

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDTRONIC, INC.
Petitioner

v.

MOSKOWITZ FAMILY LLC.
Patent Owner

Patent No. 9,005,293

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,005,293**

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LIST OF EXHIBITS

Exhibit No.	Document
Ex. 1001	U.S. Patent No. 9,005,293 to Moskowitz et al. (“the ’293 patent”)
Ex. 1002	Declaration of Brad Culbert
Ex. 1003	Curriculum Vitae of Brad Culbert
Ex. 1004	File History for U.S. Patent No. 9,005,293
Ex. 1005	U.S. Patent Application Publication No. 2010/0305704 to Messerli et al. (“Messerli”)
Ex. 1006	U.S. Patent Application Publication No. 2008/0249569 to Waugh et al. (“Waugh”)
Ex. 1007	U.S. Patent No. 7,077,864 to Byrd et al. (“Byrd”)
Ex. 1008- Ex. 1019	RESERVED
Ex. 1020	Phulchand Prithvi Raj, <i>Intervertebral Disc: Anatomy-Physiology-Pathophysiology-Treatment</i> , 8(1) PAIN PRACT. 18 (2008)
Ex. 1021	Fabio Galbusera et al., <i>Ageing and degenerative changes of the intervertebral disc and their impact on spinal flexibility</i> , 23(3) EUR. SPINE J. 324 (2014)
Ex. 1022	Dil Patel et al., <i>Interbody options in lumbar fusion</i> , 5(1) J. SPINE SURG. S19 (2019)
Ex. 1023	Sukrit Jain et al., <i>Advances in Spinal Interbody Cages</i> , 8(3) ORTHOP SURG. 278 (2016)
Ex. 1024- Ex. 1029	RESERVED
Ex. 1030	U.S. Patent No. 6,716,247 to Michelson (“Michelson ’247”)

Exhibit No.	Document
Ex. 1031- Ex. 1039	RESERVED
Ex. 1040	Amended Complaint, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 27.
Ex. 1041	Answer to Amended Complaint, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 29.
Ex. 1042	File History for U.S. Patent No. 9,907,674
Ex. 1043	File History for U.S. Patent No. 11,903,849
Ex. 1044	Amended Complaint, Exhibit A2, Amended Complaint, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 27-2.
Ex. 1045- Ex. 1046	RESERVED
Ex. 1047	U.S. Patent No. 6,342,074 to Simpson (“Simpson”)
Ex. 1048	U.S. Patent No. 11,903,849 to Moskowitz et al. (“the ’849 patent”)
Ex. 1049	U.S. Patent No. 6,972,019 to Michelson (“Michelson ’019”)
Ex. 1050	Amended Complaint, Exhibit A4, Amended Complaint, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 27-4.
Ex. 1051	Amended Complaint, Exhibit A3, Amended Complaint, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 27-3.
Ex. 1052	Amended Complaint, Exhibit A5, Amended Complaint, <i>Moskowitz Family, LLC v. Medtronic, Inc.</i> , No. 0:25-cv-00769 (D. Mass. filed Feb. 28, 2025), Dkt. 27-5.
Ex. 1053	U.S. Patent No. 7,846,188 to Moskowitz et al. (“the ’188 patent”)

I. INTRODUCTION

Medtronic, Inc. (“Petitioner”) respectfully requests *inter partes* review of claim 43 of U.S. Patent No. 9,005,293 (“the ’293 patent”) (Ex. 1001) assigned to Moskowitz Family LLC (“Patent Owner”). As this narrowly tailored Petition demonstrates, claim 43 is anticipated or rendered obvious by ***multiple*** references, and issued only because Patent Owner deprived the Office of the prior art that is cited in this Petition. In fact, when the prior art in this Petition was considered in related prosecutions, the Office determined that it discloses the ***exact claim limitations*** that Patent Owner alleged were missing from the prior art during prosecution of the ’293 patent.

Between most vertebrae of the spine are discs, which act as shock absorbers and allow for spinal flexibility. Over time, however, these discs may deteriorate or become injured and need to be artificially replaced to restore the normal function and alignment of the spine. The ’293 patent discloses implants that can be inserted into the disc space between adjacent vertebrae, which are secured to the vertebrae using screws and bone filling. But, as demonstrated by the prior art cited in this Petition, such implants were well-known to those of ordinary skill in the art.

The Office, however, did not consider the Petitioner’s cited art in no small part due to Patent Owner’s questionable actions during prosecution. Specifically, ***after*** the Office issued a Notice of Allowance, Patent Owner submitted an Information

Disclosure Statement on March 9, 2015 (“2015 IDS”) listing eighty (80) references. (Ex. 1004, 398-408.) Buried amongst them were the three prior art references (Messerli (Ex. 1005), Waugh (Ex. 1006), and Byrd (Ex. 1007)) that Petitioner relies upon in this Petition. (*See id.*) The Office, however, did not consider those references because the 2015 IDS was “non-compliant.” (*See id.*, 413.) Rather than correcting the 2015 IDS, Patent Owner let the ’293 patent issue thereby depriving the Office of the benefit of these three prior art references.

This failure was critical to the issuance of claim 43. During prosecution of later related applications, the Office determined that Messerli and Waugh disclosed the same limitations, which Patent Owner had argued were not disclosed in the prior art during prosecution of the ’293 patent. (*See infra* Sections VIII.B and VIII.C.) Had the Office considered Messerli, Waugh, or Byrd (the other reference in the 2015 IDS cited in this Petition) during prosecution of the ’293 patent, claim 43, at a minimum, would not have issued. (*See infra* Section X.)

The belated submission of key prior art during prosecution of the ’293 patent in a manner not compliant with the Office’s rules is just one example of how Patent Owner has manipulated the Office into issuing invalid patents over the past 20 years. Instead of filing patent applications based on innovation, Patent Owner inundated the Office with dozens of similar applications containing claims covered by the prior

art. In fact, Patent Owner has filed at least seventy (70) patent applications claiming priority, at least in part, to the same priority applications as the '293 patent.

Patent Owner first approached Petitioner regarding the '293 patent in 2015. (Ex. 1040, ¶45; Ex. 1041, ¶45.) Patent Owner sought to discuss whether certain patents in Patent Owner's portfolio "may be of interest to Medtronic." (Ex. 1040, ¶45; Ex. 1041, ¶45.) By January 2016, Petitioner informed Patent Owner that it did not wish to acquire or license the portfolio. (Ex. 1040, ¶48; Ex. 1041, ¶48.) Petitioner, reasonably believing that it did not infringe any of those patents, continued with its pre-existing research and development. Patent Owner did not contact Petitioner again until it filed suit against Petitioner in 2025, leading to the expectation that Patent Owner would not assert its patents against Petitioner.

Petitioner therefore requests that the Office reconsider its grant of claim 43 of the '293 patent and find it unpatentable.

II. MANDATORY NOTICES

Real Parties-in-Interest: Pursuant to 37 C.F.R. § 42.8(b)(1), the real party-in-interest is Medtronic, Inc. Medtronic plc is the ultimate parent of Medtronic Inc. Medtronic, Inc. is a co-defendant with Medtronic Sofamor Danek, Inc., Warsaw Orthopedic, Inc., and Titan Spine, Inc. in a suit involving the '293 patent (*see* Related Matters below).

Related Matters: Patent Owner asserted the '293 patent against Petitioner in the following civil action: *Moskowitz Family LLC v. Medtronic, Inc. et al.*, U.S. District Court for the District of Minnesota, civil action no. 0:25-cv-00769, filed on February 28, 2025. The '293 patent is also at issue in *Moskowitz Family LLC v. NuVasive, LLC et al.*, U.S. District Court for the District of Delaware, civil action no 1:25-cv-00711, filed on June 6, 2025. Patents related to the '293 patent were previously at issue in IPRs filed by Globus Medical, Inc. (*See* IPR2020-01303, -01304, -01305, -01306, -01307, -01308, -01309, -01310.)

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

III. PAYMENT OF FEES

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

IV. STANDING

Petitioner certifies under 37 C.F.R. § 42.104(a) that the '293 patent is available for review and that Petitioner is not barred or estopped from requesting review on the grounds identified herein.

V. RELIEF REQUESTED AND GROUNDS RAISED

Petitioner respectfully requests review of claim 43 of the '293 patent and cancellation of this claim as unpatentable based on the following grounds:

Ground 1: Claim 43 is unpatentable under pre-AIA 35 U.S.C. §103(a) as obvious based on Byrd (Ex. 1007) alone or in view of Waugh (Ex. 1006).

Ground 2: Claim 43 is unpatentable under pre-AIA 35 U.S.C. §103(a) as obvious based on Messerli (Ex. 1005) alone or in view of Waugh.

Ground 3: Claim 43 is unpatentable under pre-AIA 35 U.S.C. §102(e) as anticipated by Waugh.

