure the Perimeter of Yeh’s Shells to be Circular and Would Have Expected Reasonable Success In Doing So	40
IX.	CONCLUSION.....	45
	APPENDIX A.....	46
	APPENDIX B	74

Declaration of Mr. Brad Culbert
U.S. Patent No. 11,864,755

APPENDIX C	78
APPENDIX D	80
APPENDIX E	109
APPENDIX F	111

I, Brad Culbert, declare as follows:

I. INTRODUCTION

1. I have been retained as an independent expert consultant by Medtronic, Inc. (“Petitioner”) in this proceeding before the United States Patent and Trademark Office regarding U.S. Patent No. 11,864,755 (“the ’755 patent”) (Ex. 1001) assigned to Moskowitz Family LLC (“Patent Owner”).¹ I have been asked to consider whether prior art references disclose or suggest the features recited in claims 1-6, 8-12, and 17-20 (the “challenged claims”) of the ’755 patent. My opinions are set forth below.

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

II. BACKGROUND AND QUALIFICATIONS

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

¹ In this Declaration, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the ’755 patent.

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

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

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

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

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

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

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

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

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

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

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

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

III. MATERIALS REVIEWED

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

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

Ex. 1001	U.S. Patent No. 11,864,755 to Moskowitz et al. (“the ’755 patent”)
Ex. 1004	File History for U.S. Patent No. 11,864,755
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. 1020	Phulchand Prithvi Raj, <i>Intervertebral Disc: Anatomy-Physiology-Pathophysiology-Treatment</i> , 8(1) PAIN PRACT. 18 (2008)
Ex. 1031	Daniela Alexandru and William So, <i>Evaluation and Management of Vertebral Compression Fractures</i> , 16(4) PERM J. 46 (2012)
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)

Declaration of Mr. Brad Culbert
U.S. Patent No. 11,864,755

Ex. 1035	U.S. Patent No. 4,657,550 to Daher (“Daher”)
Ex. 1036	U.S. Patent No. 6,752,832 to Neumann (“Neumann”)
Ex. 1050	Ortrun Pohler, <i>Unalloyed titanium for implants in bone surgery</i> , 31 INJURY 7 (2000)
Ex. 1051	Amended Complaint, Exhibit J1, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 27-26.
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)

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

18. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the state of the art, the prior art, and the claims and the specification of the ’755 patent at the time of the alleged invention, which I discuss below.

19. I have been asked to consider that the time of the alleged invention of the ’755 patent was early-2000s (including the time leading up to August 23, 2005).²

² The ’755 patent claims priority to U.S. Application No. 11/208,644, filed on August 23, 2005.

20. Based on my experience and expertise, it is my opinion that certain references disclose or suggest all of the features recited in claims 1-6, 8-12, and 17-20 of the '755 patent, as I discuss in detail below.

IV. PERSON OF ORDINARY SKILL IN THE ART

21. I am familiar with the level of ordinary skill in the art regarding the '755 patent in the early-2000s. Considering the '755 patent, the technology, the educational level and experience of workers in the field relating to the patent, and problems and solutions in that field, and drawing on my own experience, I believe a person of ordinary skill in the art (a "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. A person could have qualified as a POSITA with some combination of (a) more formal education and less technical or professional experience in the listed fields, or (b) less formal education and more technical or professional experience in the listed fields. In other words, more education can supplement practical experience and vice versa. For example, a POSITA could have an advanced degree, in the technical disciplines provided above, or a Doctor of Medicine, and at least two years of experience in the subject areas provided above.

22. My opinions in this Declaration regarding the '755 patent and the prior art (including the state of the art) are from the perspective of a POSITA during the relevant timeframe, as I defined above.

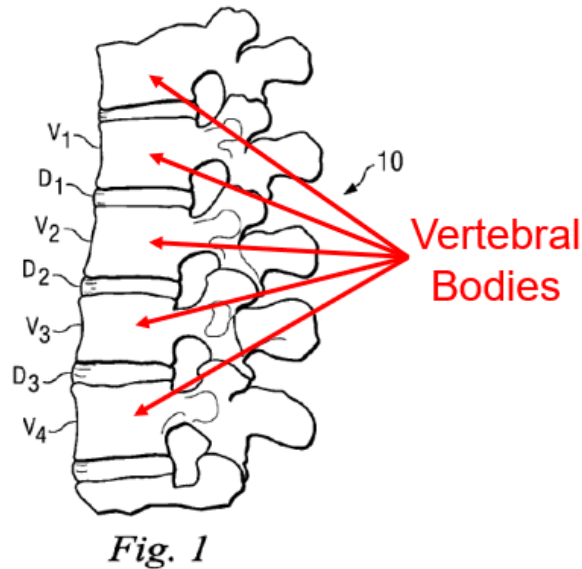
V. TECHNICAL BACKGROUND

23. Below, I present a brief overview of the anatomy of the spine and intervertebral fusion devices, including several advancements in the field. The functionalities and concepts I describe below in this technical background section reflect the state of the art that a POSITA would have understood prior to and at the time of the alleged invention of the '755 patent. I rely on and incorporate as applicable (even if not expressly mentioned below) the following disclosures and opinions to support my opinions in this Declaration, including those opinions relating to how the prior art discloses or suggests the subject matter of the challenged claim of the '755 patent, as I explain below in Section VIII and in the Appendices. The concepts below would have been within the knowledge and mindset of a POSITA during the relevant time frame (early-2000s, including the time leading up to August 23, 2005).

A. Anatomy of the Spine and Vertebral Bodies

24. The human spine, or spinal column, is the body's central support structure that protects the spinal cord and allows flexibility for movement. (See Ex. 1020, 1-2.) 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.)



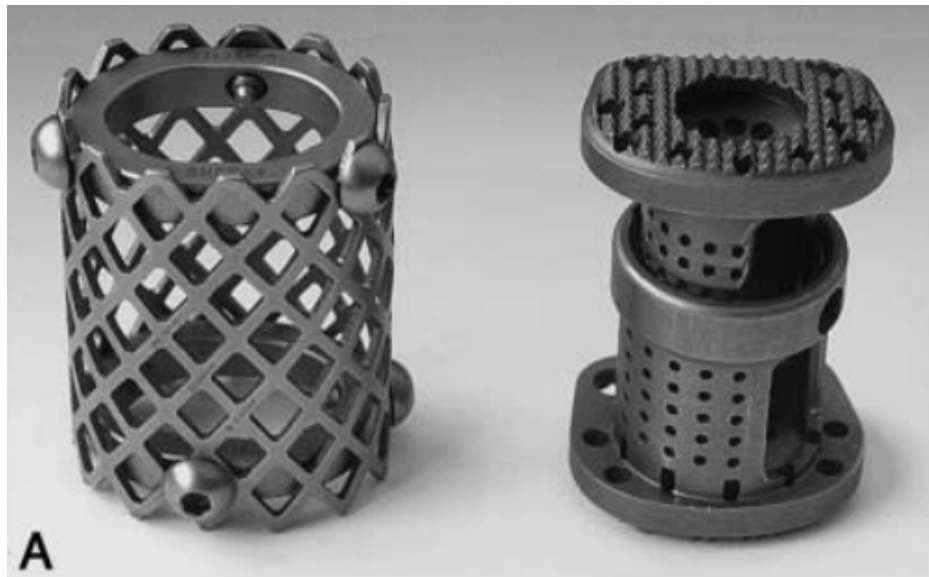
(*Id.*, Fig. 1 (annotated).)

25. 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.)

B. Vertebral Body Replacement Device

26. 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.) By the late 1990s, STRATEC Medical introduced an

expandable vertebral body replacement called “Synex™,” as shown in figure 1A (right). (*Id.*) This expandable device was found to withstand compressive forces better than a non-expandable mesh cage. (*Id.*, 1.) The cylindrical shape of non-expandable and expandable implants was a common design choice because it closely mimics the natural contour of the vertebral body, providing uniform load distribution towards the outer edges of the vertebral endplates where the endplates are stronger.



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

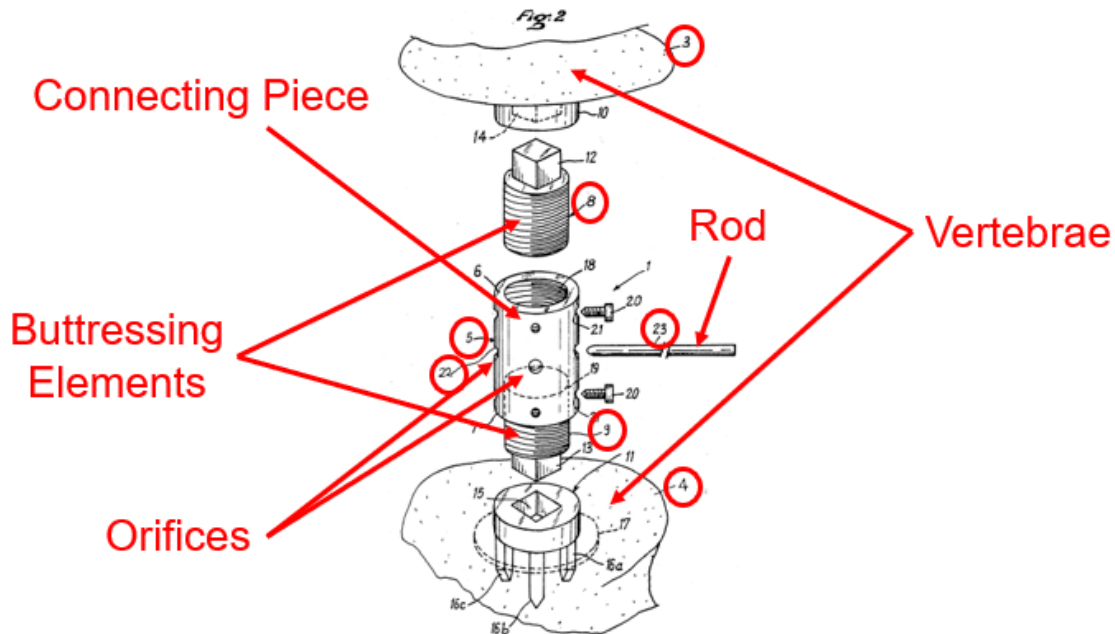
27. Expandable vertebral body replacement devices were used on patients in the United States since the early 2000s. (Ex. 1033, 1.) As shown below, in one study, one device included three attachable parts, assembled by aligning the “match grooves” on the same side and then screwing the two end pieces to the middle piece. (*Id.*, 3.) “The cage [could] be expanded either with an expansion instrument or wrench.” (*Id.*) Although the expansion instrument or wrench is not described or

shown, the appropriate tool would have been one designed to minimize lateral movement. Minimizing such movement is critical, as it helps prevent widening of the surgical opening and reduces the risk of injury to adjacent structures, including nerves and soft tissues.



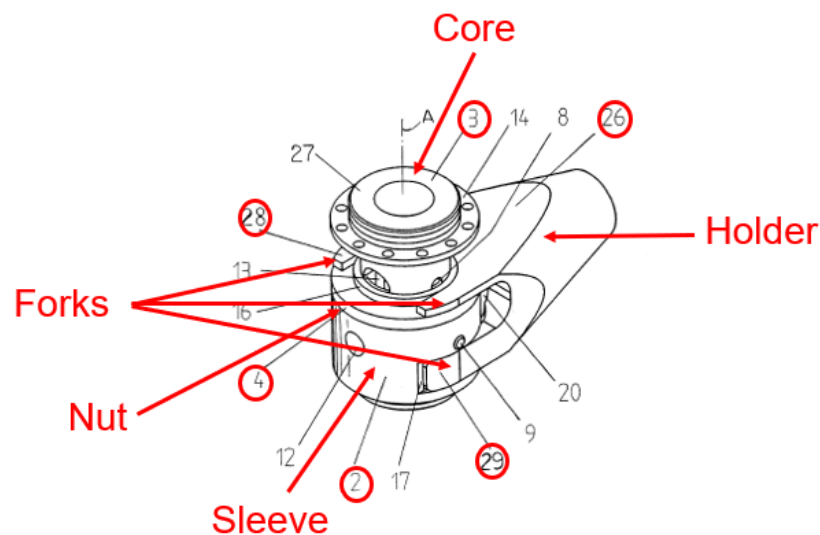
(*Id.*, Fig. 1.)

28. 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). As shown in the figures below, the implant maintains the spacing between vertebrae 3, 4, after removing the intervening vertebra and discs. (*Id.*, 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.)

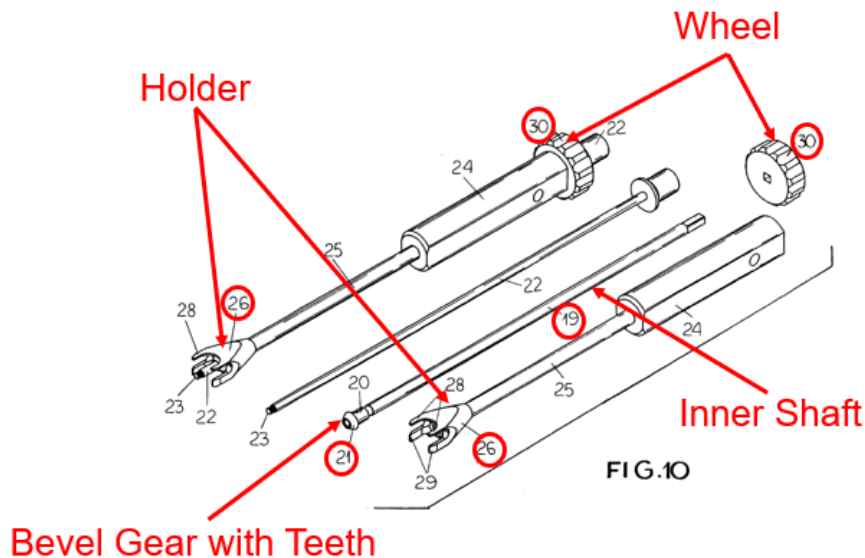


(*Id.*, Fig. 2 (annotated).)

29. 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). Neumann’s tool expands the implant through a surgical opening that is just large enough to accommodate insertion of the implant. (Ex. 1036, 1:61-63.) As shown in figures 1 and 12 below, the implant is inserted between vertebrae by forks 28, 29 on holder 26. (*Id.*, 4:1-15.) Further, Neumann’s tool includes an inner shaft 19, which has a bevel gear with teeth 21 that fit within openings in nut 4 of the implant. (*Id.*, 4:18-23, Fig. 10.) Turning wheel 30 about the longitudinal axis of the tool causes rotation of inner shaft 19, bevel gear with teeth 21, and ultimately nut 4. (*Id.*, 4:27-30.) Rotation of nut 4, in turn, screws the core 3 away from the sleeve 2, which increases



13



(*Id.*, Figs. 1, 10, 12 (all annotated).)

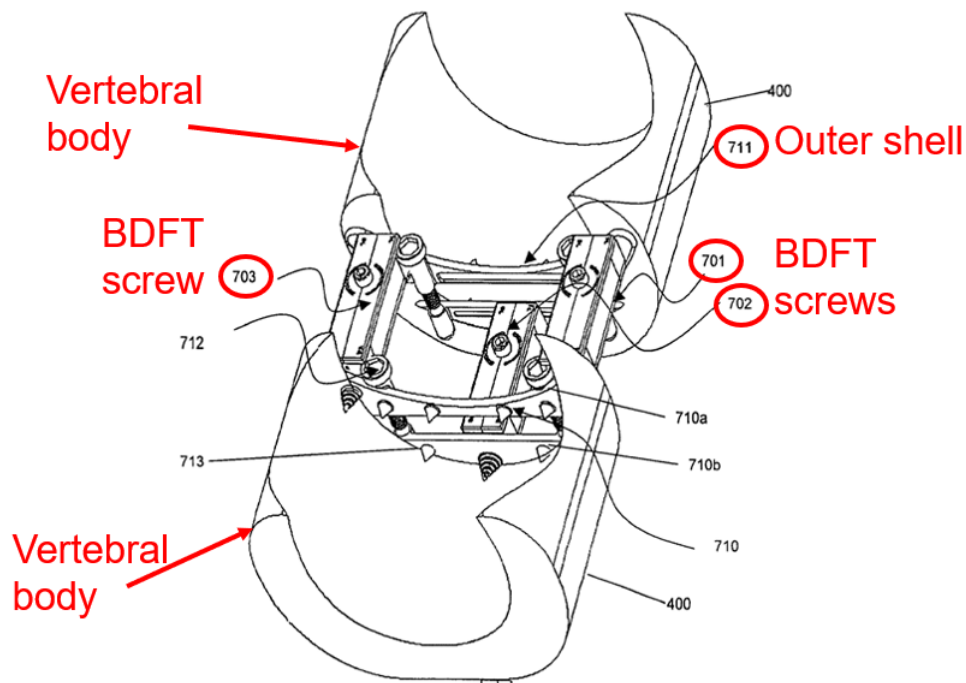
VI. THE '755 PATENT

30. 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.) Figures 7A and 7B illustrate an "IBFD 700" placed between "vertebral bodies 400." (*Id.*, 7:22-27, 8:3-6.)

31. As shown in figure 7A below, 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."

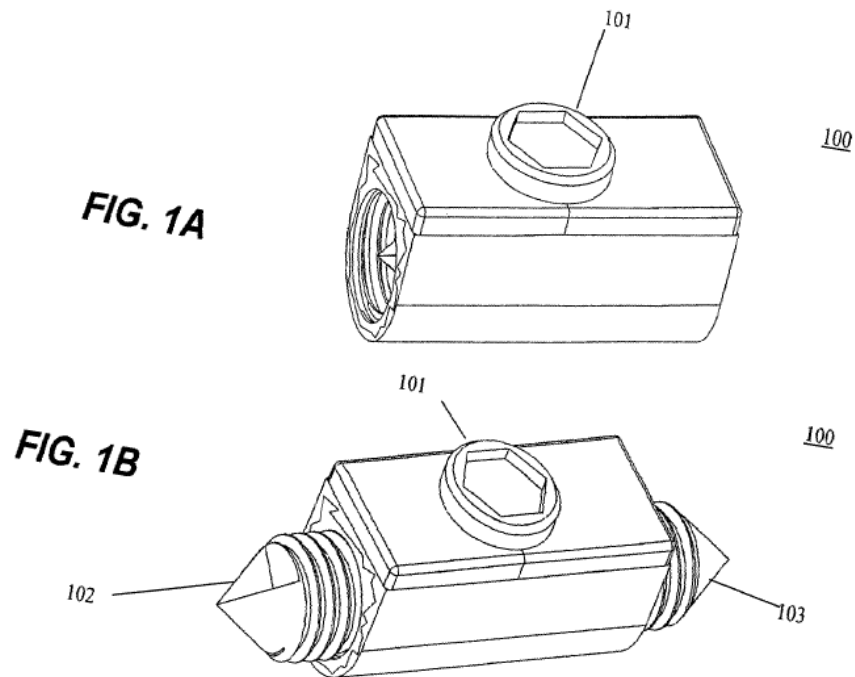
(*Id.*, 7:43-46.) After the BDFT screws are engaged “within the vertebral bodies 400, bone fusion substances are placed/packed or poured, into the inner aspects of the device 700 and its surrounding intervertebral space.” (*Id.*, 7:51-55.)

FIG. 7A



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

32. 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.)

VII. CLAIM CONSTRUCTION

33. I understand that when considering the meaning of patent claims, one must consider the language of the claims, the specification, and the prosecution history of the patent. I also understand that claim terms are typically given their ordinary and customary meanings as would have been understood by a POSITA at the time of the invention for the patent. For purposes of my opinions in this Declaration, I have not expressly construed any claim term, other than in claim 10 discussed below, because the prior art discloses or suggests each claim limitation under any reasonable construction, particularly in view of Patent Owner's infringement contentions (*see* Ex. 1051).

34. 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).) I have been asked to assume that the corresponding structure is an orifice in the implant that can receive a bone fusion material.

VIII. THE PRIOR ART

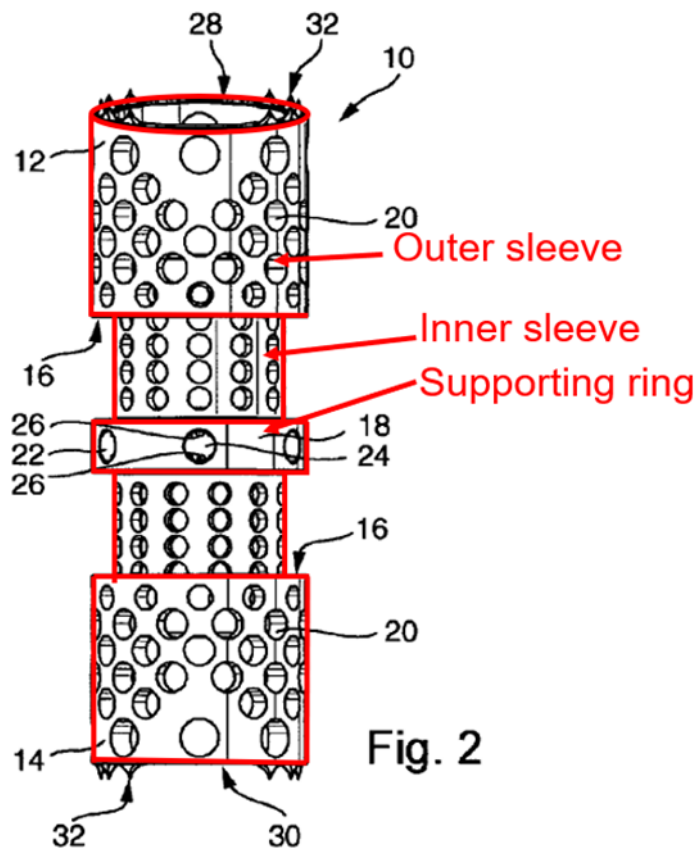
35. I provide a detailed explanation of my opinions on each element of the challenged claims in the Appendices. In this section, I address the relevant disclosures of Schäfer, Yeh, and Berry, as well as concepts known in the art at the time of the alleged invention. I also address some of the key issues.

A. Schäfer

1. Overview

36. Schäfer is titled “Extendable Spinal Implant and Extension Tool.” Schäfer discloses an expandable intervertebral implant. (Ex. 1010, Abstract.) 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.” (*Id.*, 4:45-53.) The supporting ring 18 “has at least one

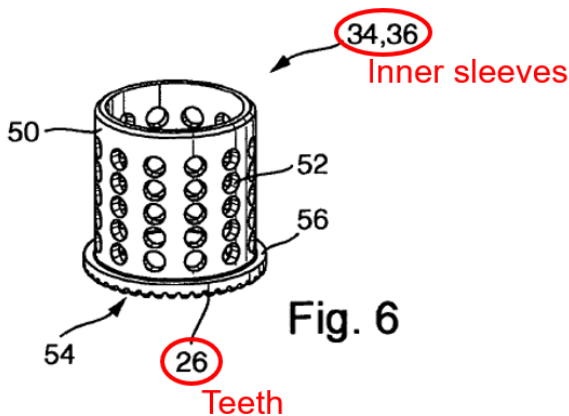
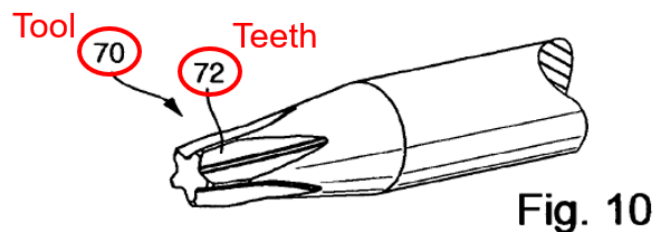
radial opening,” which is designed for the insertion of a tool. (*Id.*, 2:63-67.) The outer sleeves 12, 14 are threaded to the inner sleeves 34, 36 so that rotation of the inner sleeves will cause the outer sleeves to move away from each other. (*Id.*, 2:13-22, 2:57-62.) According to Schäfer, operation of the implant provides “an optimum union between the implant and the surrounding tissue.” (*Id.*, 3:44-47.)



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

37. 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 the tool 70 engage teeth 26 at the end of inner sleeves 34, 36 to “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 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.) 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).)

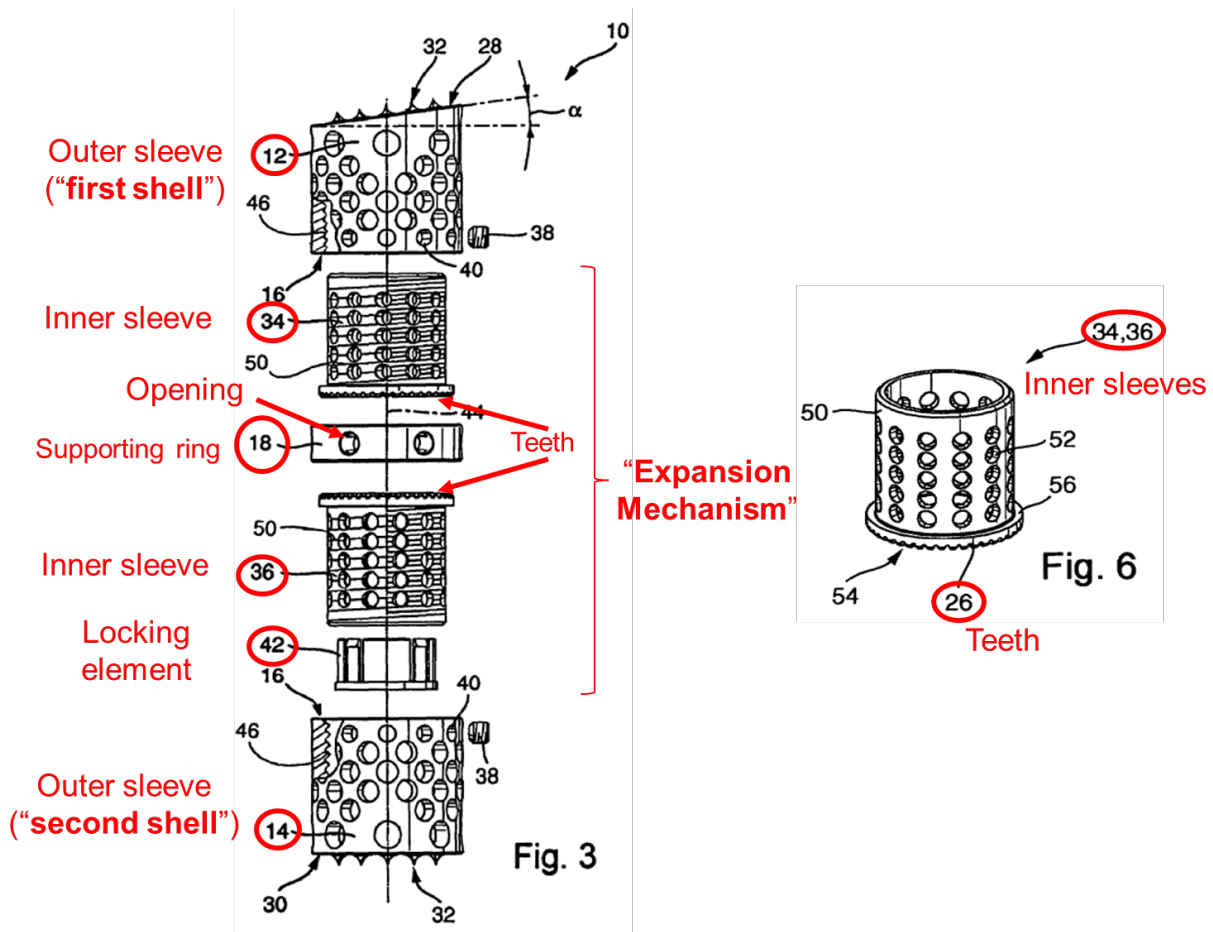
2. Schäfer Discloses a “Tool” that Rotates “About a Longitudinal Axis of the Tool” to “Cause[] a Rotation of the Turning Mechanism”³

38. Claim [1.f] requires that **“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, as I explain below.

39. Schafer’s implant comprises outer sleeves 12, 14 and inner sleeves 34, 36. (Ex. 1010, 4:37-44, 4:53-55.) Schäfer thus discloses an implant with a **“first shell”** (upper outer sleeve 12) and a **“second shell”** (lower outer sleeve 14). (*See* my analysis in Appendix A [1.b].) The inner sleeves 34, 36 “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.) A locking element 42 “maintains the two inner sleeves on the supporting ring.” (*Id.*, 4:13-15, Fig. 3.) “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.) Specifically, the inner sleeves 34, 36 have teeth 26,

³ From here onwards, I bold all claim language and show any special emphasis in italics.

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.) 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.) Schäfer thus discloses “an expansion mechanism” where the contours of opening 22 is the “tool-engagement surface,” and in which “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.”



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

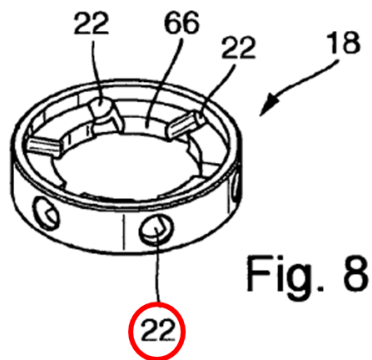


Fig. 8

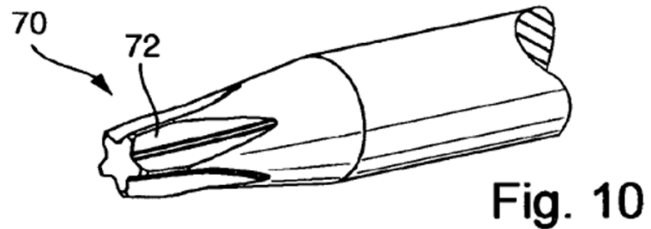


Fig. 10

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

This expansion is apparent in figures 1 and 2, which show the implant in its compressed and extended configuration, respectively. (*Id.*, 1:53-57.)

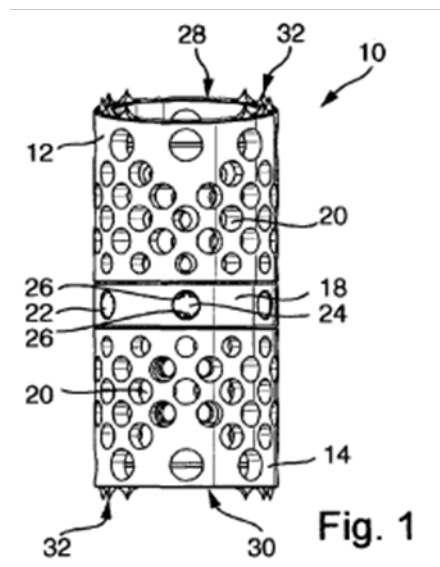


Fig. 1

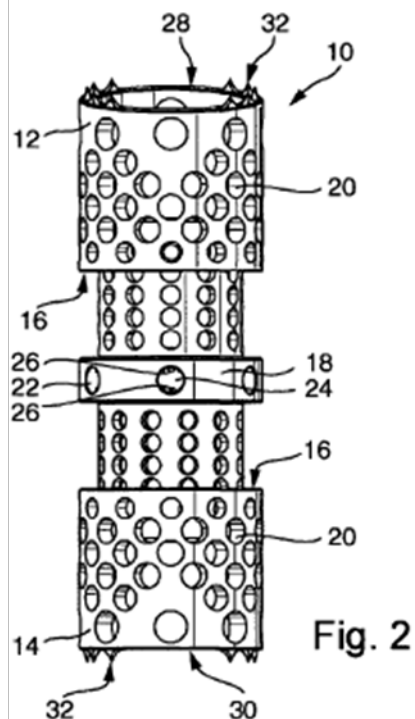
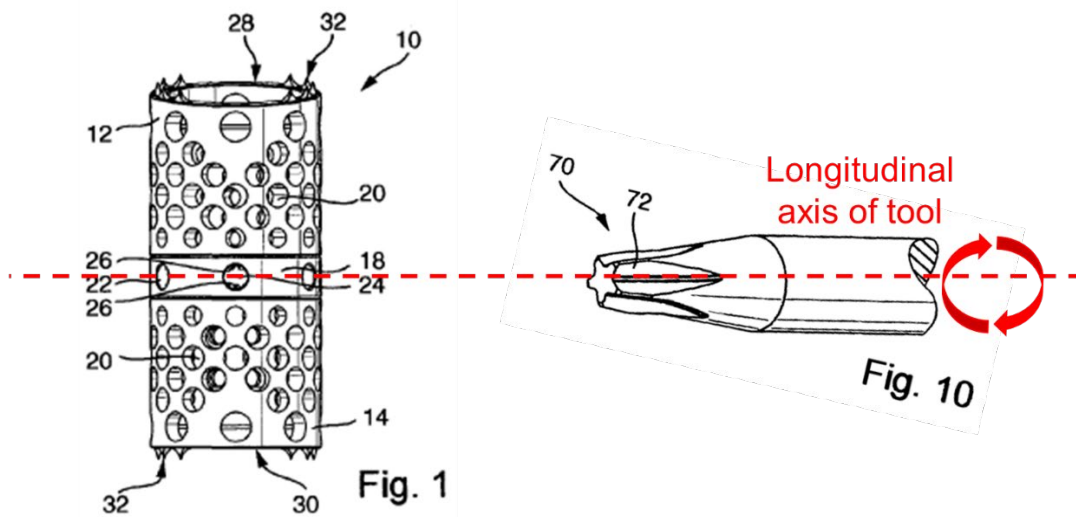


Fig. 2

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

40. In the above description, the bevel teeth 26 on the inner sleeves and supporting ring 18 constitute a “**turning mechanism.**” (*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.)

41. Schäfer’s tool 70 rotates 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,**” as recited in claim [1.g]. As I discussed above, the surface of opening 22 (**tool-engagement surface**) engages Schäfer’s tool 70, which is inserted via opening 22 in supporting ring 18 to engage teeth 26. (*Id.*, 2:59-62, 4:25-33, 5:41-57.) Teeth 72 of tool 70 and teeth 26 of inner sleeves 34, 36 “form a bevel tooth gear” (*id.*, 5:52-57) so that when tool 70 is “turned in the supporting ring,” teeth 72 engage and rotate inner sleeve teeth 26, which is part of the “**turning mechanism.**” (*Id.*, 2:59-62, 4:25-33, 5:52-57.)



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

42. Based on Schäfer’s disclosure, a POSITA would have understood that tool 70 is rotated about its longitudinal axis. As an initial matter, tool 70 is “turned in the supporting ring.” (*Id.*, 4:25-30.) But tool 70 have teeth 72, which form a “bevel tooth gear” with teeth 26. (*Id.*, 5:53-55.) A bevel gear is a well-known mechanical arrangement in which *rotational* motion is translated between two intersecting devices. An example of this rotational translation can be seen in the image below⁴ where rotating the tool with the shaft rotates another gear with teeth that engage with teeth on the tool.

⁴ Obtained from <https://www.iqsdirectory.com/articles/gear/bevel-gear.html#:~:text=Chapter%201:%20Understanding%20Bevel%20Gears,gear%20yields%20higher%20output%20torque>.



The above understanding is also consistent with Neumann’s disclosure where a shaft 19 of a bevel gear 20 with teeth 21 is rotated to extend the implant. (Ex. 1036, 4:1-5 (“Such an implant is set and expanded by a tool 18 shown in detail in FIGS. 9 through 12. It comprises an inner tube or shaft 19 having at an inner end a bevel gear 20 with teeth 21 engageable with the teeth 7 of the nut 4 and fittable in the aperture 10, and at its opposite end a hand wheel 30.”), 4:28-31 (“The wheel 30 is rotated to turn the shaft 19 and gear 21, thereby rotating the nut 4 so that it screws the core part 3 axially away from the sleeve part 2, axially extending the implant.”).)