The '293 patent issued on April 14, 2015, from U.S. Application No. 13/108,982 ("the '982 application"), filed May 16, 2011, which is a continuation of U.S. Application No. 11/842,855 ("the '855 application"), filed on August 21, 2007. The '293 patent also claims the benefit of U.S. provisional application No. 60/670,231, filed on April 12, 2005. For purposes of this Petition, Petitioner has applied a priority date of August 21, 2007, the filing date of the '855 application, which is a *continuation-in-part* of U.S. Application No. 11/536,815 ("the '815

application”), filed on September 29, 2006, now U.S. Pat. No. 7,846,188. None of the applications in the priority chain of the ’293 patent with a filing date prior to the ’855 application disclose or provide support for an intervertebral cage, where “*the internal bore of the exit opening formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall*” (emphasis added). For example, the ’855 application has figures that are entirely different from those in the ’815 application filed on September 29, 2006. (Ex. 1002, ¶¶46-48.)

Byrd was filed on February 5, 2003, and issued on July 18, 2006. Thus, Byrd is prior art under pre-AIA 35 U.S.C. § 102(b). Messerli was filed on February 27, 2007, and published on December 2, 2010. Waugh was filed on April 3, 2007, and published on October 9, 2008. Thus, Messerli and Waugh are prior art under pre-AIA 35 U.S.C. § 102(e). The Office did not consider Byrd, Messerli, and Waugh during prosecution of the ’293 patent.

VI. BACKGROUND

A. Technology Overview

1. Anatomy of the Spine and Intervertebral Discs

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

Ex. 1002, ¶¶24-25.¹) 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.)

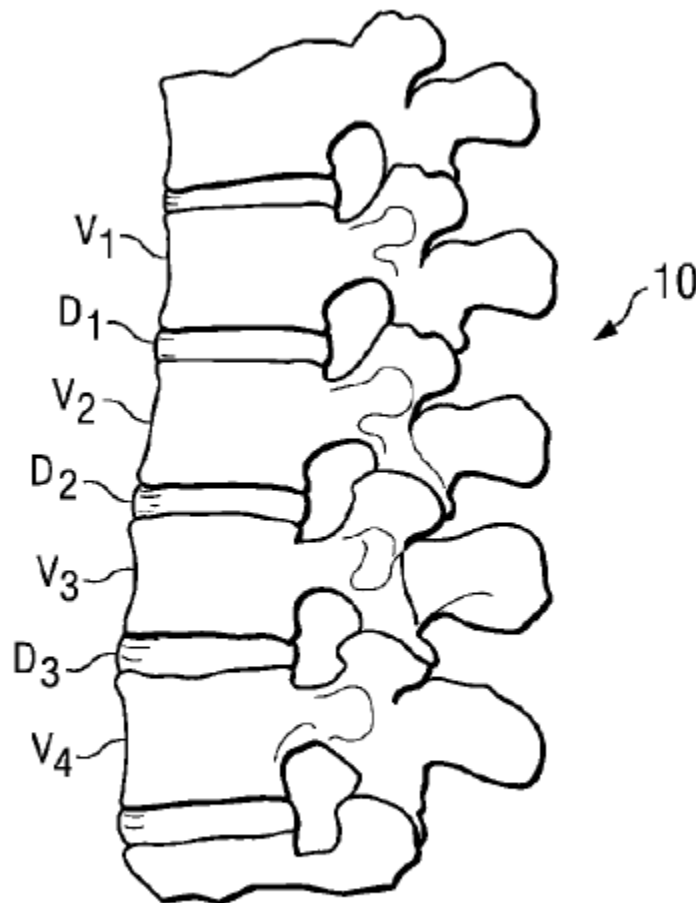


Fig. 1

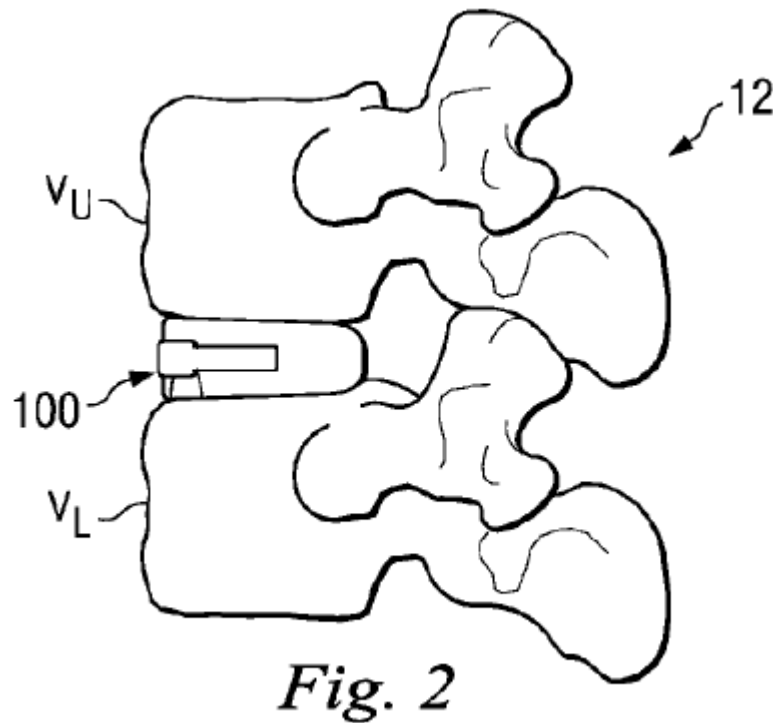
(*Id.*, Fig. 1.)

¹ Petitioner submits a declaration (Ex. 1002) by Mr. Brad Culbert, an expert in the field of spinal implants (Ex. 1003).

These discs, however, can become damaged due to various degenerative diseases, aging, trauma, and mechanical stress. (*See* Ex. 1020, 6-9; *see also* Ex. 1021, 2-3.) Damaged discs can bulge and lose height, which, in turn, can cause compression of nearby nerves, reduce the discs' ability to absorb mechanical loads, and lead to decreased mobility. (*See* Ex. 1020, 9-10.)

2. Intervertebral Fusion Devices

When spinal disc injury is severe, surgical intervention may involve removing all or part of the damaged disc, followed by placement of an implant that can fuse adjacent vertebrae. (*See* Ex. 1020, 15-20; *see also* Ex. 1022, 2; Ex. 1002, ¶¶26-27.) These implants, known as intervertebral or interbody fusion devices, are positioned between adjacent vertebrae and may employ various components, such as screws, to achieve fusion with the vertebrae. (*See* Ex. 1022, 1-3.) As shown in the figure below, a damaged disc can be removed and replaced by an “implantable device . . . [s]ized to fit the disc space height in a manner similar to a natural intervertebral disc” (Ex. 1006, ¶27.)



(*Id.*, Fig. 2.)

An example of such an implantable device is found in U.S. Patent No. 6,342,074 (“Simpson”) (Ex. 1047; Ex. 1002, ¶¶28-29). Simpson was filed in April 2000, more than a decade before the filing of the ’982 application, which issued as the ’293 patent. Simpson discloses an “implant 100” inserted between two adjacent vertebrae 10 and 12. (Ex. 1047, 7:45-60, Figs. 1, 2.) The implant is held in place by “orthopedic screws 52, 54.” (*Id.*, 7:56-60.)

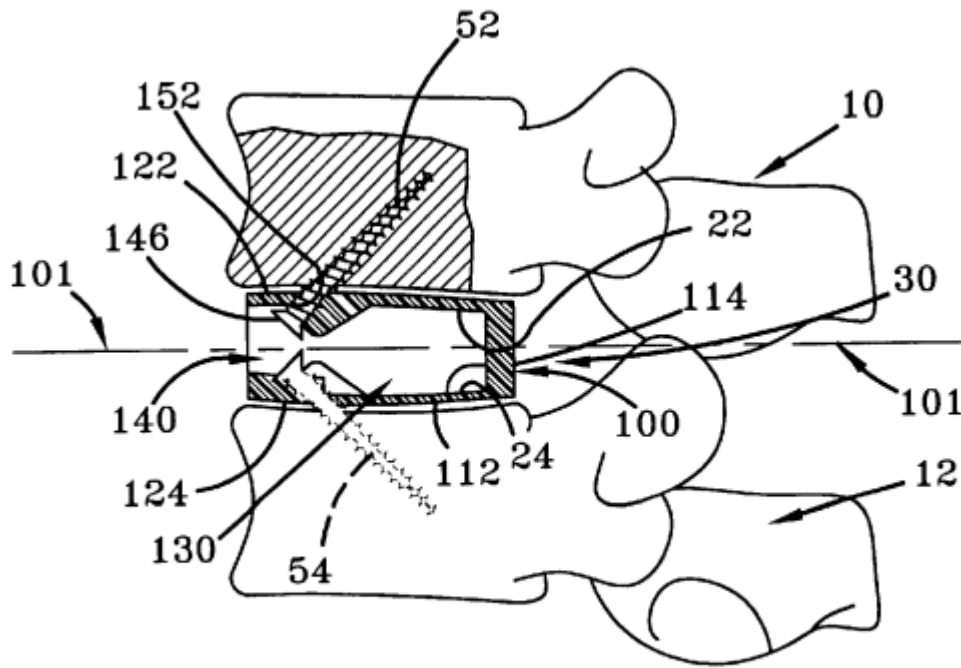


FIG-2

(*Id.*, Fig. 2.) The implant also has a cage-like structure with an “an interior chamber 130 that can be filled with bone graft material (not shown) for extending between and effecting fusion of central cancellous portions of the endplates 22, 24” of vertebrae 10 and 12. (*Id.*, 8:1-4, Fig. 3.)

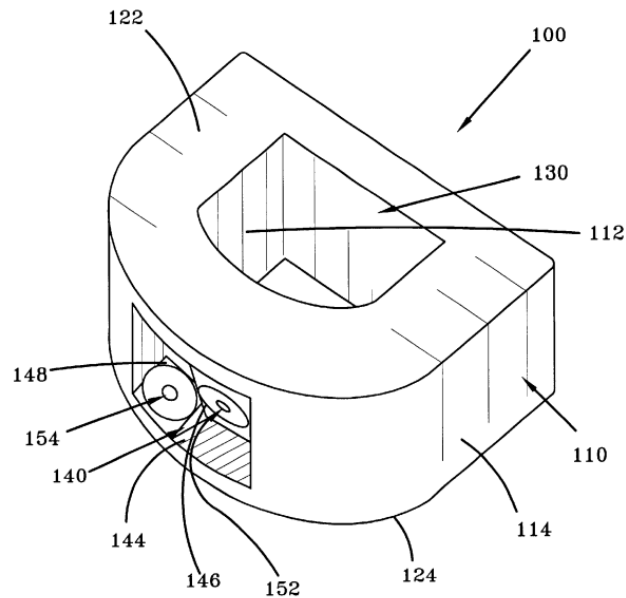


FIG-3

(*Id.*, Fig. 3.)

i) Screws Used in Intervertebral Fusion Devices

As was well-known in the art in the mid-2000s, screws used in intervertebral fusion devices typically had a screw head and a threaded portion. (Ex. 1002, ¶¶30-21.) For example, Byrd's screw 80 features a head 82 followed by a threaded portion 84. (Ex. 1007, 6:4-9, Fig. 8.)

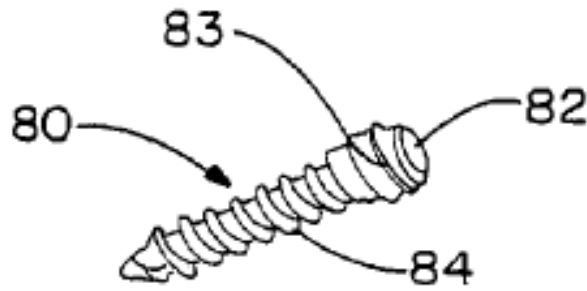


FIG. - 8

(*Id.*, Fig. 8.)

Michelson '019 likewise discloses a screw 128 with a head 138 and a threaded shaft 134. (Ex. 1049, 6:60-62, Fig. 1.)

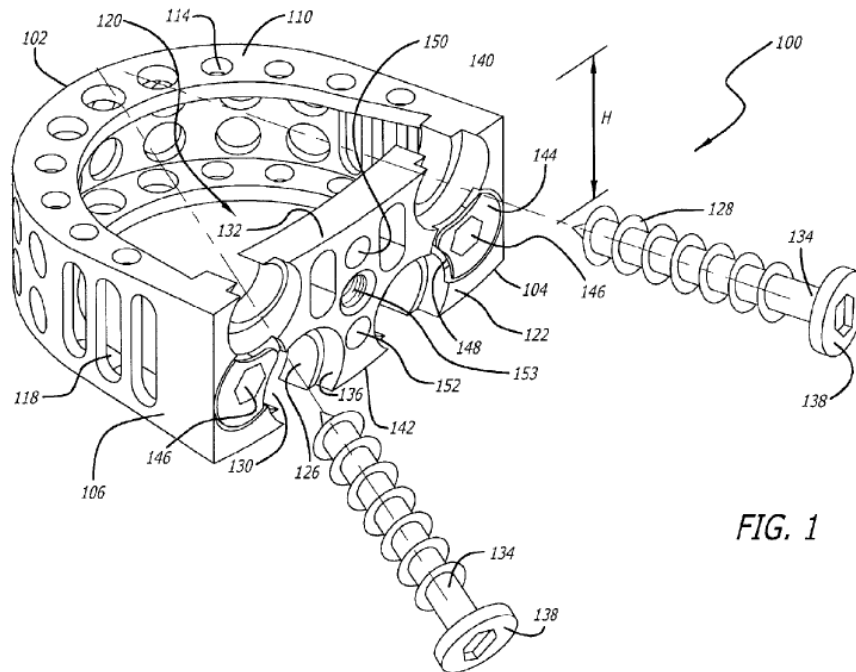


FIG. 1

(*Id.*, Fig. 1.)

The screws were typically inserted at different angles to form “effective connections with the adjacent vertebrae.” (Ex. 1047, 5:41-47; *see also* Ex. 1002, ¶32 (discussion of Messerli’s screw angles).) Byrd similarly discloses screw passages, where “[a] suitable range for the angle from a horizontal plane is from about 10° to about 50°” to allow the screws to pass through the implant at various angles. (Ex. 1007, 5:49-50; Ex. 1002, ¶53.)

ii) Zero or Low Profile Implants

Implants that fit completely within the disc space are referred to as “zero profile” implants. (Ex. 1002, ¶33.) A “zero profile” implant is a type of “low profile” implant. (*Id.*) Simpson’s implant, as shown in figure 2 above, sits ***completely within*** the intervertebral disc space and is an example of a “zero profile” implant. (*Id.*) Simpson’s choice in seating the implant completely within the disc space was based on the known fact that implant parts protruding outside of the disc space could engage with vessels and tissues located outside the disc space. (Ex. 1047, 8:44-48.) Simpson further discloses that the implant “[is] provided in a variety of sizes and thickness,” which a POSITA would have understood allows fitting the implant inside differing sizes of the intervertebral disc space. (*Id.*, 9:64-65, 10:20-23; Ex. 1002, ¶34.) Other patents recognized the same risk as Simpson did and sized or configured their implants to fit completely

within the disc space. (*See* Ex. 1002, ¶¶35-38 (discussing Michelson '019 (Ex. 1049), Michelson '247 (Ex. 1030), and Waugh (Ex. 1006)).)

Implants like Simpson were ubiquitous in the early and late 2000s. (Ex. 1002, ¶¶34-38.) Some of those implants (*e.g.*, those described in Byrd, Messerli, and Waugh) render the '293 patent claims unpatentable. (*See infra* Section X.)

B. '293 Patent Overview

The '293 patent generally relates to spinal devices, expandable and non-expandable, designed for insertion into the disc space between adjacent vertebrae. (*See generally* Ex. 1001.) As exemplified in figures 2A-2C (reproduced below), the '293 patent discloses a “screw box” 200 with “bi-directional fixating transvertebral screws” 201, 202. (*Id.*, 8:1-3.) The screw box also has “hollow spaces allowing packaging with bone.” (*Id.*, 8:5-6.) These bi-directional screws allow the screw box to be attached to adjacent vertebrae. (*Id.*, 1:28-35, 8:3-5.)

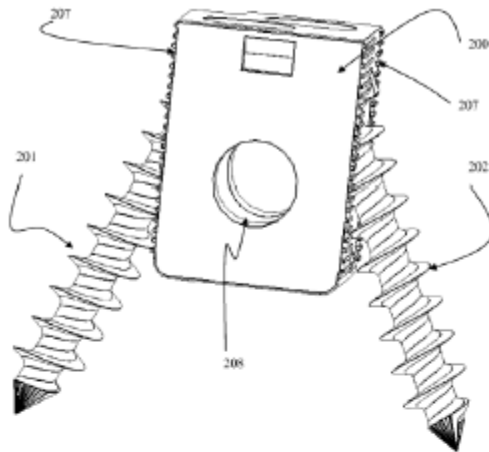


Fig. 2A

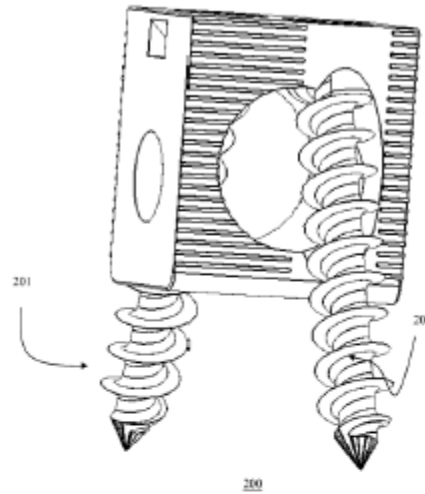


Fig. 2B

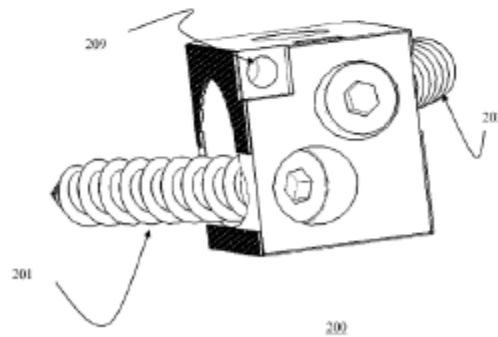


Fig. 2C

(*Id.*, Figs. 2A-2C.)