43. The understanding that tool 70 rotates about its longitudinal axis 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.**"

3. Schäfer in Combination with Yeh Discloses "Substantially Conical Tips"

44. Claim 2 recites "[t]he 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.**" 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. The 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.**"

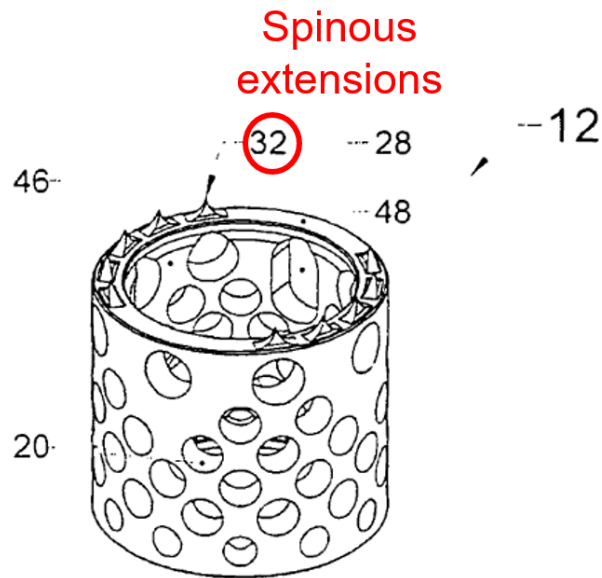


Fig. 4

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

45. Yeh additionally discloses fixation teeth that are “**substantially conical.**” 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; *see also* my analysis below in Sections VIII.B.1 and VIII.B.3.) 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.**”

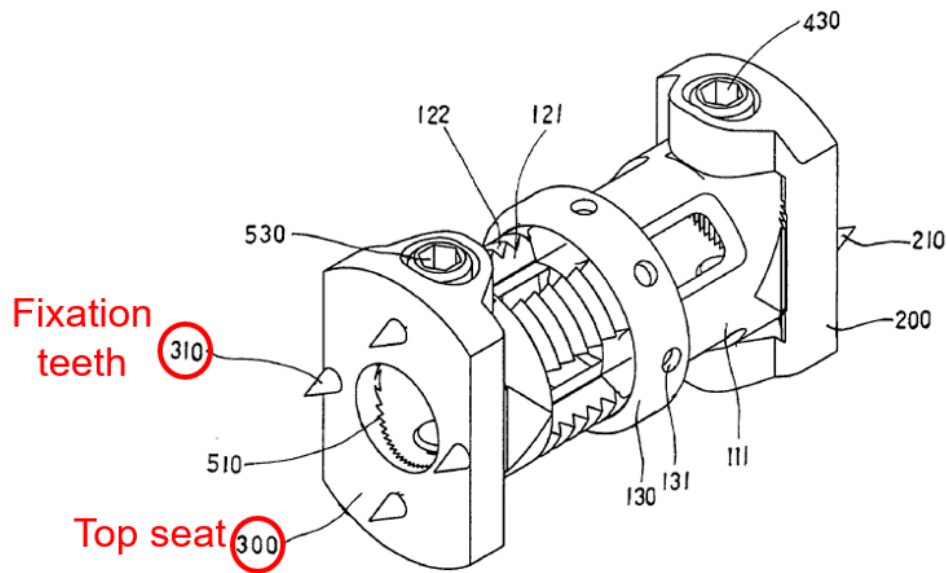


Fig. 3

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

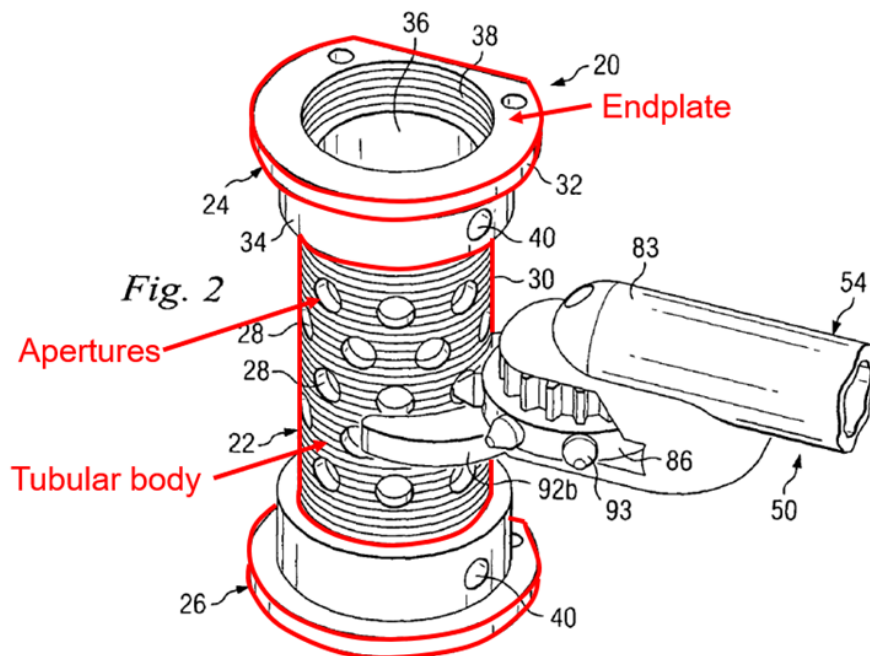
46. A POSITA would have been motivated to substitute Schäfer's spinous extensions with Yeh's fixation teeth 310 because both serve the same function, penetrating the contact surfaces of the neighboring vertebrae, and differ only slightly in shape, making them an interchangeable design choice for a POSITA. A POSITA would have had a reasonable expectation of success in using Yeh's conical tips with Schäfer's implant. Both Schäfer's spinous extensions and Yeh's fixation teeth are located on the outer surfaces of their respective implants and 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").)

B. Yeh & Berry

1. Overview of Yeh

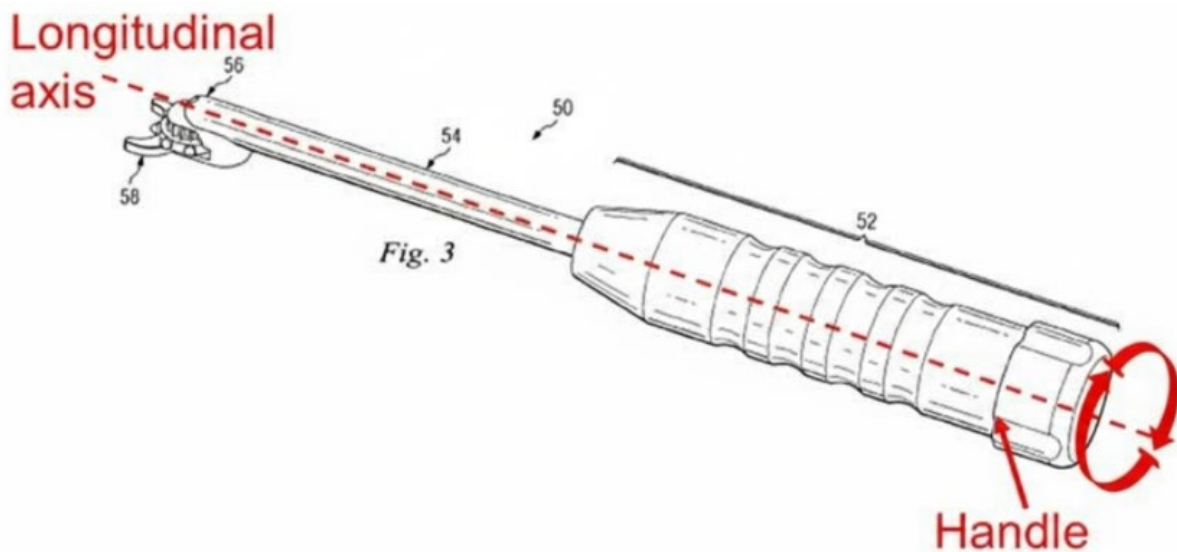
47. Yeh is titled “Device for Fixing Spinal Column Under Treatment.” Yeh discloses a “spinal column fixation device” with “a top seat [300] fastened at the top end with [a] support member [*i.e.*, upper support body 120], and a bottom seat [200] fastened at the bottom end with [a] support member [*i.e.*, lower support body 110].” (Ex. 1008, Abstract, Fig. 2.) 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. (*Id.*, ¶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.*)

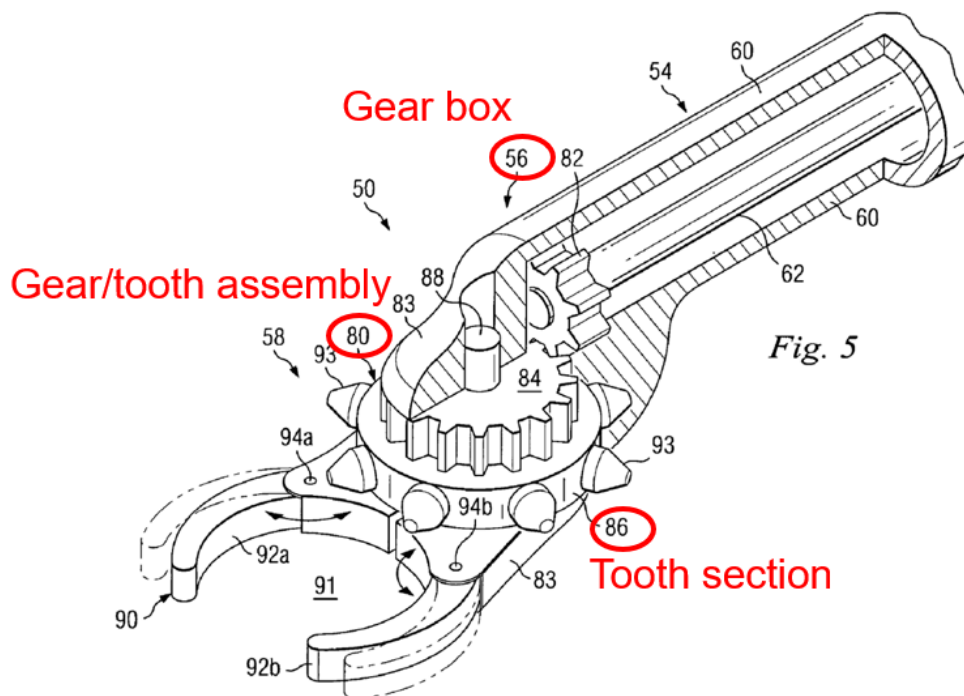
¶¶19, 22, Fig. 1.) Assembly 20 has endplate assemblies 24, 26, which engage adjacent vertebrae, and a rotating tubular body 22, which increases the height of the implant. (*Id.*) Both the tubular body 22 and the endplate assemblies 24, 26 are threaded so that rotation of the tubular body 22 can draw the endplate assemblies 24, 26 closer or further apart. (*Id.*, ¶21.) “The threaded tubular body 22 is provided with a plurality of apertures 28 that may be used for installation of the assembly 20” (*Id.*, ¶19.) 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).)

50. 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).)

3. Yeh in Combination with Berry Discloses or Suggests a “Tool” That Rotates “About a Longitudinal Axis of the Tool” to “Cause[] a Rotation of the Turning Mechanism”

51. Claim [1.f] requires that “**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.**” Yeh discloses this limitation, as I explain below.

52. 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). Yeh also discloses a “height adjusting mechanism,” *i.e.*, an **“expansion mechanism,”** “formed of the upper support body 120, the lower support body 110 and the adjustment ring 130.” (*Id.*) Further, as shown in figures 6a and 6b below, the adjustment ring 130 has “threaded teeth 132 (shown in Fig. 2)” that engage with “threaded teeth 122” of the upper support body 120, allowing “the adjustment of height of the support member” by “rotat[ing] the adjustment ring 130.” (*Id.*, ¶¶21, 26.) 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, whose contours constitute a **“tool-engagement surface.”** 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.”**

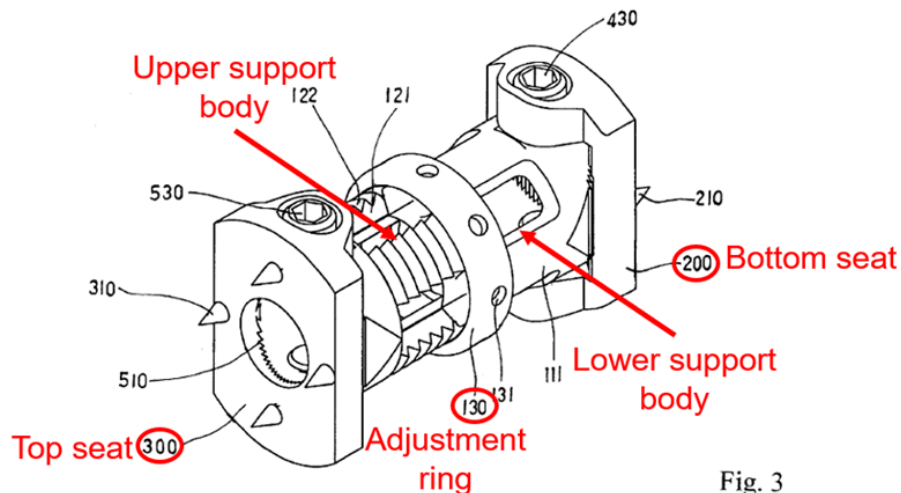
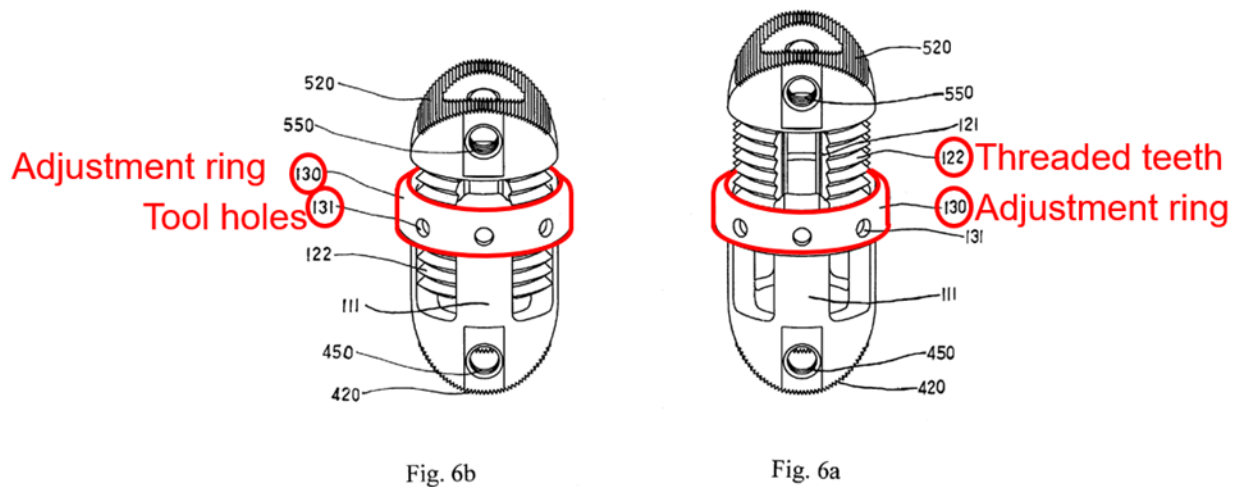


Fig. 3

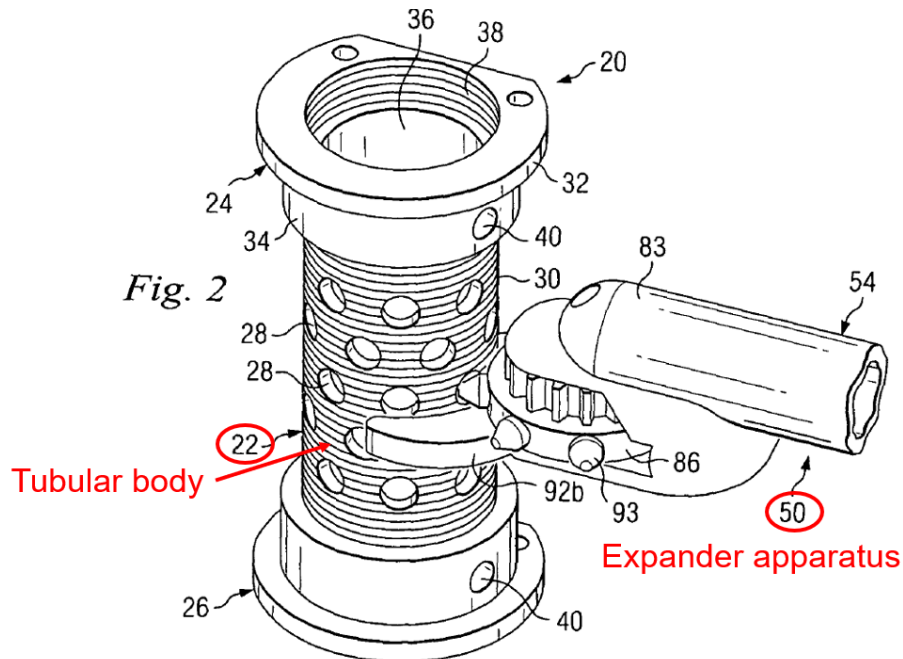
(*Id.*, Fig. 2 (annotated).)



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

53. As explained immediately above, 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.” (*Id.*, 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,”** as recited in claim [1.g]. But Yeh does not disclose the specific design of the tool that could be used to expand the lower (110) and upper (120) support bodies. Berry, however, discloses a tool that can be compatible with Yeh, with very minor dimensional modifications, that satisfies limitation [1.g]; in particular, Berry discloses a tool **“rotating about a longitudinal axis of the tool while the tool is engaged with the tool-engagement surface,”** as recited in claim [1.g].

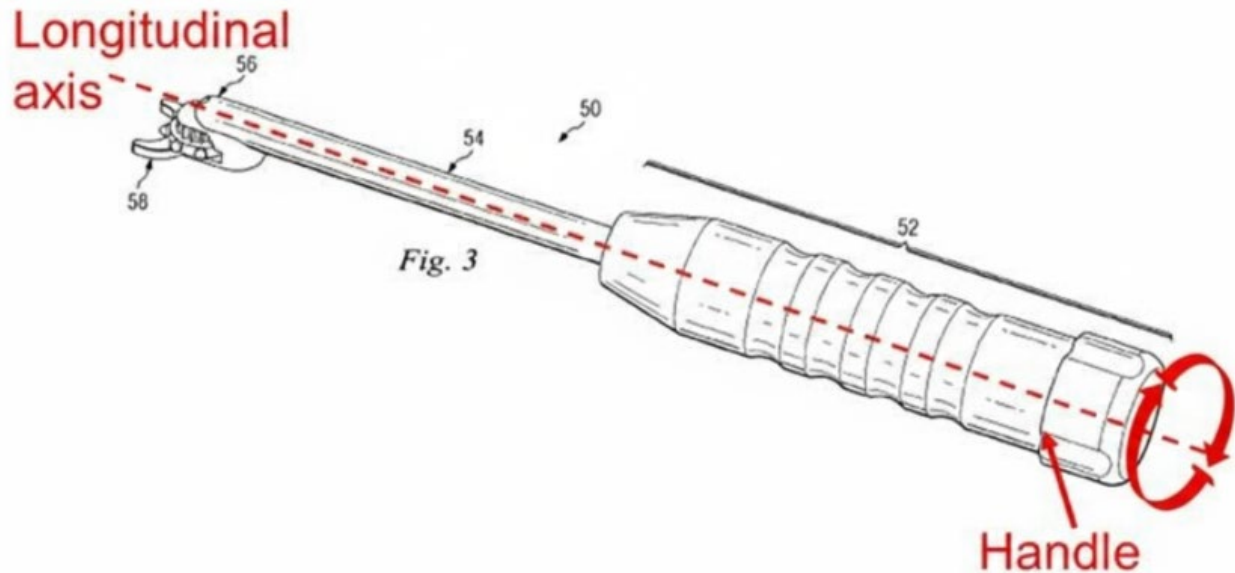
54. Berry discloses an expanding implant assembly with a tubular body 22 that expands upon rotation of the tubular body.