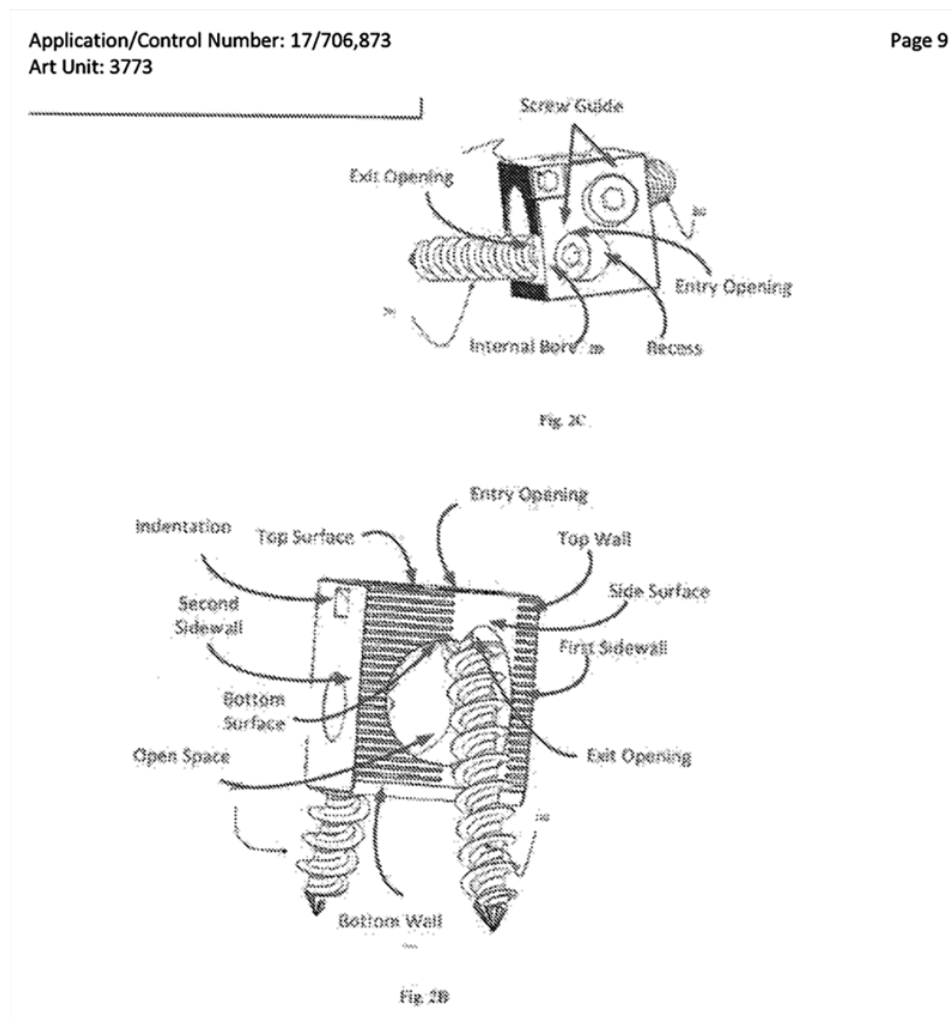
1. The '293 Patent Fails to Describe the Claimed Features

Claim 43 recites a spinal implant with the above-identified features, but also recites a host of limitations that are not described textually in the specification of the '293 patent. (Ex. 1002, ¶¶40-45.) To the extent they are even supported by the '293 patent under 35 U.S.C. § 112, they can only be inferred from the figures. For example, claim 43 recites “[a] zero-profile, intervertebral cage . . . comprising: a top

wall; a bottom wall opposite the top wall; a first sidewall; [and] a second sidewall opposite the first sidewall” (Ex. 1001, 16:40-48.) The cage has “an internal screw trajectory guide for guiding a trajectory of a screw through the intervertebral cage, the internal screw trajectory guide having an internal bore with an entry opening and an exit opening, ...” (*Id.*, 16:62-17:3.) The specification, however, does not expressly identify any structure as a “top wall,” “side wall,” “bottom wall,” or “internal screw trajectory guides” with any “internal bore.” Likewise, the specification does not explain or identify the claimed “entry opening” and “exit opening.”

The Office noted some of these deficiencies during prosecution of a related patent with similar claim limitations. Specifically, during prosecution of U.S. Patent No. 11,903,849 (“the ’849 patent”) (Ex. 1048), which is a continuation of the ’293 patent, then pending claim 21 recited “an internal screw guide having an internal bore . . . the internal bore having an entry opening and an exit opening, . . . the entry opening of the internal bore formed only in the top surface of the top wall” (Ex. 1043, 161.) The Office expressed concern regarding the lack of adequate disclosure for claim limitations such as the “top wall” and “internal bore,” which are also recited in claim 43 of the ’293 patent. (*Id.*, 172 (“it is unclear what exact structure constitutes the claimed top wall, top surface, bottom surface, bottom wall, . . . , internal screw guide, internal bore, . . . , entry opening, and exit opening” in

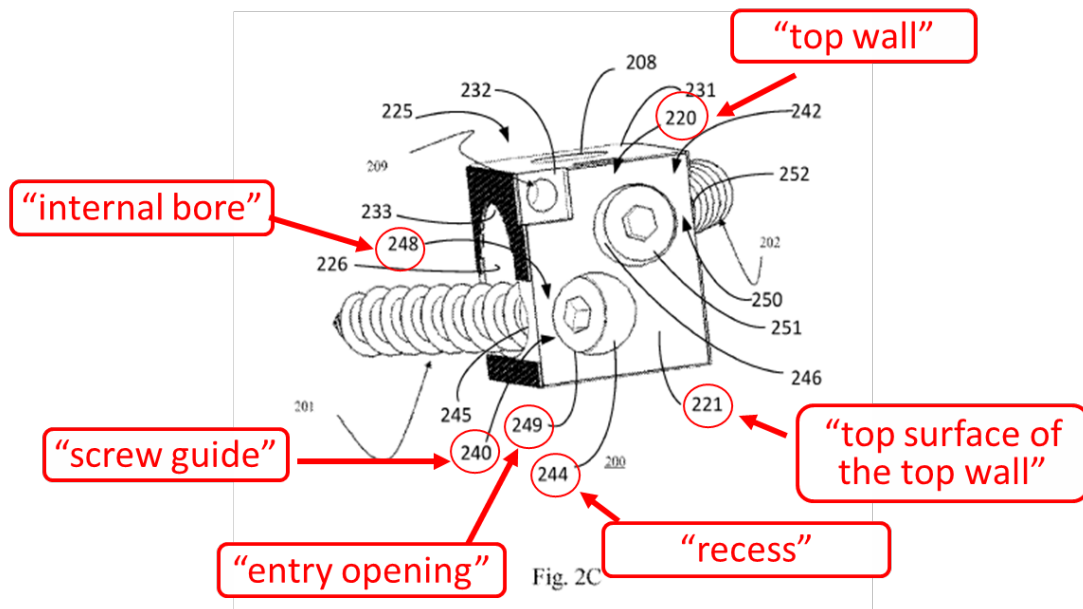
“Figs. 2A-2C”); *see also id.*, 176-177.) In response, Patent Owner provided the following annotations to figures 2B and 2C of the ’849 patent, which are the same as figures 2B and 2C of the ’293 patent. (*See id.*, 180 (“**annotated document (see below) submitted by Applicant during a telephone interview with the examiner**”) (emphasis in original).)



(*Id.*, 182 (excerpted).)

Patent Owner later amended the specification and drawings, “add[ing] new paragraph [0064.1] referencing the structures recited in the claims”

(*Id.*, 244-245.) The new specification paragraph described, among other things, a “top wall 220,” “top surface of the top wall 221,” “first internal screw guide 240,” “first internal bore 248,” “first recess 244,” and “first entry opening 249.” (*Id.*, 231, 238-240; *see also id.*, 244-245 (“The amendment to the specification adds new paragraph [0064.1] referencing the structures recited in the claims as they appear in Figs. 2A-2C.”).)



(*Id.*, 240 (annotated).) As seen from the above drawings and the proposed specification amendments, Patent Owner contended that figure 2C showed an internal bore 248 with an entry opening 249 “formed only in the top surface [221] of the top wall [220].”

The Office remained unconvinced noting, *inter alia*, that the “arrows for reference numbers 248 [internal bore] and 240 [first internal screw guide] appear to

point to the same structure” and that the “drawings fail to illustrate an entry opening of the internal bore that is formed only in the top surface of the top wall AND the entry opening formed at a juncture between the internal bore and the recess.” (*Id.*, 251.) *In response, Patent Owner removed all language pertaining to the “internal bore” from the claims.* (*See id.*, 281-288 (remarks), 299-305 (claims).)

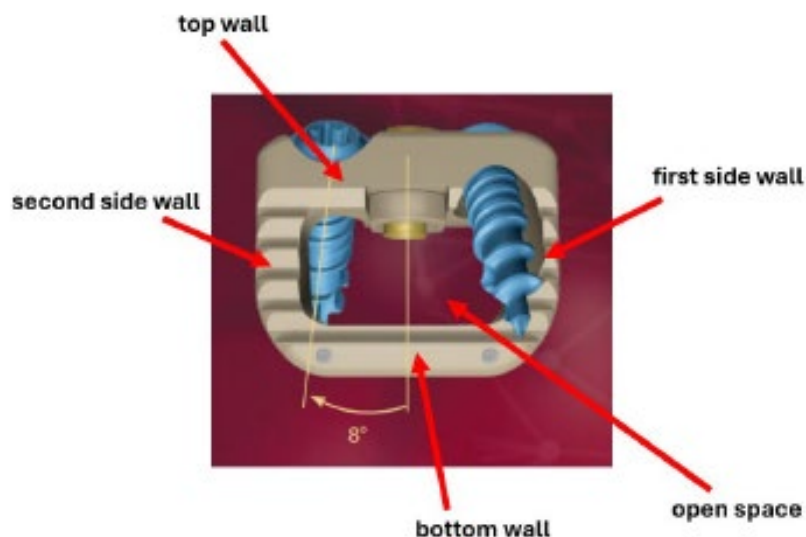
The ’293 patent’s issued claims have similar inconsistencies. Despite the ’293 patent independent claims reciting that the entry opening of the “internal bore” is “formed only in the top surface of the top wall” (*see* Ex. 1001, claims 1, 43, 44), some dependent claims state that the entry opening of the “internal bore” is “formed in a lower surface of the counterbore,” which is “formed at least partially in the top surface of the top wall for accommodating a screw head” (*See* Ex. 1001, claims 40, 48.²) For the same reasons noted by the Office during the ’849 patent prosecution history, these limitations are internally inconsistent. (Ex. 1043, 253 (“It

² Patent Owner used the term “recess” during the ’849 patent prosecution history instead of the term “counterbore” (recited in claims 40 and 48 of the ’293 patent). (*Compare* Ex. 1043, 232 (“recess sized and shaped to accommodate a screw head of a screw”), *with* Ex. 1001, claim 48 (“counterbore . . . for accommodating a screw head of a screw”).)

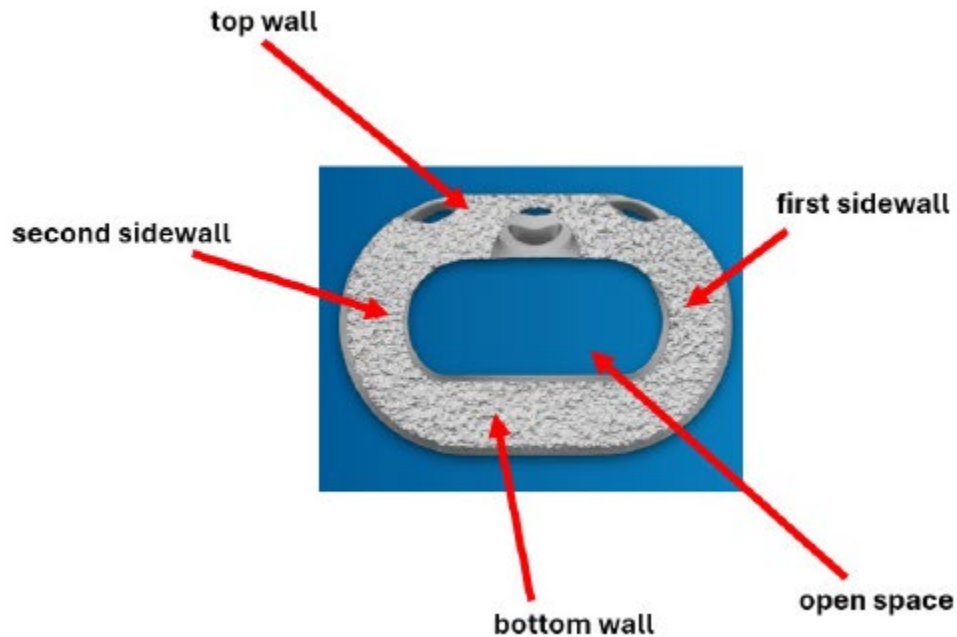
is unclear how the entry opening can be both formed at a juncture between the internal bore and the recess AND formed only in the top surface of the top wall.”.)

2. Patent Owner’s Litigation Positions Relevant to This Petition

Patent Owner’s litigation positions confirm the lack of relevant description in the ’293 patent. For example, claim 43 recites a cage with a “top wall,” “bottom wall,” “first side wall,” and “second side wall.” As explained in Section VI.B.1, there is no discussion of what constitutes a “wall” in the context of a cage. Nevertheless, in its Amended Complaint (Ex. 1040), Patent Owner alleged that Petitioner’s products infringed claim 43. Specifically, as shown in the images below, Patent Owner labeled portions of one *continuous* piece in two of Petitioner’s accused products as the “top wall,” “bottom wall,” “first side wall,” and “second side wall.”



(Ex. 1044, 3 (excerpted).)



(Ex. 1050, 2 (excerpted).)

Similarly, claim 43 requires an “entry opening” of an “internal bore,” where the “entry opening” is “formed only in the top surface of the top wall.” As explained in Section VI.B.1, Patent Owner’s apparent litigation position is that the “entry opening” is “formed *only* in the top *surface* of the top wall” so long as the “entry opening” is formed in a “recess” in the “top wall,” irrespective of whether the recess is “only in the *top surface* of the top wall.” (Ex. 1044, 3; Ex. 1050, 4.) Again, the ’293 patent does not provide textual support for such a reading, which also conflicts with Patent Owner’s arguments during prosecution of the ’849 patent, as discussed above in Section VI.B.1.

As set forth in Section X, the prior art renders the Challenged Claims unpatentable under the plain and ordinary meaning of the relevant terms and under Patent Owner's interpretations.

VII. LEVEL OF ORDINARY SKILL

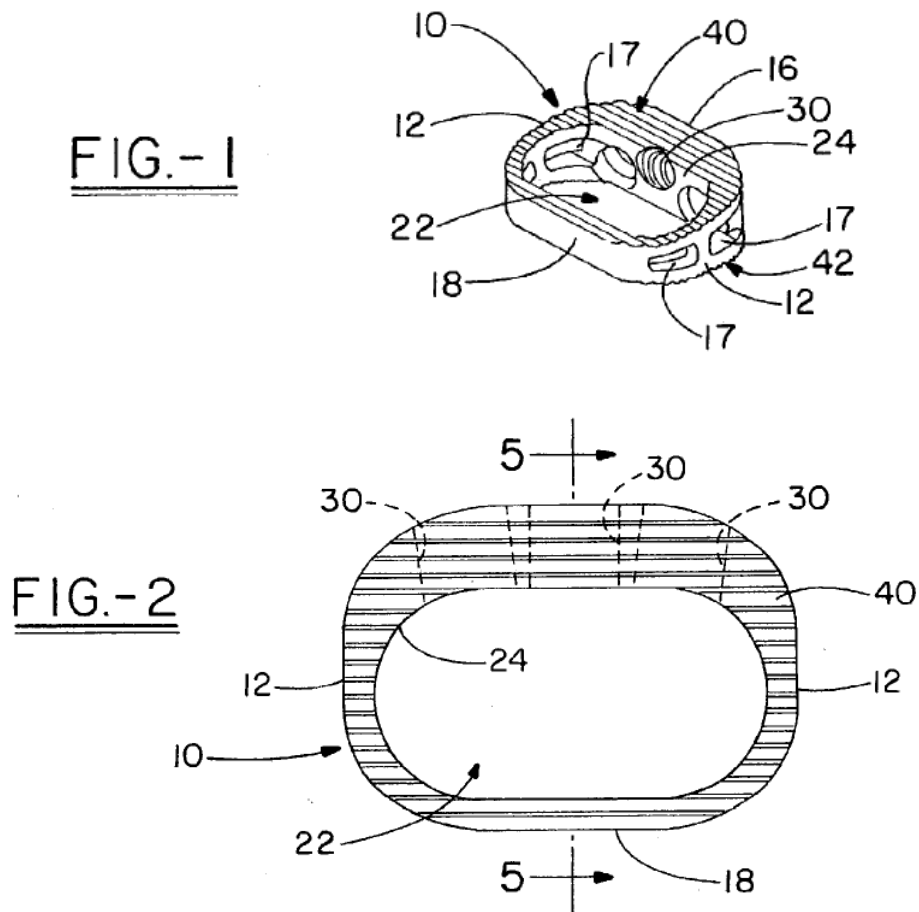
A person of ordinary skill in the art ("POSITA") at the time of the alleged invention (mid-2000s, including the time leading up to August 21, 2007) would have a bachelor's or equivalent degree in Mechanical Engineering or a related discipline (*e.g.*, biomechanics, biomedical or metals and materials engineering), and at least five years of experience. (Ex. 1002, ¶21.) More education can supplement practical experience and *vice versa*. For example, a POSITA could have an advanced degree, in the technical disciplines provided above, or a Doctor of Medicine, and at least two years of experience in the subject areas provided above.

VIII. OVERVIEW OF THE PRIOR ART

A. Byrd

Byrd is titled “Vertebral Interbody Cage with Translatable Locking Screw.”

Byrd discloses a “cage” designed for insertion between adjacent vertebrae following removal of a degenerative disc, to secure and maintain the proper relative positioning of the vertebrae. (Ex. 1007, Abstract, 1:52-60, 4:27-30, 5:38; Ex. 1002, ¶¶51-54.)