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

55. 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. According to Berry, 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).)

56. Due to its 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.**”

57. A POSITA would have been motivated to combine the teachings of Yeh and Berry to utilize a tool like Berry’s to rotate Yeh’s adjustment ring 130. 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. As discussed

in Section V.B, 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.)

58. 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. 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." (*Id.*, ¶23.)

59. Additionally, a POSITA would have known that an insertion tool would be needed to deliver the implant to the intervertebral space. 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

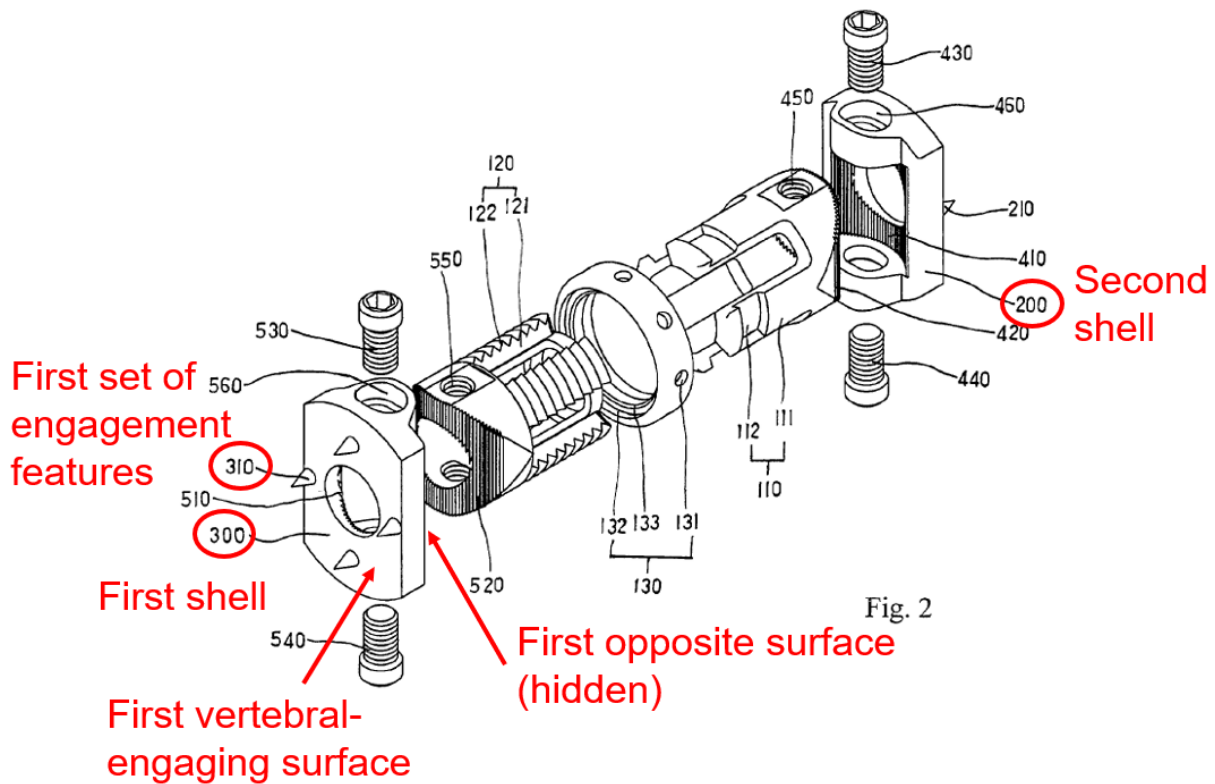
require more time and effort by the surgeon. Berry discloses that the “expander apparatus 50 can be used to facilitate the placement of the assembly 20 inside the vertebral column,” and does so by engaging the engager 58 with the tubular body 22, with at least one tooth 93 engaging one of the apertures 28. (*Id.*, ¶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. 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.

60. 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. (*See* Ex. 1046.) 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.)

61. 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, little to no modifications would be needed to the design of Yeh's adjustment ring 130 for use with Berry's expander apparatus 50.

4. A POSITA Would Have Been Motivated to Configure the Perimeter of Yeh's Shells to be Circular and Would Have Expected Reasonable Success In Doing So

62. Claim 5 recites that "[t]he 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." Claim 18 recites that "[t]he artificial spinal implant system of claim 12, wherein the first shell curves continuously around a first perimeter of the first shell." 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 claims 5 and 18 because at least a portion of the perimeter of Yeh's shells is circular.



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

63. A POSITA would have understood that the perimeter of Yeh's shells could have also been easily modified to be completely circular around its perimeter. For example, Schäfer discloses such a configuration. As shown in figure 4 below, the perimeter of outer sleeve 12 in Schäfer is completely cylindrical, *i.e.*, surface 28 has a circular perimeter, which is also true of Schäfer's outer sleeve 14 (*see* Ex. 1010, Fig. 5.) Schäfer thus discloses claim 5.

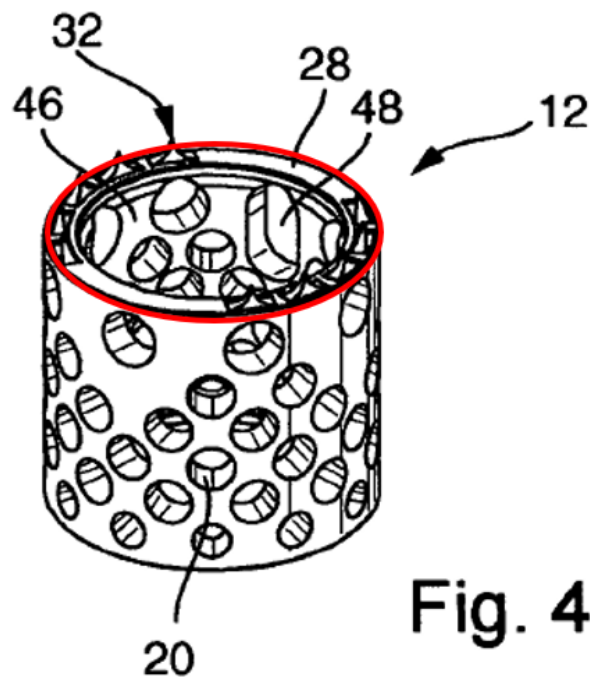


Fig. 4

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

64. A POSITA would have been motivated to modify the vertebral engagement surfaces of the shells in Yeh to have a continuous curve in view of Schäfer. Both Yeh and Schäfer disclose expandable intervertebral implants that rotate to expand and that engage with the vertebral surfaces. 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. Additionally, a POSITA would have understood that changing the perimeter shape of an intervertebral device is a routine type of modification.

65. In fact, a POSA 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. When intervertebral or interbody fusion devices are positioned between adjacent vertebrae, there is a risk that these devices can sink into the body of the vertebrae. This problem is referred to as “subsidence.” To mitigate the risk of subsidence, those in the art investigated how to better distribute stress caused by interbody cages. (Ex. 1053, 556.) It was well-known that “vertebral bodies have generally *oval*-shaped top and bottom plates, (i.e., end plates), of hard cortical bone which surround the softer interior cancellous bone.” (Ex. 1007, 1:32-34.) Researchers observed that “[t]he shape, density and the strength of the [vertebral] endplate have been shown to vary across its surface, with the centre being the thinnest and weakest area.” (Ex. 1053, 556.) Improper size and geometry of the interbody implant and placement of the implant in the porous *central area* of the vertebral body were factors that could cause subsidence. (*Id.*) Thus, it was known that implants should be designed “such that they can rely on the strong peripheral part of the endplate to reduce the risk of subsidence” (*Id.*, 560.) 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. Thus, a POSITA would have been motivated to configure the perimeter of Yeh’s top and bottom seats like Schafer’s outer sleeves.

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

IX. CONCLUSION

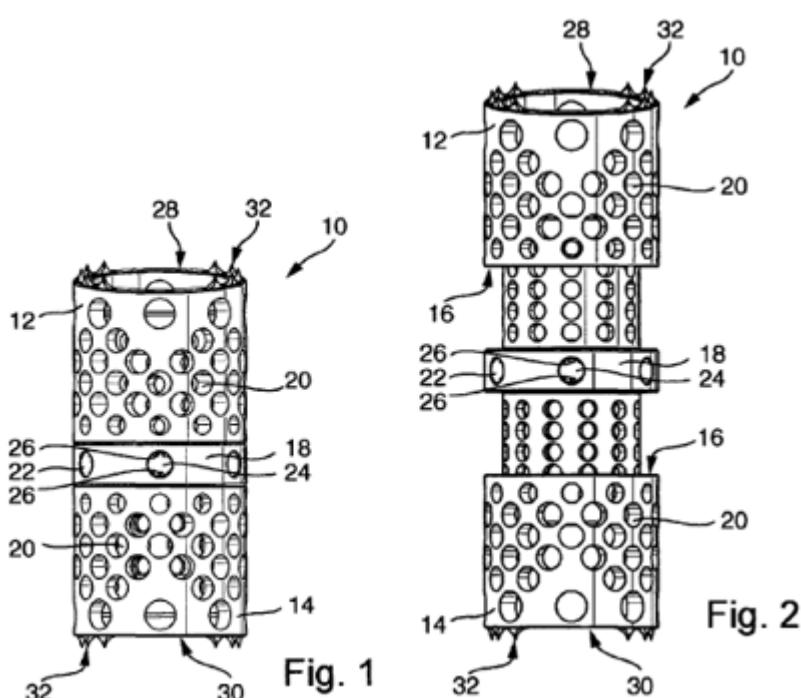
67. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or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

Dated: November 7, 2025

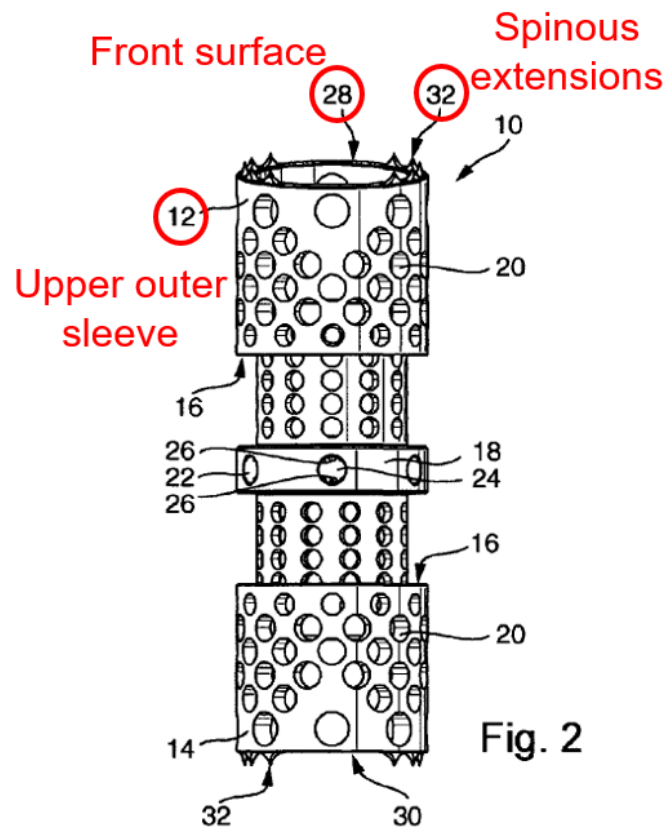
By: Brad Culbert

Brad Culbert

APPENDIX A

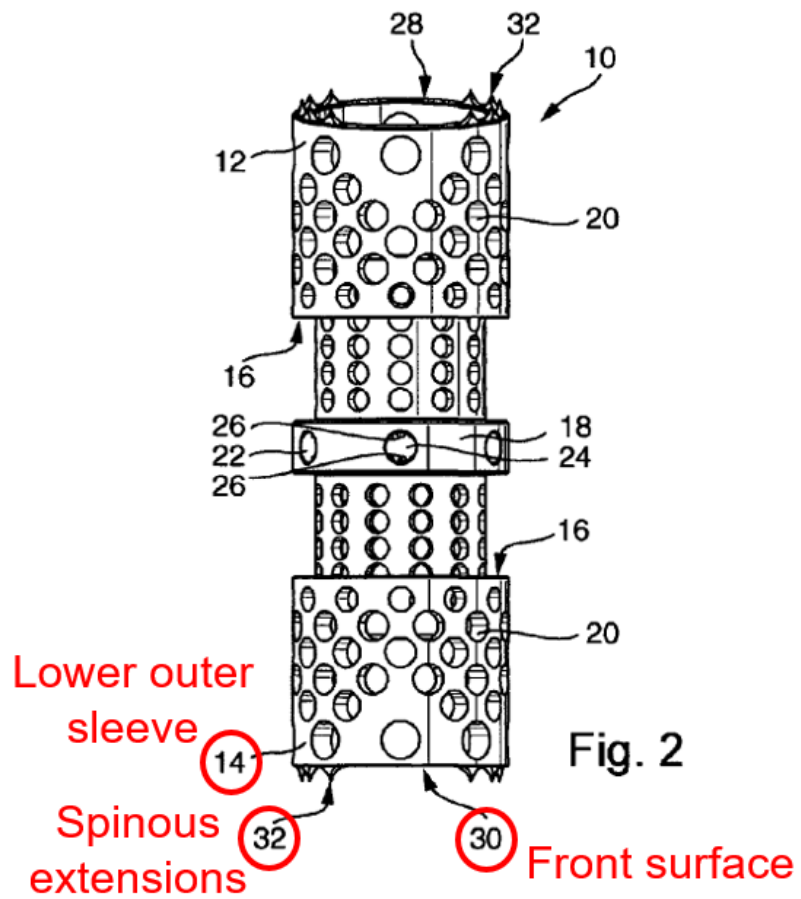
'755 Patent Claim Element	Prior Art Analysis
Claim 1	
<p>[1.a] “An artificial spinal implant system comprising: an artificial expansile spinal implant comprising:”</p>	<p>Schäfer discloses this limitation. As shown in figures 1 and 2 below, Schäfer discloses an “extendable spinal implant.” (Ex. 1010, 1:53-57; <i>see also supra</i> Section VIII.A.1.) Moreover, as demonstrated by its man-made parts, Schäfer’s implant is “artificial.” 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.</p> <div style="text-align: center;">  <p>Fig. 1 Fig. 2</p> </div> <p>(<i>Id.</i>, Figs. 1-2.)</p>

<p>[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 extending from the first vertebral-engaging surface;”</p>	<p>Schäfer discloses this limitation. 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. (<i>Id.</i>, 2:13-21.) Schäfer thus discloses an implant with a “first shell” (upper outer sleeve 12) and a “second shell” (lower outer sleeve 14).</p> <p>“[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” (<i>Id.</i>, 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.” (<i>Id.</i>, 4:37-41, Fig. 2.) Schäfer thus discloses “a first shell having a first vertebral-engaging surface and a first opposite surface.”</p>
---	---



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

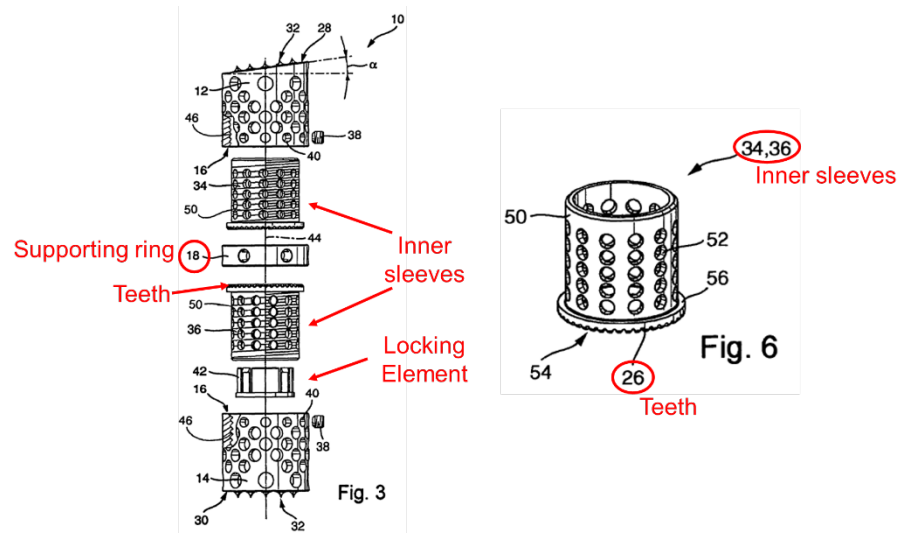
<p>[1.c] “a second shell having a second vertebral-engaging surface and a second opposite surface, the second shell comprising a second set of engagement features extending from the second vertebral-engaging surface; and”</p>	<p>Schäfer discloses this limitation. As discussed in Appendix A [1.b], and 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.” (<i>Id.</i>, 4:38-41, Fig. 2.) Schäfer thus discloses “a second shell having a second vertebral-engaging surface and a second opposite surface.”</p> <p>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” (<i>Id.</i>, 4:47-52.) Schafer thus discloses “the second shell comprising a second set of engagement features extending from the second vertebral-engaging surface.”</p>
---	--



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

[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. 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.**”



(*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.**”

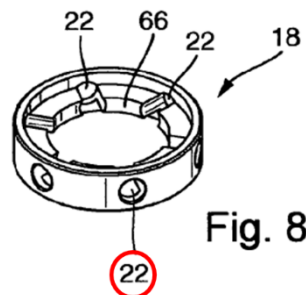


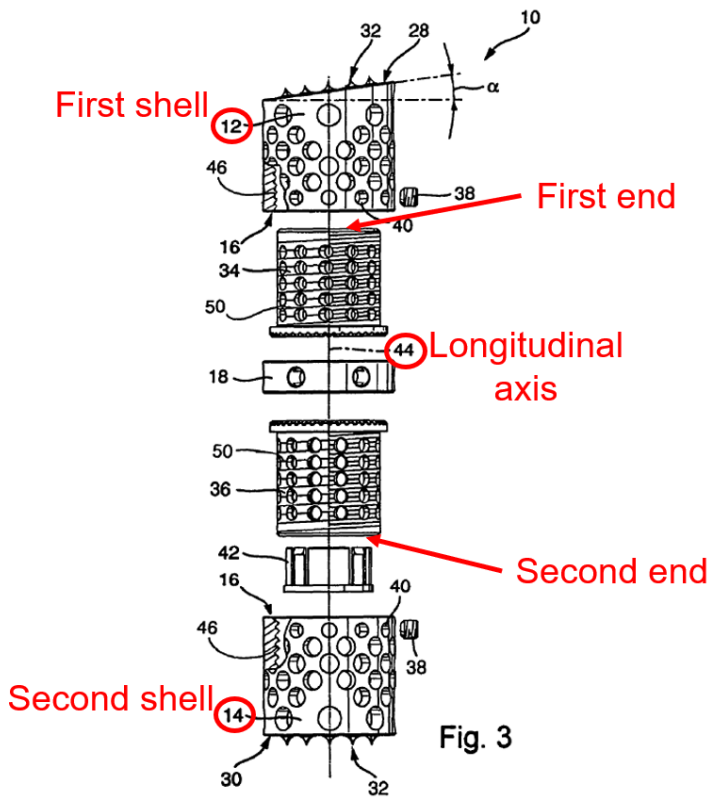
Fig. 8



Fig. 10

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

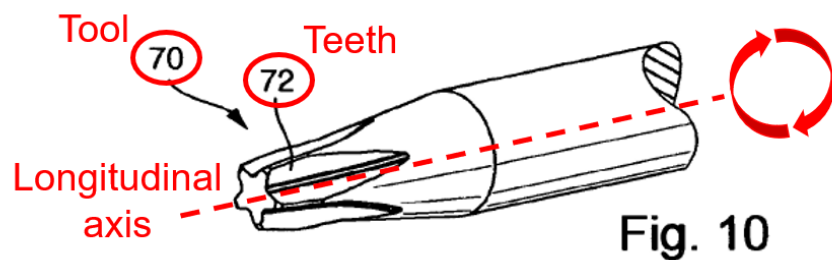
As shown in figure 3 above, inner sleeves 34, 36 both have an outside thread 50, and are connected with each other through a locking mechanism 42 (*id.*, 5:30-40) to form a “**threaded body.**” Schäfer also discloses a “**turning mechanism**” comprising bevel teeth 26 on the inner sleeves 34, 36 and 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

	<p>the bevel teeth, so as to carry out the screwing motion,” and the supporting ring 18 “guide[s] and <i>support[s]</i> the tool” while the inner sleeves are screwed, <i>i.e.</i>, turned. (<i>Id.</i>, 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.”</p>
<p>[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;”</p>	<p>Schäfer discloses this limitation. As discussed in Appendix A [1.b]-[1.d], 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].</p>  <p>(<i>Id.</i>, Fig. 3 (annotated).)</p>

<p>[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,”</p>	<p>Schäfer discloses this limitation. As discussed in Appendix A [1.d], 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.”</p>
--	---

[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. As discussed in Appendix A [1.d], 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. As discussed in Appendix A [1.d], 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 a POSITA operates by rotating the tool about its longitudinal axis. 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. (*Id.*, 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.**”

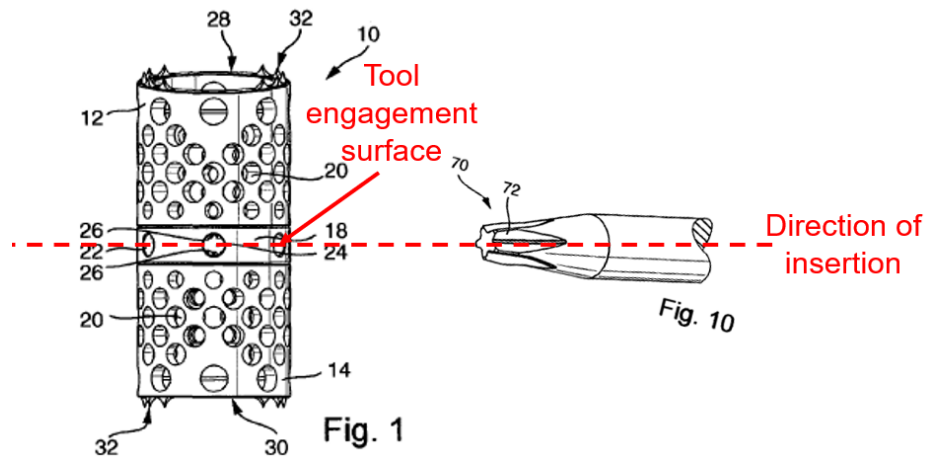


(*Id.*, Fig. 10 (annotated).)

<p>[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;”</p>	<p>Schäfer discloses this limitation. Schäfer discloses that spinous extensions 32, <i>i.e.</i>, 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>i.e.</i>, the spinous extensions 32 are engaging opposing vertebral bodies to hold the artificial expansile spinal implant in place. (Ex. 1010, 4:47-53.) Schäfer thus discloses this limitation.</p>
--	---

[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”

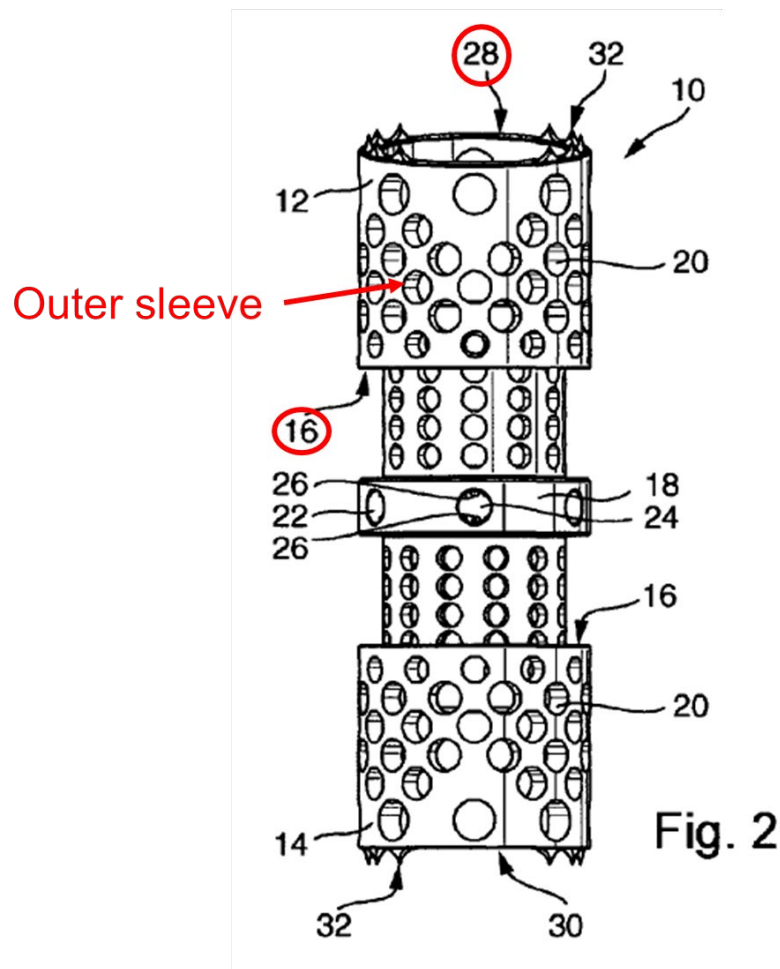
Schäfer discloses this limitation. The surface of opening 22 (the **tool-engagement surface**) engages with the tool 70 by guiding and supporting insertion of the tool into the supporting ring and by “mov[ing] it to the front surface of the inner sleeve.” (Ex. 1010, 2:63-67, 5:41-51.) As shown in figures 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).)

[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. 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].**”



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

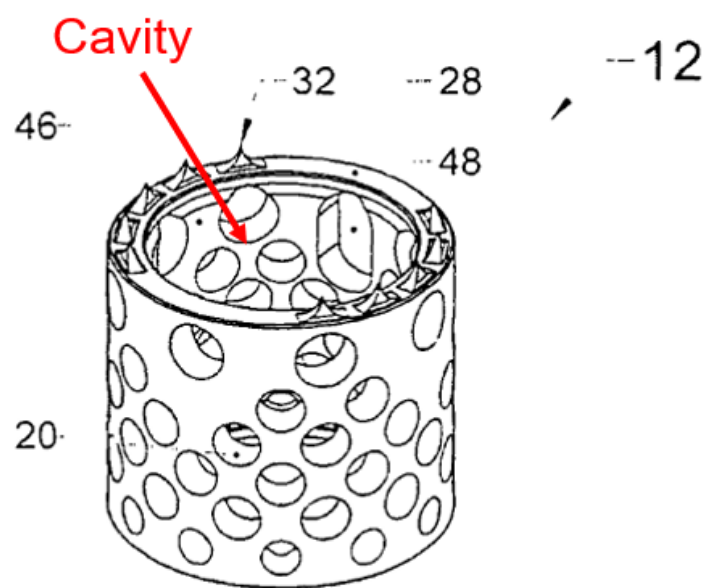


Fig. 4

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

[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. 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.**”

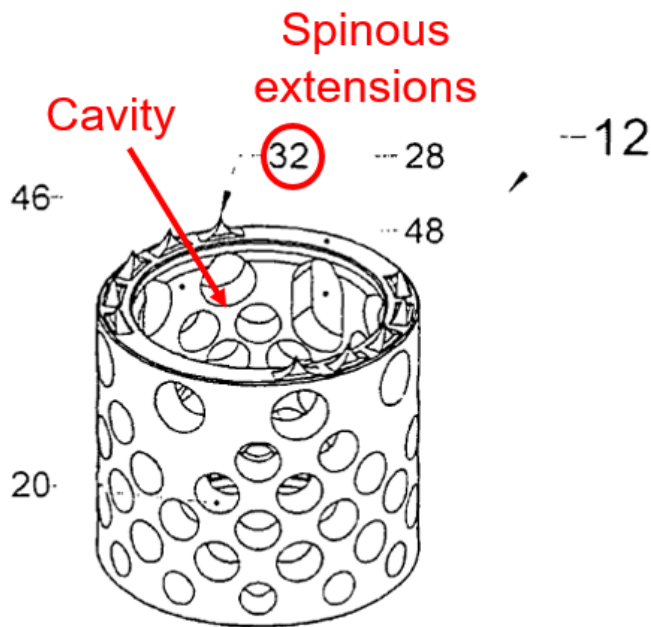


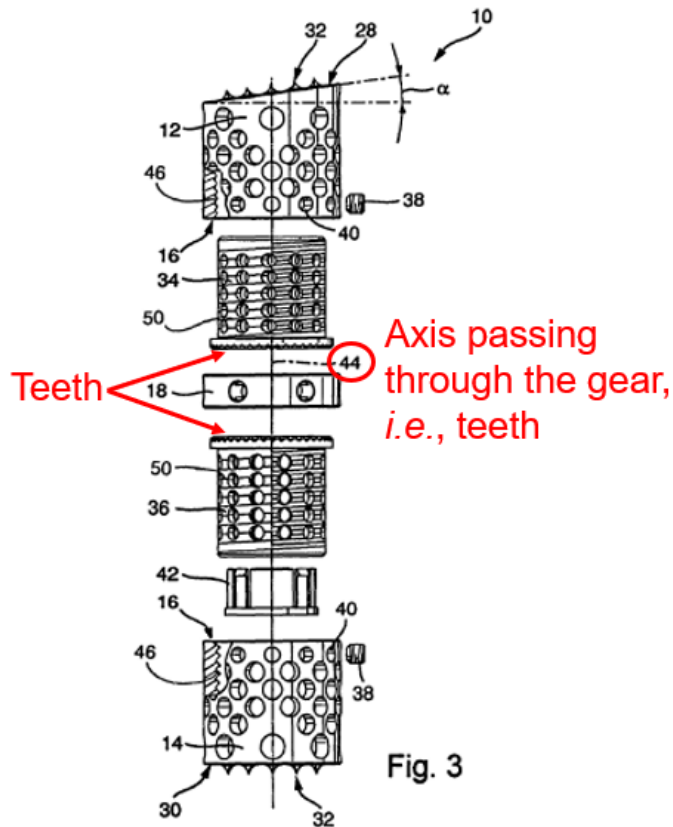
Fig. 4

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

Claim 8

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

Schäfer discloses this limitation. 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. (*Id.*, 2:56-62, 5:4-7, 5:52-54, Fig. 3.) Schäfer thus discloses “a rotatable gear.”



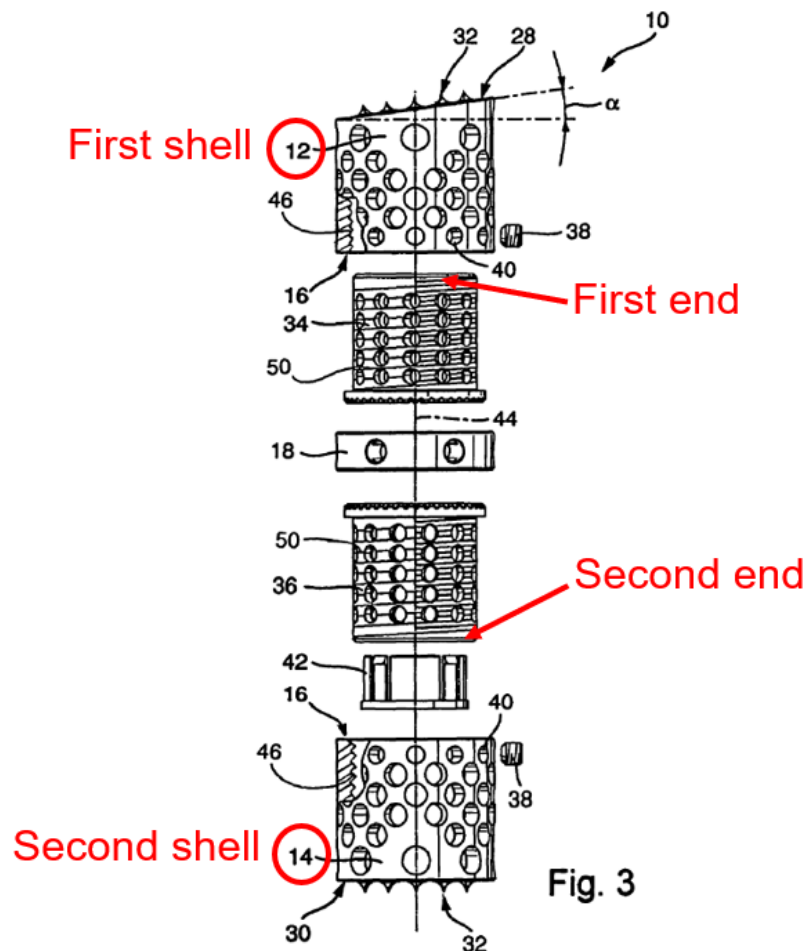
(*Id.*, Fig. 3 (annotated).)

Claim 10

<p>“The artificial spinal implant system of claim 1, wherein the artificial expansile spinal implant further comprises means for placement of a bone fusion material.”</p>	<p>Schäfer discloses this limitation. As discussed in Section VII, 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.</p>
<p>Claim 11</p>	

“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. 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 Appendix A [1.d], the two inner sleeves 34, 36, and locking element 42, comprise a **threaded body**. Additionally, as discussed in Appendix A [1.d], 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 Appendix A [1.d], 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. (<i>Id.</i> , 2:57-62, 5:30-40.) Schäfer thus discloses that “ the turning mechanism engages threads of the threaded body. ”
Claim 12	
[12.a] “An artificial spinal implant system comprising: an artificial expansile spinal implant comprising:”	<i>See above analysis for claim [1.a]. (Supra, Appendix A [1.a].)</i>
[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”	<i>See above analysis for claim [1.b]. (Supra, Appendix A [1.b].)</i>

<p>[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”</p>	<p><i>See above analysis for claim [1.c]. (Supra, Appendix A [1.c].)</i></p>
--	--

<p>[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;”</p>	<p><i>See</i> above analysis for claims [1.d] and [8]. (<i>Supra</i>, Appendix A [1.d] and [8].) 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.</p>
--	--

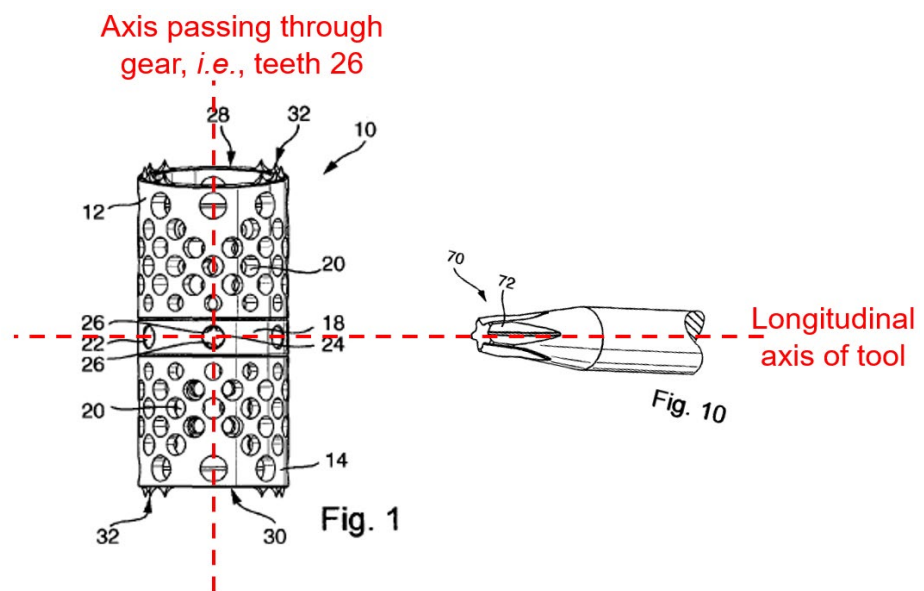
<p>[12.e] “wherein the expansion mechanism is configured to drive expansion between the first shell and the second shell in response to rotating of a tool engaged with the tool-engagement surface,”</p>	<p><i>See above analysis for claim [1.f]. (Supra, Appendix A [1.f].)</i></p>
<p>[12.f] “wherein rotating 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;”</p>	<p><i>See above analysis for claims [1.g] and [8]. (Supra, Appendix A [1.g] and [8].)</i></p>

[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;”	<i>See above analysis for claim [1.h]. (Supra, Appendix A [1.h].)</i>
[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”	<i>See above analysis for claim [1.i]. (Supra, Appendix A [1.i].)</i>

[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”	<i>See above analysis for claim [1.j]. (Supra, Appendix A [1.j].)</i>
[12.j] “wherein the first set of engagement features are positioned on the first vertebral-engaging surface circumferentially about the first cavity.”	<i>See above analysis for claim [1.k]. (Supra, Appendix A [1.k].)</i>
Claim 17	

“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. 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 Appendix A [8], 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. Schäfer thus discloses “**wherein the axis passing through the gear is perpendicular to the longitudinal axis of the tool.**”

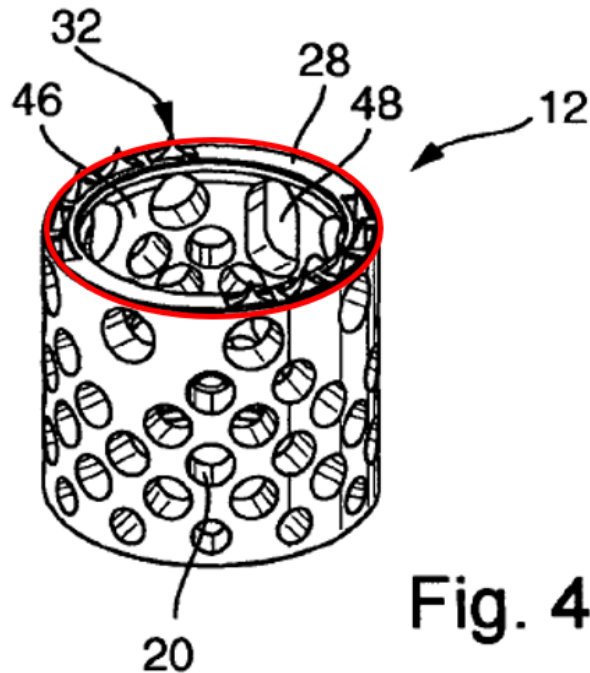


(Ex. 1010, Figs. 1, 10 (both annotated).)