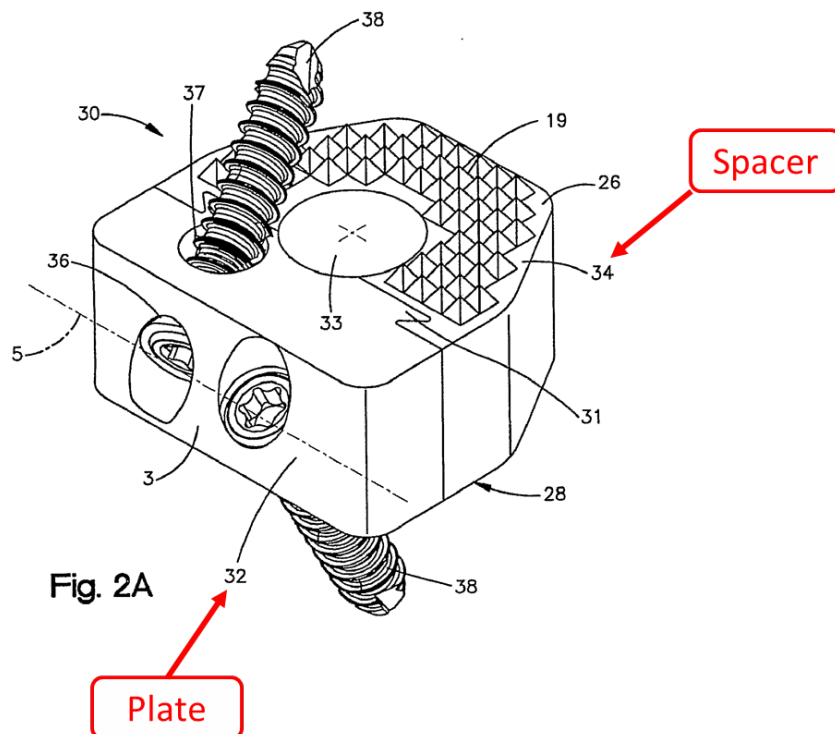
(Ex. 1007, Figs. 1, 2.)

As shown in the figures above, Byrd’s implant has a “front wall 16” and an opposing “rear wall 18,” connected by a pair of “curved side walls 12.”

(*Id.*, 5:24-27.) The implant includes “screw passages 30,” which permit screws to pass through the cage, securing both the vertebrae and cage in place. (*Id.*, 2:29-33, 5:43-47.) According to Byrd, “there are three passages, with one angled downward, 34 and two 32 having a corresponding degree of angle upward.” (*Id.*, 5:45-49.)

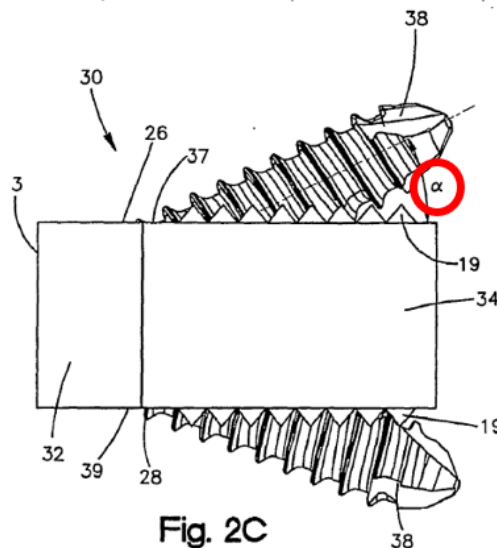
B. Messerli

Messerli is titled “Intervertebral Implant with Fixation Geometry.” Messerli discloses “an intervertebral spacer implant” that is used to stabilize and immobilize vertebrae in the treatment of degenerative disc disease and failed fusions. (Ex. 1005, Abstract, ¶3; Ex. 1002, ¶¶71-74.) As shown in figure 2A below, Messerli’s implant includes “a plate 32 and a spacer/graft 34,” which are connected by “a dovetail joint 31.” (Ex. 1005, ¶¶48-49.)



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

The screws 38, which are positioned in different directions, enter through the plate 32 and exit into the adjacent vertebrae to secure the implant between the vertebrae. (*Id.*, ¶48.) As shown in figure 2C below the screws pass through the screw openings of the implant, which “form an angle α with respect to the upper and lower surfaces of the implant.” (*Id.*)



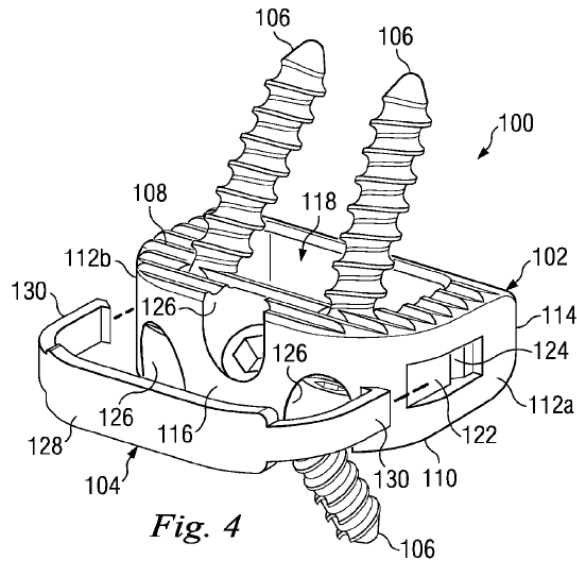
(*Id.*, Fig. 2C (annotated).)

Messerli’s implant is “generally sized and configured for anterior insertion.” (*i.e.*, through the patient’s frontside). (*Id.*, ¶76.) Regarding the specific placement of the implant, Messerli states, “[t]he present invention relates . . . more particularly, to a zero or low profile fusion implant,” *i.e.*, the implant can be placed entirely in the disc space. (*Id.*, ¶12.)

Notably, the Patent Office considered Messerli during prosecution of U.S. Patent No. 9,907,674 (“the ’674 patent”), which claims priority to a common provisional patent application, No. 60/670,231, as the ’293 patent. In a Non-Final Rejection, the Office rejected all the pending claims under pre-AIA 35 U.S.C. § 103(a) as unpatentable over US 2008/0249575 in view of Messerli. (Ex. 1042, 536.) According to the Office, Messerli discloses “the use of a vertebral implant wherein ... the entry opening of the internal bore is formed only in the top surface of the top wall, ... and the exit opening is formed at least partially in the bottom surface of the top wall and at least partially in the side surface of the top wall ...” (*Id.*, 537.) These are the very same limitations that Patent Owner argued were not disclosed by the prior art during prosecution of the ’293 patent. (*See* Ex. 1004, 371.) Patent Owner did not dispute the Office’s characterization of Messerli. Instead, Patent Owner chose to cancel then-pending claims in favor of new claims that added a slew of new limitations. (Ex. 1042, 564-581.)

C. Waugh

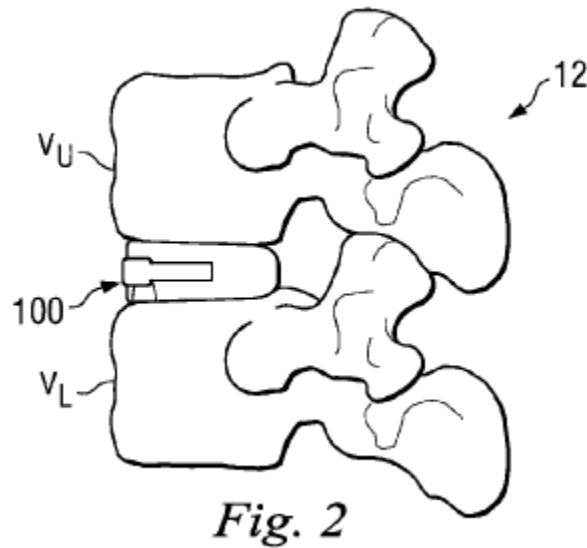
Waugh is titled “Implant Face Plates.” Waugh discloses “an implantable medical device” used to replace the natural spinal disc that is affected by injury, degradation, or disease. (Ex. 1006, ¶¶2, 6, 27; Ex. 1002, ¶¶104-106.)



(Ex. 1006, Fig. 4.)

As shown in figure 4 above, an “implantable device 100” includes “an implant member 102, a face plate 104, and anchor members 106.” (*Id.*, ¶28.) The “anchor members 106,” (*i.e.*, screws), “extend through the anchor member apertures 126 in the front surface 116 and upper and lower surfaces 108, 110 and out the hollow center 118 and into the bearing endplates of the vertebrae 14, 16,” thereby securing the implant entirely within the disc space. (*Id.*, ¶30.)

Moreover, as shown in figure 2 below, Waugh’s implantable device 100 “resides within the vertebral space” and is “[s]ized to fit the disc space height in a manner similar to a natural intervertebral disc” (*Id.*, ¶27.)



(*Id.*, Fig. 2.)

Notably, the Patent Office considered Waugh during prosecution of U.S. the '849 patent, which claims the benefit of a common provisional patent application, No. 60/670,231, as the '293 patent. In a Non-Final Rejection, the Office rejected then-pending claim 21 under pre-AIA 35 U.S.C. § 102(e) as being anticipated by Waugh. (Ex. 1043, 180.)

According to the Office, Waugh discloses “an intervertebral implant . . . comprising: a top wall including a top surface and a bottom surface opposite the top surface; a bottom wall opposite the top wall; a first sidewall; a second sidewall opposite the first sidewall . . .” (*Id.*) Further, the Office found that Waugh discloses “an internal screw guide having an internal bore . . . the internal bore having an entry opening and an exit opening, . . . the entry opening of the internal bore formed only in the top surface of the top wall, . . . and the exit opening formed at least partially

in the bottom surface of the top wall and at least partially in a side surface of the top wall.” (*Id.*) Again, these are the very same limitations that Patent Owner argued were not disclosed by the prior art during prosecution of the ’293 patent. (*See* Ex. 1004, 371.)

Patent Owner did not dispute the Office’s characterization of Waugh. Instead, Patent Owner chose to amend the claim to add a claim limitation that “the intervertebral implant does not include a faceplate to retain the screw in the internal screw guide.” (Ex. 1043, 232, 245-246.)

IX. CLAIM CONSTRUCTION

For IPR proceedings, the Board applies the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). Under *Phillips*, claim terms are typically given their ordinary and customary meanings, as would have been understood by a POSITA, at the time of the invention, having taken into consideration the language of the claims, the specification, and the prosecution history of record. *Phillips*, 415 F.3d at 1313; *see also id.* at 1312-16. The Board need not construe any claim terms, as the claims are unpatentable under any reasonable construction, or any interpretation offered by Patent Owner. *Toyota*

Motor Corp. v. Cellport Systems, Inc., IPR2015-00633, Paper No. 11 at 16 (P.T.A.B. Aug. 14, 2015).³

X. DETAILED EXPLANATION OF GROUNDS

Claim 43 is unpatentable. Messerli, Waugh, and Byrd each disclose and/or suggest a spinal implant that: (1) is sized and configured for insertion into a disc space between adjacent vertebral bodies to achieve both biological bone fusion and screw fusion; (2) has an internal screw trajectory guide with an internal bore having an entry opening formed only in the top surface of the top wall, and an exit opening formed at least partially in the bottom surface of the top wall and at least partially in a side surface of the top wall. Messerli and Waugh also disclose a “zero-profile” implant.

Accordingly, the prior art renders claim 43 of the '293 patent unpatentable as both anticipated and obvious.

³ Petitioner reserves all rights to raise claim construction and other arguments in other venues. Specifically, Petitioner is not conceding that each claim satisfies all statutory requirements, nor waiving any arguments concerning claim scope or grounds that can only be raised in district court. Nor is Petitioner conceding that any interpretation offered by Patent Owner thus far in the corresponding litigation is reasonable.

**A. Ground 1: Byrd Alone or in View of Waugh Renders Obvious
Claim 43 of the '293 Patent**

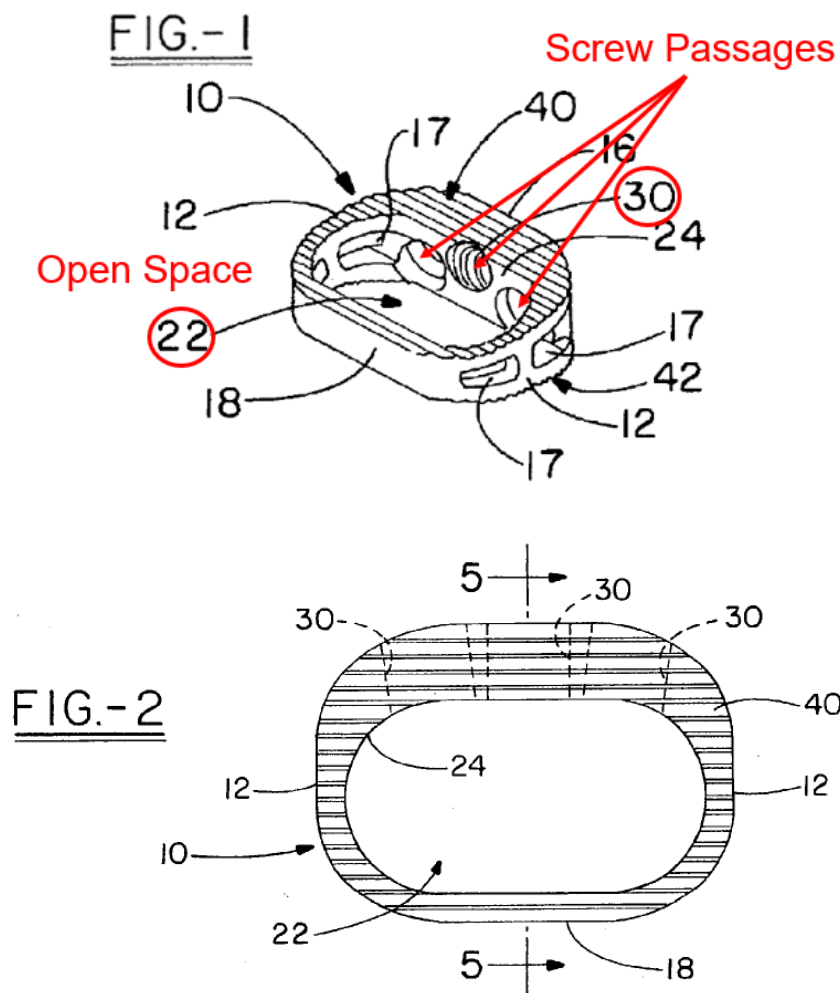
1. Claim 43

- i) **[43.pre] “A zero-profile, intervertebral cage sized and configured to be inserted into a disc space between adjacent vertebral bodies and to provide fusion of the adjacent vertebral bodies via biological bone fusion and screw fusion”⁴**

Byrd alone or in combination with Waugh discloses or suggests this limitation. (Ex. 1002, ¶¶62-70, Appendix-A [43.pre].) According to Byrd, “[t]he present invention provides a vertebral spacer [sic] or cage, shown generally in FIG. 1.” (Ex. 1007, 5:23-24.) The cage “is used to replace a disc,” effectively maintaining the space between adjacent vertebrae. (*Id.*, 1:6-8, 5:38-40.) The cage also has a “front wall 16” with “angled screw passages 30” that allows screws to be inserted through the cage and into the adjacent vertebrae. (*Id.*, 5:24-29, 5:43-62, Fig. 1.) Byrd’s implant also has a hollow “center opening 22” for the placement of “bone graft material used to promote fusion” of the vertebrae. (*Id.*, 5:29-42; *see also id.*, 1:54-57 (“bone graft material . . . promotes the growth of two vertebrae into a solid segment”).) Byrd’s implant is thus an **“intervertebral cage sized and configured to be inserted into a disc space between adjacent vertebral bodies**

⁴ Claim language is bolded throughout. Emphasis is indicated by italics.

and to provide fusion of the adjacent vertebral bodies via biological bone fusion and screw fusion.”



(*Id.*, Fig. 1 (annotated), Fig. 2.)

Byrd also discloses or suggests a cage configured to be “**zero-profile.**” According to Byrd, its “cage” is “typically . . . used to replace a disc . . .” (Ex. 1007, 5:38-40, Fig. 1.) Moreover, because the implant is inserted in an area that is “adjacent to important blood vessels,” Byrd discloses that “it is desirable to maintain fluid exterior implant shapes with *low profiles.*” (*Id.*, 3:6-11 (emphasis added).)

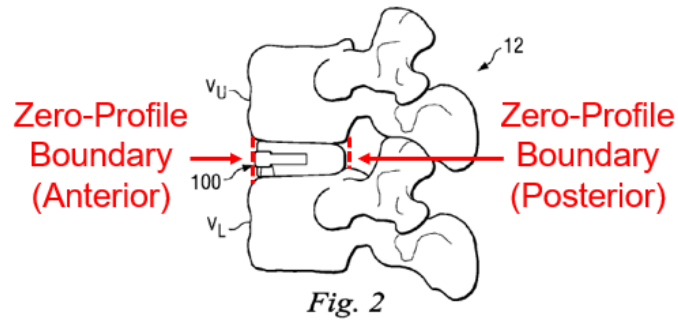
Based on this disclosure, a POSITA would have understood that Byrd's implant would be implanted in a "zero-profile" manner (*i.e.*, the implant can fit completely within the disc space). (Ex. 1002, ¶62.) To start, Byrd recognizes the benefit of making the implant "low profile[]," and a POSITA would have known that a "zero profile" implant is a type of "low profile" implant. (Ex. 1002, ¶63.) Moreover, Byrd discloses that the cage, which is typically used to replace a spinal disc, can be appropriately sized, which allows a surgeon to pick a size that can allow the implant to fit completely within the disc space. (Ex. 1007, 5:35-38 ("Differing size cages may be provided . . . depending on the level of the spine where the cage is being implanted.").)

A POSITA would have also recognized that Byrd's implant would be "zero profile" based on the implant having flat end surfaces. (Ex. 1002, ¶64.) As Mr. Culbert explains, a POSITA would not have used such an implant in a non-zero-profile manner because that could have caused complications such as damage to blood vessels outside the disc space. (*Id.*, ¶65.)