Claim 18

“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. As shown in figure 4 below, outer sleeve 12 is cylindrical, *i.e.*, the surface 28 has a circular perimeter. Schäfer thus discloses that **“the first shell curves continuously around a first perimeter of the first shell.”**

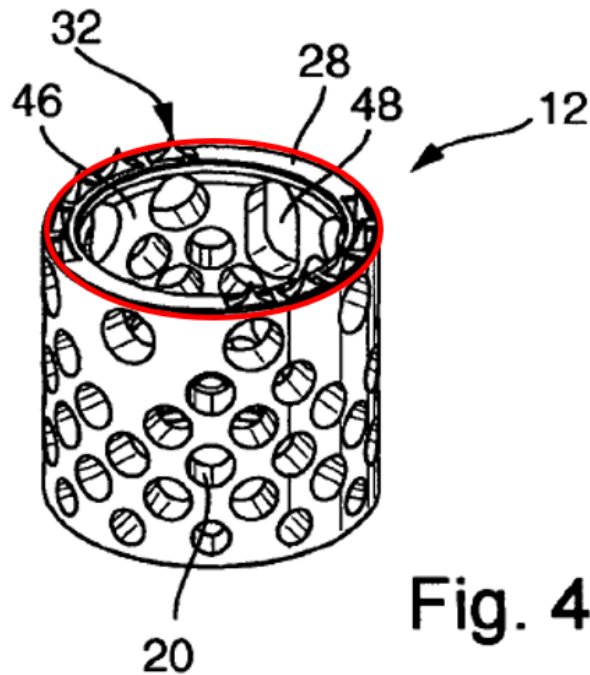


(Ex. 1010, Fig. 4 (annotated).)

Claim 19

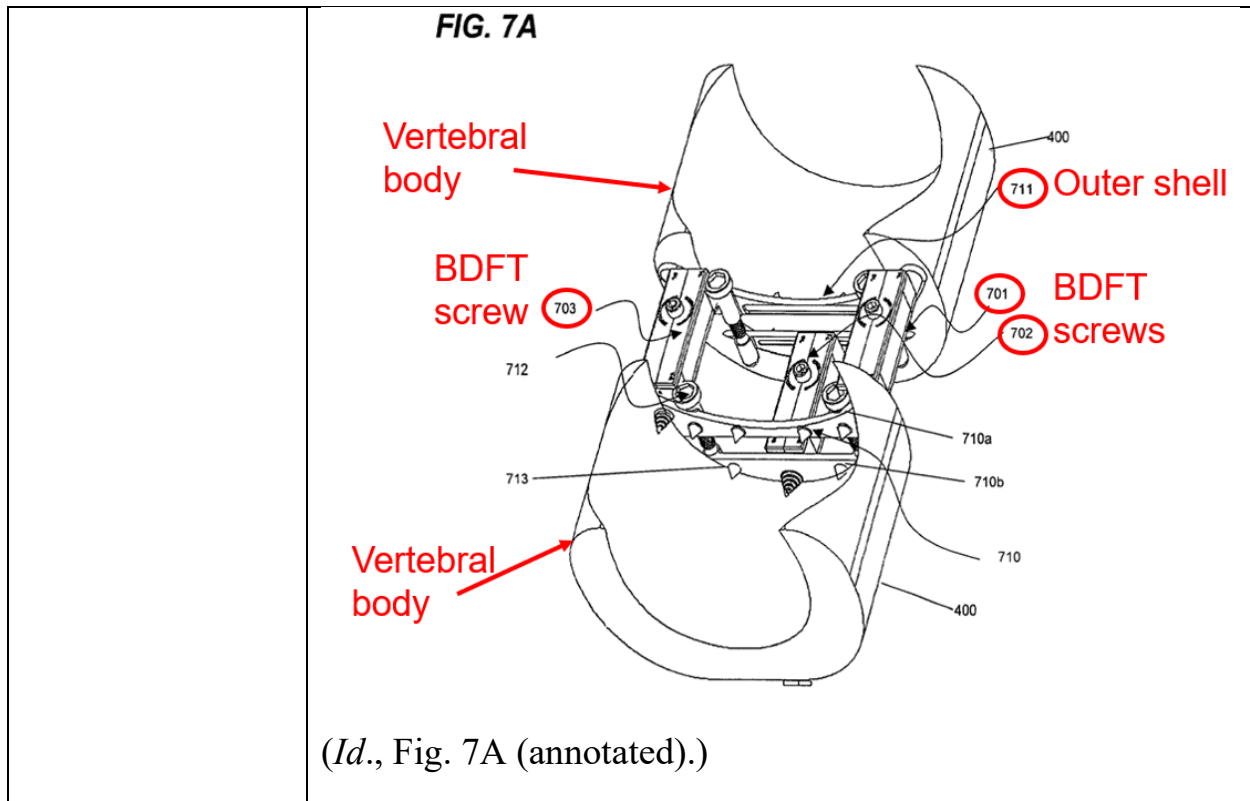
“The artificial spinal implant system of claim 18, wherein the first perimeter is shaped to correspond to a shape of a vertebral body.”

Schäfer discloses this limitation. As discussed in Appendix A [18], 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 the ’755 patent’s disclosure.



(*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.



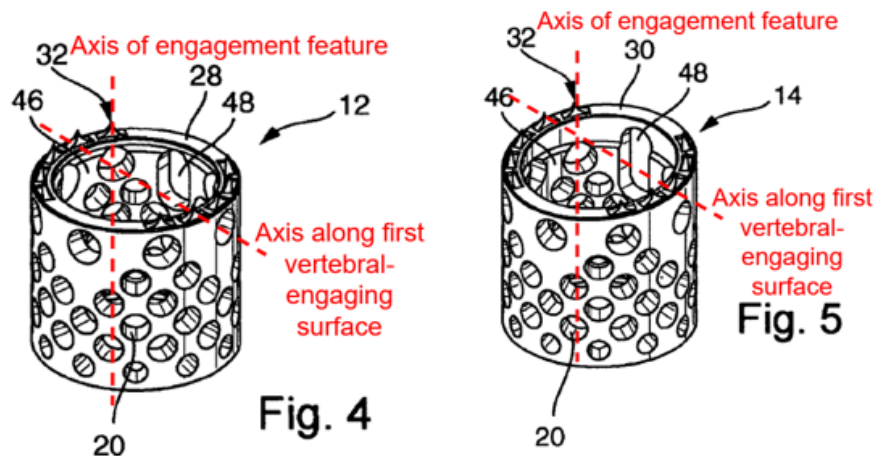
APPENDIX B

'755 Patent Claim Element	Prior Art Analysis
Claim 2	
“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 for the reasons I discussed above in Section VIII.A.3.

Claim 3

“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. As discussed in Appendix A [1.b]-[1.c], 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.”**



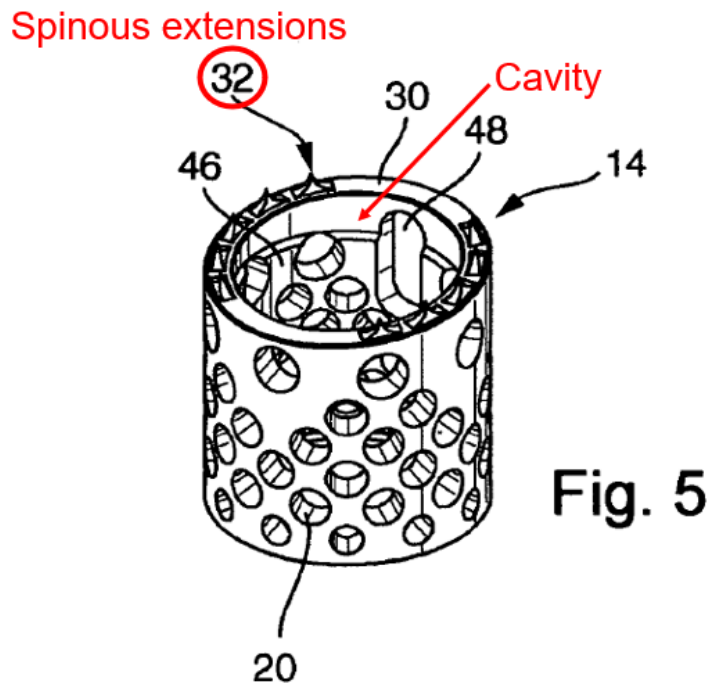
(*Id.*, Figs. 4-5 (both annotated).)

Claim 4

“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. 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.) Schäfer thus discloses “**wherein the second shell comprises a second cavity extending from the second vertebral-engaging surface through the second shell to the second opposite surface.**”

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



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

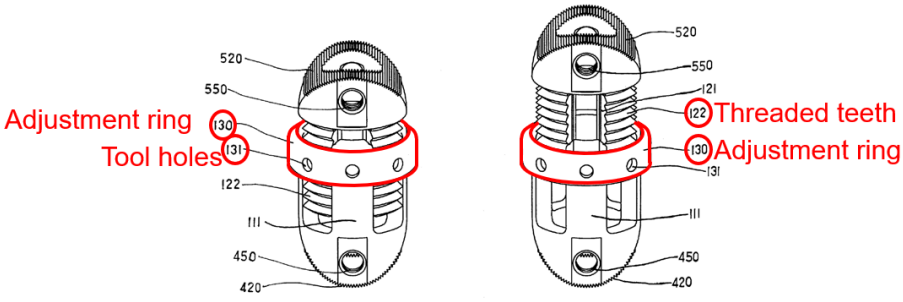
Claim 5	
“The artificial spinal implant system of claim 4, wherein the first shell curves continuously around a first perimeter of the first shell and the second shell curves continuously around a second perimeter of the second shell.”	<i>See above analysis for claim [18]. (Supra, Appendix A [18].)</i>
Claim 6	
“The artificial spinal implant system of claim 5, wherein the first perimeter is shaped to correspond to a shape of a vertebral body.”	<i>See above analysis for claim [19]. (Supra, Appendix A [19].)</i>

APPENDIX C

'755 Patent Claim Element	Prior Art Analysis
Claim 9	
<p>“The artificial spinal implant system of claim 1, wherein the first shell and the second shell each comprise titanium.”</p>	<p>Schäfer in view of Suddaby discloses this limitation. Schäfer’s specification does not delimit the material used to make outer sleeves 12, 14 (first shell and second shell). Suddaby, however, 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 is titled “Intervertebral Disc Prosthesis.” Suddaby discloses an expandable device designed for replacement of an intervertebral disc. (<i>Id.</i>, 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. (<i>Id.</i>, 3:64-4:19.) Suddaby discloses an implant that is “easy to manufacture from common materials,” such as “titanium.” (<i>Id.</i>, 2:25-27, 2:64.)</p> <div data-bbox="532 1220 1336 1549"> <p style="text-align: right;">FIG. 2B</p> </div> <p>(<i>Id.</i>, Fig. 2B (annotated).)</p> <p>Suddaby thus discloses “the first shell and the second shell each comprise titanium.”</p>

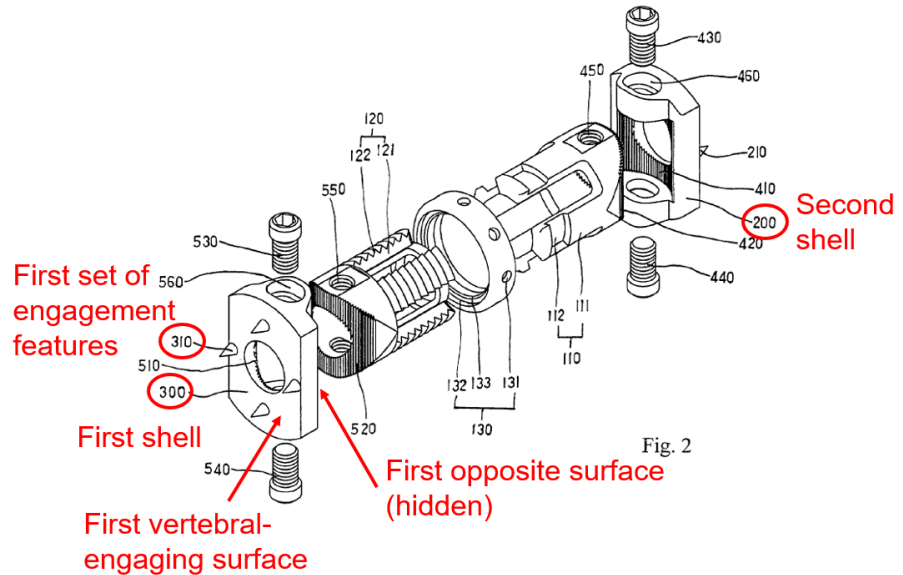
	<p>A POSITA would have been motivated to use titanium shells for Schäfer’s implant because titanium was known to have “outstanding features” for implants for more than two decades. (<i>See</i> Ex. 1050, 1 (“Commercially pure (c.p.) titanium has proven its suitability as an implant material in bone surgery 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.)</p> <p>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. (<i>See supra</i>, Section V.B) 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.</p>
Claim 20	
“The artificial spinal implant system of claim 12, wherein the first shell and the second shell each comprise titanium.”	<i>See</i> above analysis for claim [9]. (<i>Supra</i> , Appendix C [9].)

APPENDIX D

'755 Patent Claim Element	Prior Art Analysis
Claim 1	
<p>[1.a] “An artificial spinal implant system comprising: an artificial expansile spinal implant comprising:”</p>	<p>Yeh discloses this limitation. 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. (<i>Id.</i>, ¶¶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.”</p> <div style="text-align: center;">  <p>Fig. 6b Fig. 6a</p> </div> <p>(<i>Id.</i>, Figs. 6a-6b (both annotated).)</p> <p>Yeh further discloses a “tool” for adjusting the height of the implant. (<i>Id.</i>, ¶26.) Thus, Yeh discloses an “artificial spinal implant system.”</p>

[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 extending from the first vertebral-engaging surface;”

Yeh discloses this limitation. 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).



(*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. Indeed, the “fixation teeth” of Yeh are similar to Schäfer’s spinous extensions 32, which “penetrate the contact surfaces of the neighboring vertebrae . . .” (Ex. 1010, 4:47-52, Fig. 2.) As shown in figure 2 above, the top seat 300 also has a “recessed curved surface . . . (510)” that is opposite the vertebral-engaging surfaces. (*Id.*) 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

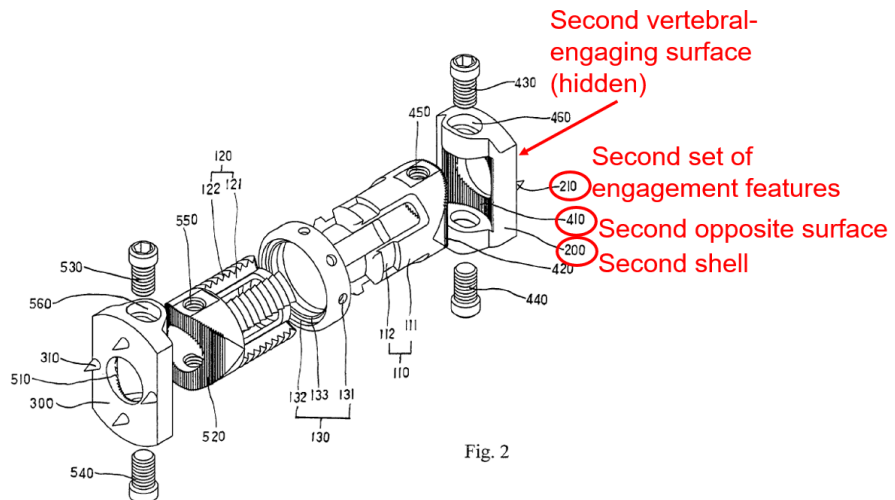
	vertebrae. (<i>Id.</i>) As shown in figure 2 above, the fixation teeth 310 are also arranged in a circular manner around a hole, or cavity, in the top seat. Yeh thus discloses a “ first set of engagement features extending from the first vertebral-engaging surface. ”
--	--

[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”

Yeh discloses this limitation. As described in Appendix D [1.b], 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 include “fixation teeth” 210 and 310, a POSITA would have understood that these components of the implant contact the surfaces of the vertebrae. 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. (*Id.*) Yeh thus discloses a “**second shell having a second vertebral-engaging surface**,” and a recessed curved surface 410 that is the “**second opposite surface**.”

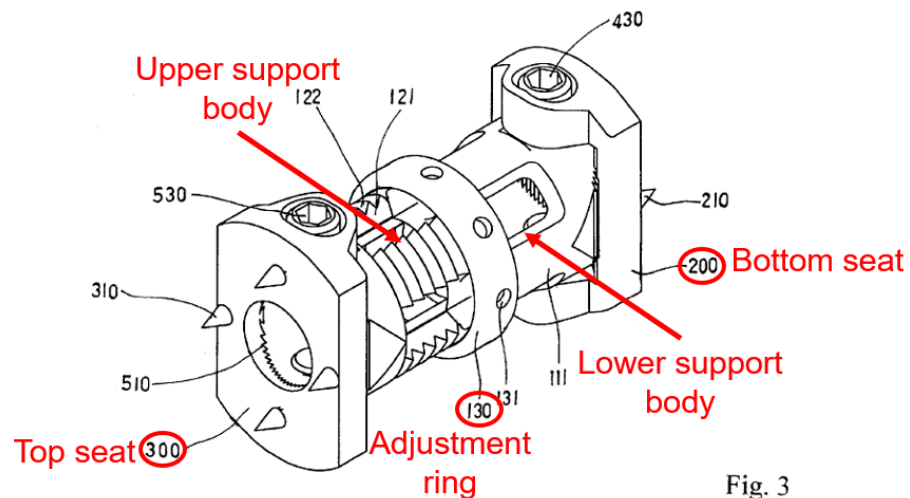
The bottom seat 200 is “provided with fixation teeth 210,” *i.e.*, a set of structures that extends from the top seat to engage the vertebrae. (*Id.*; *see also id.*, Fig. 2.) Yeh thus discloses a “**second set of engagement features extending from the second vertebral-engaging surface**.”



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

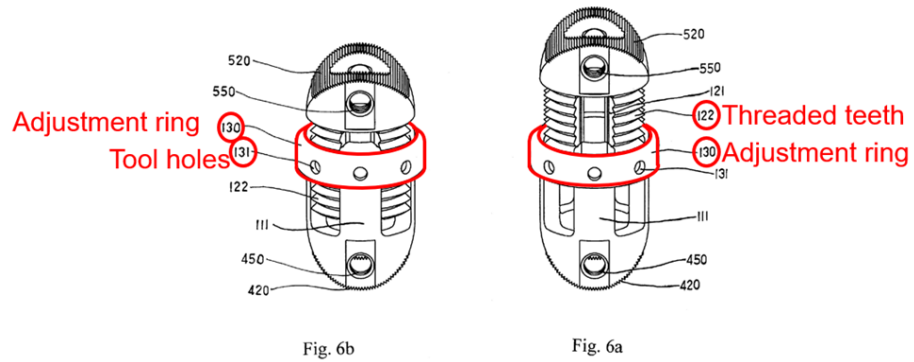
[1.d] “an expansion mechanism positioned between the first shell and the second shell and configured to expand the artificial expansile spinal implant, the expansion mechanism coupled to the first opposite surface and the second opposite surface, the expansion mechanism comprising a tool-engagement surface,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

Yeh discloses this limitation. 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.**”



(*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.**”



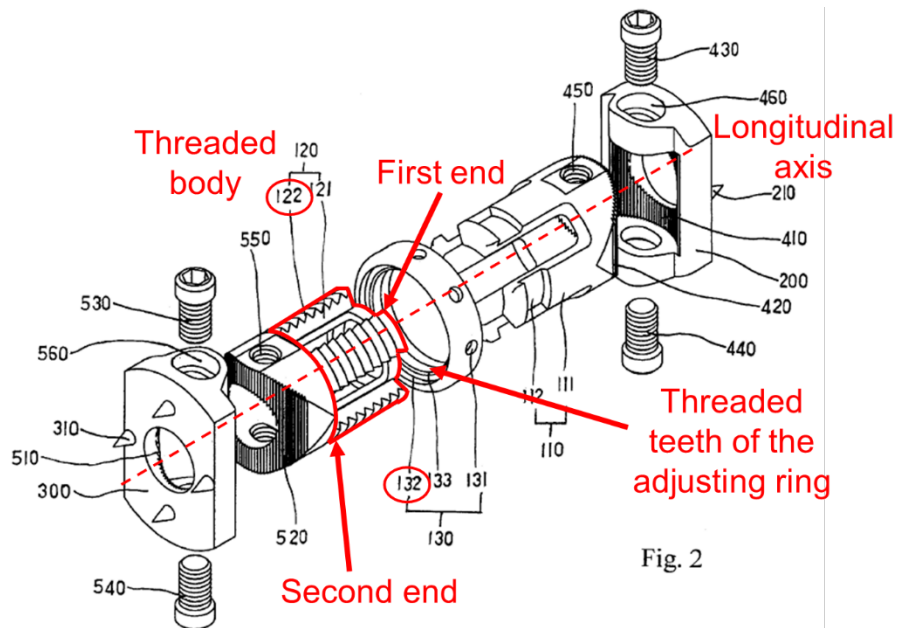
(*Id.*, Figs. 6a-b (both annotated).)

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.)

[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;”

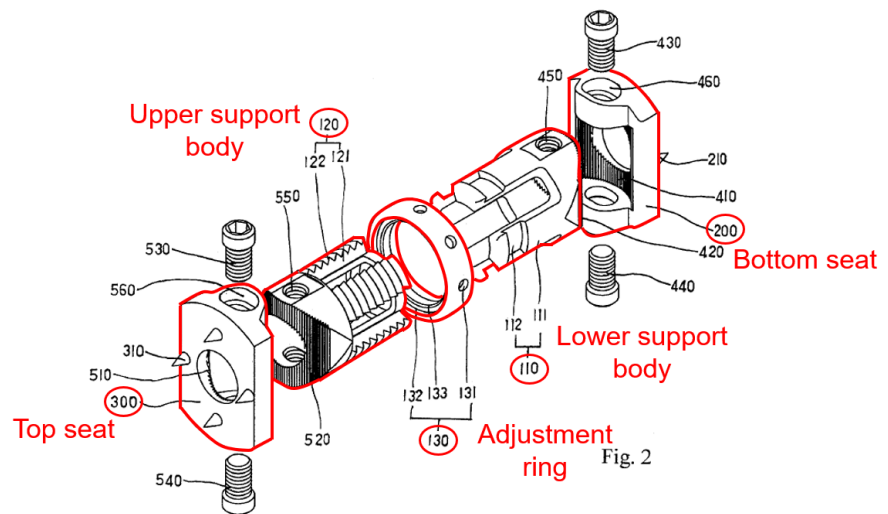
Yeh discloses this limitation. As explained in Appendix D [1.b] and [1.c], the top seat 300 and bottom seat 200 are the **first** and **second shells**, respectively. Figure 2 below illustrates **the threaded body** (*i.e.*, upper support body 120) having “**a first end, a second end, and a longitudinal 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).)

[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,”

Yeh discloses this limitation. 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. 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.”**

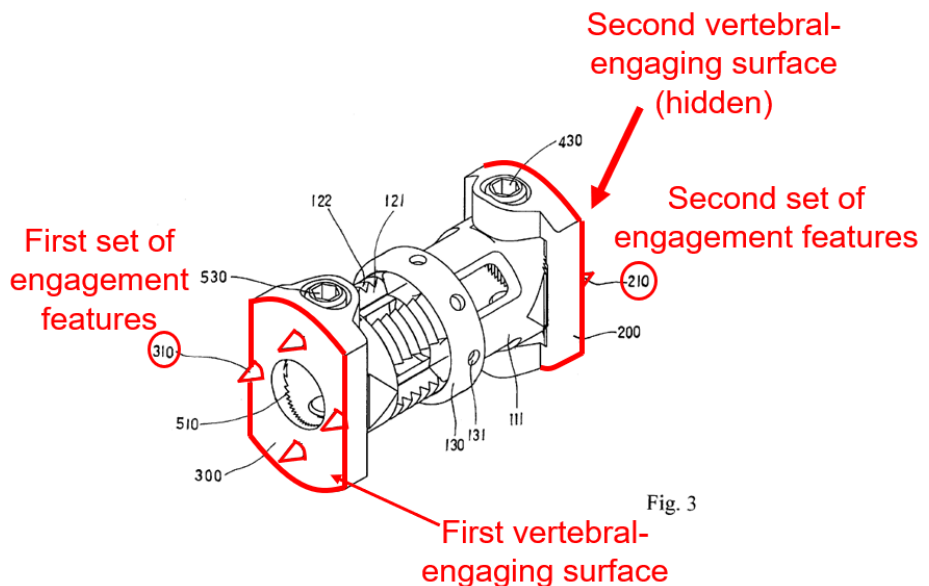


(*Id.*, Fig. 2 (annotated).)

<p>[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;”</p>	<p>Yeh in combination with Berry discloses or suggests this limitation for the reasons I discussed in Section VIII.B.3.</p>
---	---

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

Yeh discloses this limitation. As explained in Appendix D [1.a]-[1.c], 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.**”



(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.) Indeed, the “fixation teeth” of Yeh are similar to Schäfer’s spinous extensions 32, which “penetrate the contact surfaces of the neighboring vertebrae . . .” (Ex. 1010, 4:47-52, Fig. 2.) Yeh thus discloses that “**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 [are] engaging opposing**

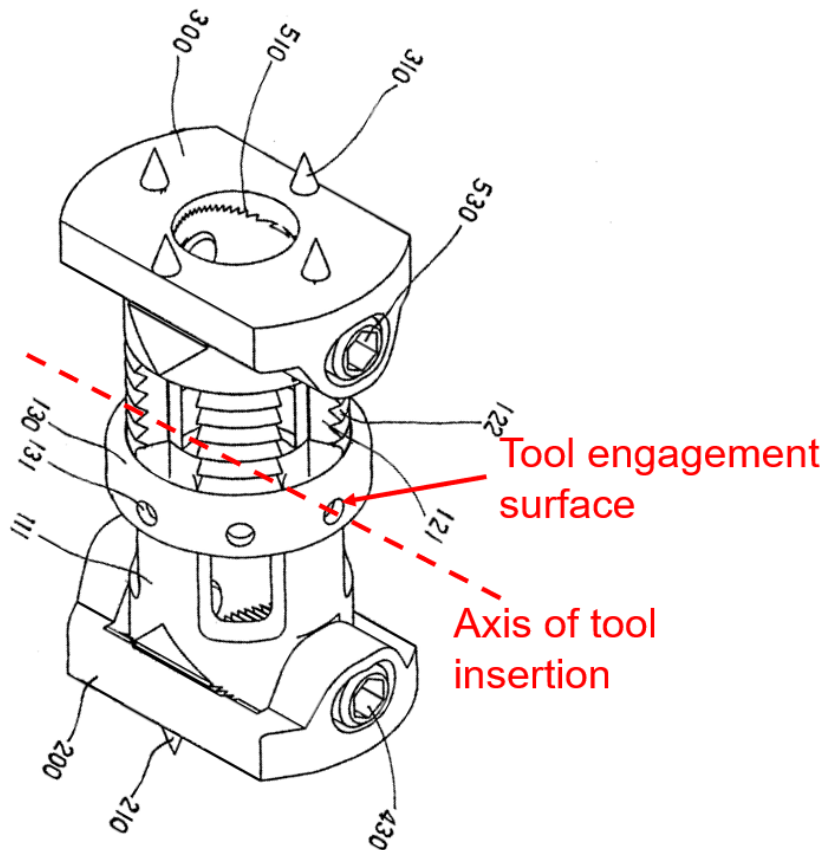
Declaration of Mr. Brad Culbert

U.S. Patent No. 11,864,755

	vertebral bodies to hold the artificial expansile spinal implant in place.”
--	--

[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”

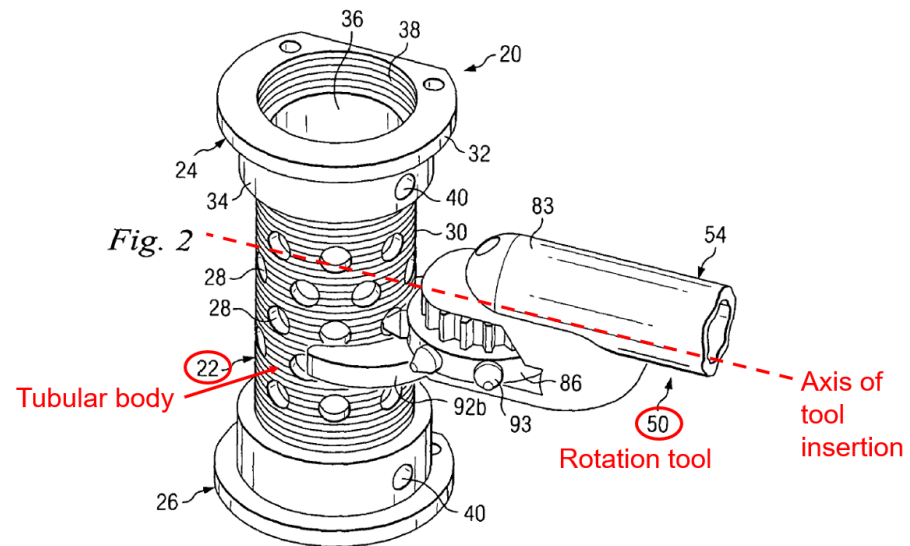
Yeh, either alone or in combination with Berry, discloses this limitation. Yeh discloses that “[t]he adjustment of [the] height of the support member is attained by a tool which is inserted into the tool holes 131 to rotate the adjustment ring 130.” (Ex. 1008, ¶26.) As explained in Appendix D [1.d], 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.



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

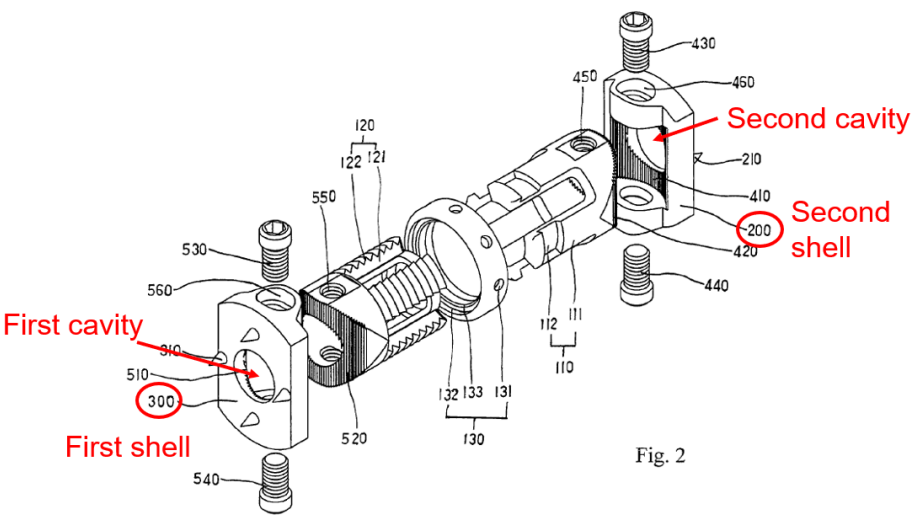
As also discussed in Appendix D [1.g], and as shown in figure 2 below, Berry also discloses a tool that engages **“the tool-engagement surface of the expansion mechanism [i.e.,**

holes of Yeh's adjustment ring 130] . . . **along a direction of insertion."**



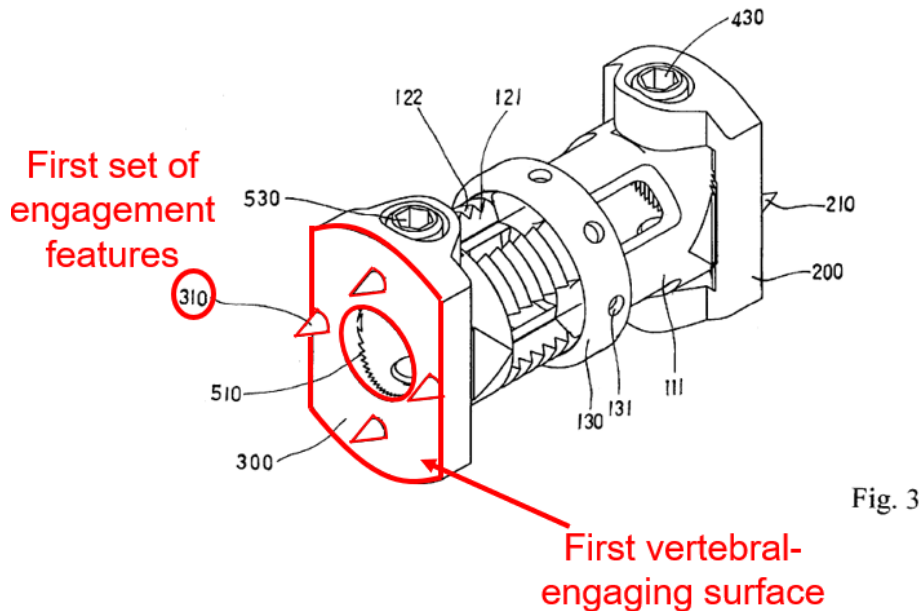
(Ex. 1009, Fig. 2 (annotated).)

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.

<p>[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”</p>	<p>Yeh discloses this limitation. 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, <i>e.g.</i>, 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.”</p>  <p>(Ex. 1008., Fig. 2 (annotated).)</p>
<p>[1.k] “wherein the first set of engagement features are positioned on the first vertebral-engaging surface circumferentially about the first cavity.”</p>	<p>See above analysis for claim [1.b]. (<i>Supra</i>, Appendix D [1.b].)</p>
<p>Claim 2</p>	

“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.”

Yeh discloses this limitation. As discussed in Appendix D [1.b], 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).)

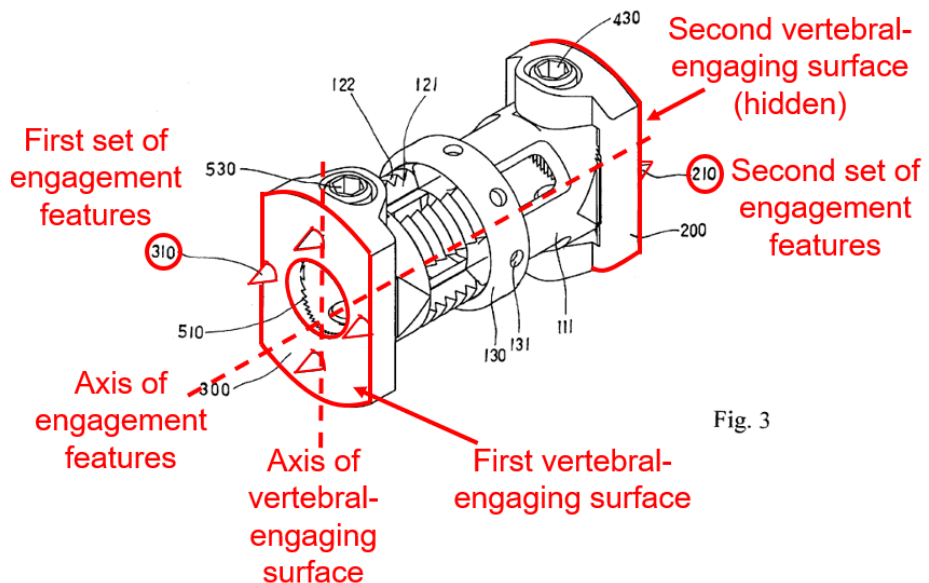
As explained in Appendix D [1.h], Yeh’s “primary objective is to provide a spinal column fixation device” and Yeh’s implant is intended to be “**introduced into a spine and expanded.**” (*Id.*, [0003].) The fixation teeth 310 have “**substantially conical tips**” so that they may “**pierce [the] endplates of the opposing vertebral bodies when introduced into the spine and expanded.**”

Claim 3

“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.”

Yeh discloses this limitation. As discussed in Appendix D [1.b], 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* Appendix D [1.c].) 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).)

Claim 4

<p>“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.”</p>	<p>Yeh discloses this limitation. 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, <i>e.g.</i>, 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.”</p> <p>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. (<i>See supra</i> Appendix D [1.k].) 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>i.e.</i>, engaging opposing vertebrae, and there is no disclosure to the contrary in Yeh. 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.”</p>
--	---

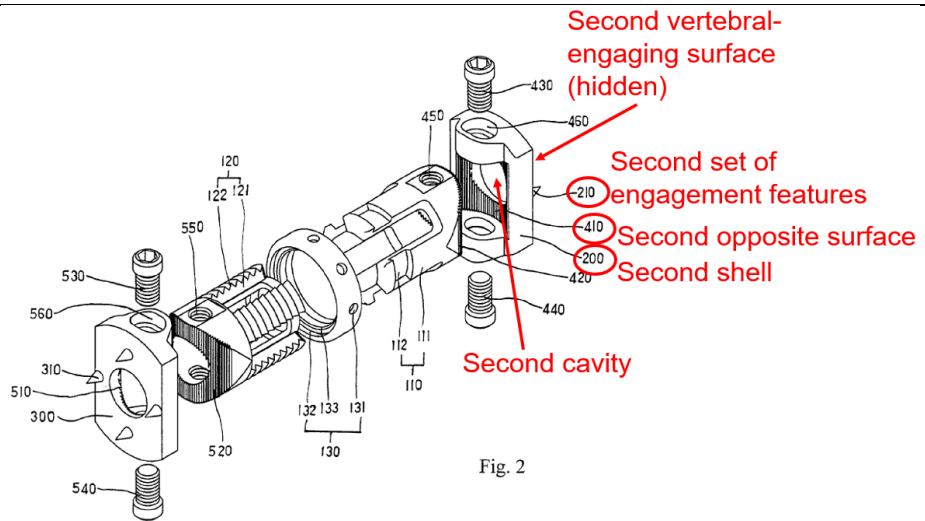
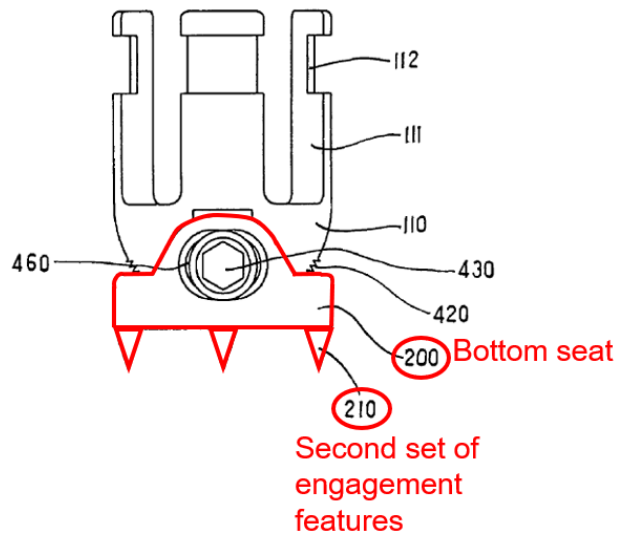


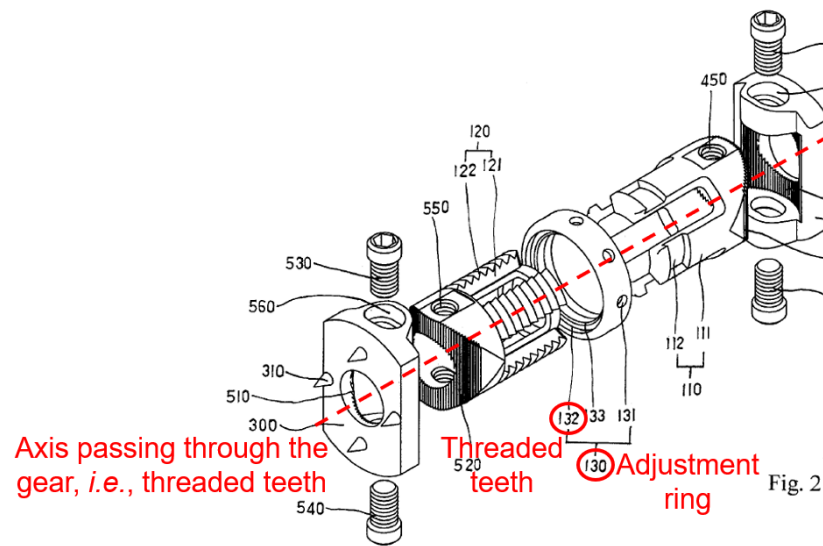
Fig. 4a

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

Claim 8

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

Yeh discloses this limitation. The adjustment ring 130 in combination with the upper and lower support members comprise the **expansion mechanism**. (*See supra* Appendix D [1.d].) Yeh further discloses that adjustment ring 130 has “threaded teeth 132.” (Ex. 1008, ¶21.) Because adjustment ring 130, and with it, threaded teeth 132, rotate about a longitudinal axis passing through the implant (*see supra* Appendix D [1.d]), Yeh’s threaded teeth 132 are a **rotatable gear**. (Ex. 1008, ¶26.) Yeh thus discloses an expansion mechanism “**wherein the expansion mechanism further comprises a rotatable gear.**”



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

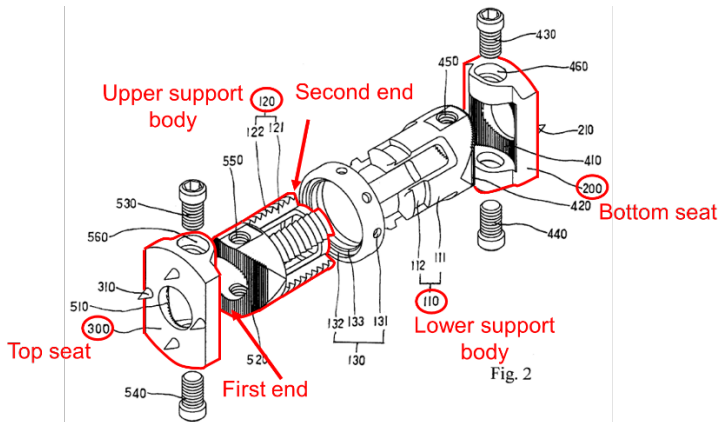
Claim 10

<p>“The artificial spinal implant system of claim 1, wherein the artificial expansile spinal implant further comprises means for placement of a bone fusion material.”</p>	<p>Yeh discloses this limitation. As discussed in Section VII, 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. (<i>See supra</i> Appendix D [1.j] and [4].) A POSITA would have understood that bone fusion material could be placed into the first and second cavities of Yeh’s implant. Yeh thus discloses “the artificial expansile spinal implant further comprises means for placement of a bone fusion material.”</p>
<p>Claim 11</p>	

“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.”

Yeh discloses this limitation. As discussed in Appendix D [1.d], 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 Appendix D [1.d], 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 “**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.)



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

Claim 12

[12.a] “An artificial spinal implant system comprising: an artificial expansile spinal implant comprising:”	<i>See above analysis for claim [1.a]. (Supra, Appendix D [1.a].)</i>
[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”	<i>See above analysis for claim [1.b]. (Supra, Appendix D [1.b].)</i>

<p>[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”</p>	<p><i>See above analysis for claim [1.c]. (Supra, Appendix D [1.c].)</i></p>
--	--

<p>[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;”</p>	<p><i>See above analysis for claims [1.d] and [8]. (Supra, Appendix D [1.d] and [8].) 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.) The adjustment ring 130 is a rotating gear and the contours of the tool holes 131 constitute a tool-engagement surface.</i></p>
--	---

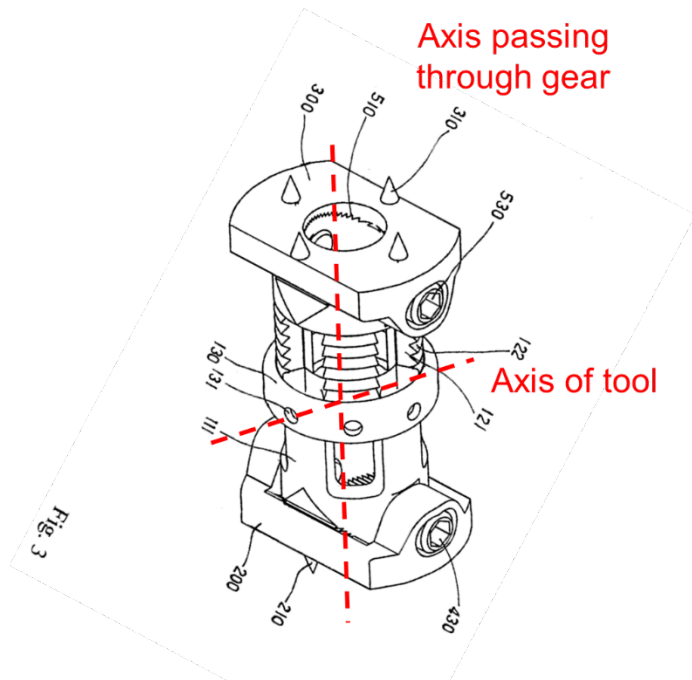
<p>[12.e] “wherein the expansion mechanism is configured to drive expansion between the first shell and the second shell in response to rotating of a tool engaged with the tool-engagement surface,”</p>	<p><i>See above analysis for claim [1.f]. (Supra, Appendix D [1.f].)</i></p>
<p>[12.f] “wherein rotating 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;”</p>	<p><i>See above analysis for claims [1.g] and [8]. (Supra, Appendix D [1.g] and [8].)</i></p>

<p>[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;”</p>	<p><i>See above analysis for claim [1.h]. (Supra, Appendix D [1.h].)</i></p>
<p>[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”</p>	<p><i>See above analysis for claim [1.i]. (Supra, Appendix D [1.i].)</i></p>

[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”	<i>See above analysis for claim [1.j]. (Supra, Appendix D [1.j].)</i>
[12.j] “wherein the first set of engagement features are positioned on the first vertebral-engaging surface circumferentially about the first cavity.”	<i>See above analysis for claim [1.k]. (Supra, Appendix D [1.k].)</i>
Claim 17	

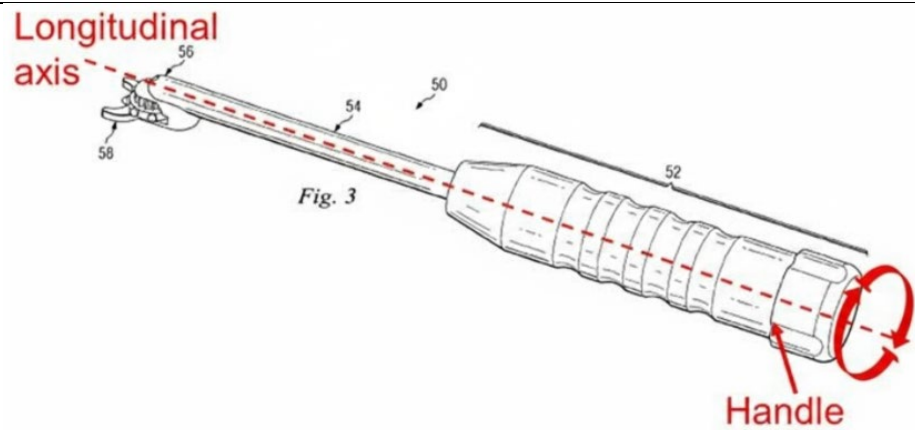
“The artificial spinal implant system of claim 12, wherein the axis passing through the gear is perpendicular to the longitudinal axis of the tool.”

Yeh in combination with Berry discloses this limitation. 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.



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

As discussed in Appendix D [1.g], 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. (*See supra* Appendix D [1.g]; 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.**”

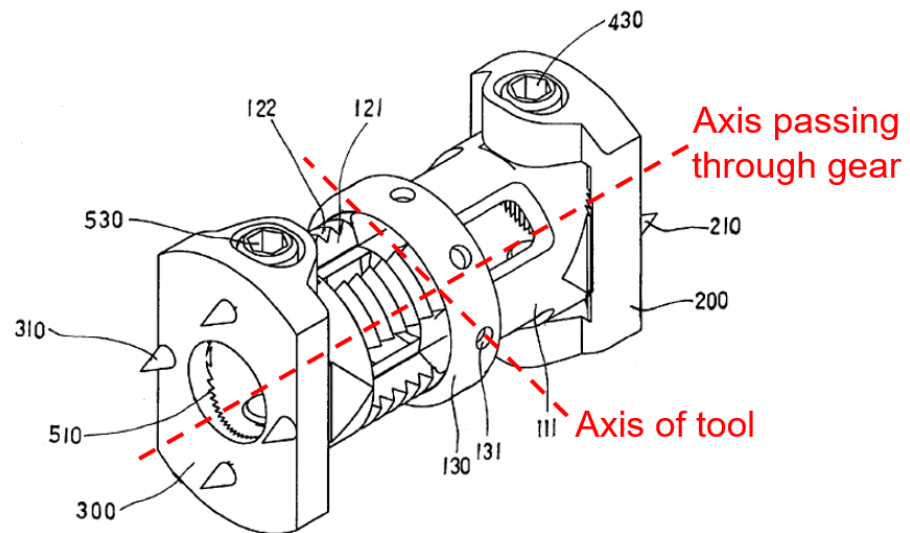


Fig. 3

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

APPENDIX E

'755 Patent Claim Element	Prior Art Analysis
Claim 5	<p data-bbox="500 485 1421 730">The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation. 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.</p> <div data-bbox="527 774 1421 1348"> <p data-bbox="527 1035 698 1134">First set of engagement features</p> <p data-bbox="597 1192 722 1224">First shell</p> <p data-bbox="602 1283 828 1348">First vertebral- engaging surface</p> <p data-bbox="906 1224 1182 1297">First opposite surface (hidden)</p> <p data-bbox="1312 961 1421 1029">Second shell</p> <p data-bbox="1161 1207 1209 1234">Fig. 2</p> </div> <p data-bbox="500 1388 1421 1591">(Ex. 1008, Fig. 2 (annotated).) However, the perimeters are at least partially circular. Thus, consistent with the '755 patent in which the perimeter of the shells of the implant is only partially circular (<i>see</i> Ex. 1001, Figs. 7A, 7B), Yeh also discloses claim 5.</p> <p data-bbox="500 1633 1421 1753">Moreover, as I discuss in Section VIII.B.4, a POSITA would have been motivated to modify the perimeter of Yeh's shells to be circular in view of Schäfer.</p>
Claim 6	

“The artificial spinal implant system of claim 5, wherein the first perimeter is shaped to correspond to a shape of a vertebral body.”	The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation. As discussed above in Appendix E [5], 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 . (<i>See supra</i> Appendix A [19].)
Claim 18	
“The artificial spinal implant system of claim 12, wherein the first shell curves continuously around a first perimeter of the first shell.”	The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation for the reasons discussed above with respect to claim 5. (<i>See supra</i> Appendix E [5].)
Claim 19	
“The artificial spinal implant system of claim 18, wherein the first perimeter is shaped to correspond to a shape of a vertebral body.”	The combined Yeh-Berry device alone or in combination with Schäfer discloses this limitation for the reasons discussed above with respect to claim 6. (<i>See supra</i> Appendix E [6].)

APPENDIX F

'755 Patent Claim Element	Prior Art Analysis
Claim 9	
<p>“The artificial spinal implant system of claim 1, wherein the first shell and the second shell each comprise titanium.”</p>	<p>Yeh and Berry in view of Suddaby discloses this limitation. Yeh’s specification is silent as to the material of the implant. As discussed in Appendix C[9], 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, 4:9-19.) Suddaby thus discloses that “the first shell and the second shell each comprise titanium.”</p> <p>A POSITA would have been motivated to use titanium shells for Yeh’s implant because titanium has been noted in academic articles as having “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.)</p> <p>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 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.</p>
Claim 20	

Declaration of Mr. Brad Culbert
U.S. Patent No. 11,864,755

“The artificial spinal implant system of claim 12, wherein the first shell and the second shell each comprise titanium.”	Yeh and Berry in view of Suddaby discloses this limitation. <i>See</i> above analysis for claim [9]. (<i>See supra</i> Appendix F [9].)
--	--