At a minimum, it would have been obvious to configure and implant Byrd's cage to be "zero-profile" based on Byrd's disclosure that, because the implant is inserted in an area that is "adjacent to important blood vessels[,] . . . it is desirable to maintain fluid exterior implant shapes with *low profiles*" (Ex. 1007, 3:6-11 (emphasis added).) Faced with the limited choice of designing an implant that either

protrudes out of, or fits within, the intervertebral disc space, it would have been obvious to try a version of the implant that fits within the intervertebral disc space, *i.e.*, “zero-profile.” (Ex. 1002, ¶65.) *See Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1341 (Fed. Cir. 2020) (“Because terminal-side plotting (as described in Okubo) and server-side plotting (as described in Konishi and claimed in the ’593 patent) would have been *two of a finite number of known, predictable solutions . . .*, a person of ordinary skill would have faced a simple design choice between the two, and therefore would have been motivated to combine the teachings of Okubo and Konishi to achieve the limitation.”) (emphasis added). This is particularly so given that, unlike other prior art implants, Byrd does not use support structures, such as anterior plates, that would need to be placed outside the intervertebral disc space. (Ex. 1002, ¶65.) Furthermore, varying the dimensions of Byrd’s implant, such as by downscaling it or varying its aspect ratio, to achieve a “**zero-profile**” implant would have been a matter of routine experimentation or optimization, well within the level of ordinary skill. (*Id.*)

Alternatively, given Byrd’s above disclosures and the teachings of Waugh, discussed below, a POSITA would have been motivated to configure and implant Byrd’s cage to be “**zero-profile**.” (*Id.*, ¶66.) As shown in the figure below, and as discussed in Section X.C.1.i, Waugh discloses a **zero-profile** intervertebral cage. (Ex. 1006, ¶27, Figs. 2-4.)



(*Id.*, Fig. 2 (annotated).) Waugh expressly states that the implantable device 100 “is capable of being entirely contained within the disc space.” (*Id.*, ¶36.) According to Waugh, “patient trauma [] can occur if organs and tissues are able to easily contact the implantable device outside the disc space.” (*Id.*) Waugh’s disclosure of the advantages of a “**zero-profile**” implant is consistent with contemporaneous art (*e.g.*, Simpson and Michelson ’019) and with a POSITA’s understanding that reducing the protrusions beyond the disc space through a zero-profile design reduces soft tissue irritation. (Ex. 1002, ¶¶67-68.)

In view of the above teachings in Waugh and a POSITA’s knowledge (as evidenced by state-of-the-art references such as Michelson ’019 and Simpson), a POSITA would have been motivated to combine the teachings of Byrd and Waugh to configure and use Byrd’s cage in a “**zero-profile**” configuration whereby Byrd’s implant could reside entirely within the disc space. (*Id.*, ¶69.) Such a modification of Byrd would have been a predictable design choice given the considerations described above in Byrd, Waugh, and the cited state-of-the-art references. (*Id.*; see also *supra* Section VI.A.2.ii (discussing Simpson’s disclosures).)

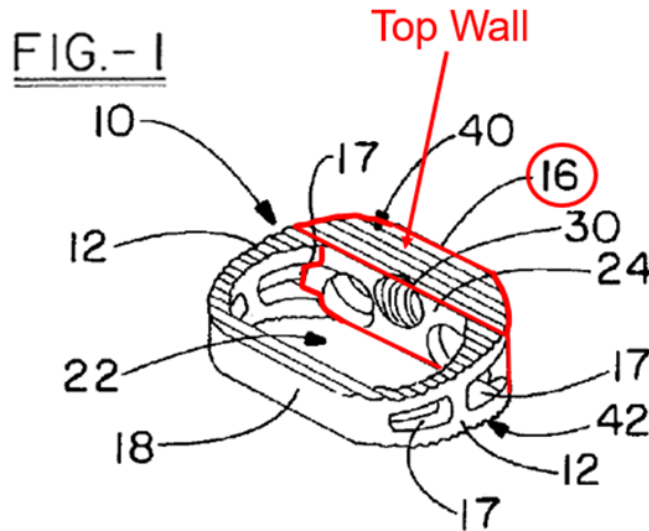
Moreover, a POSITA would have reasonably expected success in combining the disclosures of Byrd and Waugh to arrive at a “**zero-profile, intervertebral cage.**” (Ex. 1002, ¶70.) Configuring Byrd’s implant to be “zero-profile” would not have required the design of Byrd’s implant to be altered. (*Id.*) Instead, a POSITA would only need to choose the dimensions of the cage that would allow the cage to fit entirely within the intervertebral space, a mere matter of routine experimentation or optimization of the implant, as evidenced by the similarity of Byrd’s design with other zero-profile implants like Simpson and Waugh. (*Id.*) Moreover, modifying the dimensions of the cage would not alter how the Byrd implant functions to maintain distance between adjacent vertebrae. (*Id.*) This is supported by Byrd’s disclosure that different cage sizes can be used depending on the region of the spine that the intervertebral cage is implanted. (Ex. 1007, 5:35-37.⁵)

- ii) **[43.a] “the intervertebral cage comprising: a top wall;” “a bottom wall opposite the top wall;” “a first sidewall;” “a second sidewall opposite the first sidewall,”**

Byrd discloses this limitation. (Ex. 1002, Appendix-A [43.a].) Byrd’s intervertebral cage has “a bracelet or oval peripheral shape with opposing front 16

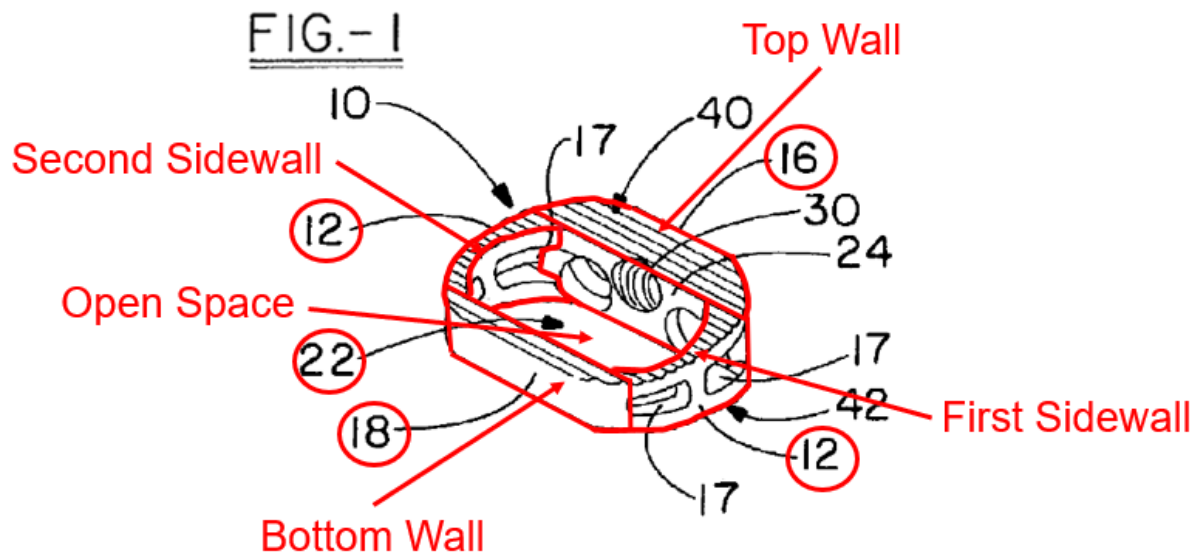
⁵ Configuring Byrd’s implant to be “zero-profile” does not impact Byrd’s disclosure of limitations [43.a]-[43.d] and [43.f]-[43.i] because the design of Byrd’s implant need not be altered to make the implant zero-profile. (Ex. 1002, ¶70.)

and rear 18 walls that are generally solid, and are connected by curved side walls 12” (Ex. 1007, 5:24-27.) Front wall 16 constitutes “**a top wall.**”



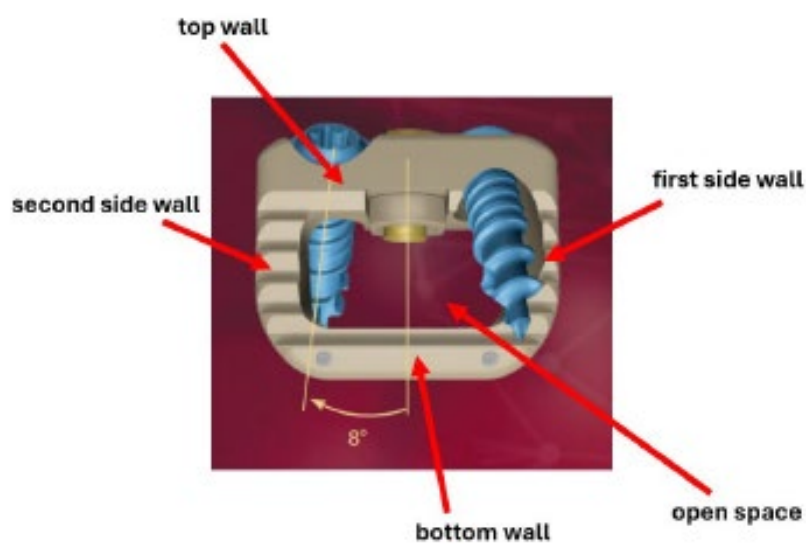
(*Id.*, Fig. 1 (annotated).)

Moreover, Byrd’s cage has a hollow center opening 22 for receiving bone graft material. (*Id.*, 5:29-42.) The portion of the cage located below the center opening, which is rear wall 18, corresponds to the “**bottom wall.**” (*See id.*, Fig. 1 (reproduced below).) Also, the portions of the cage located to the left and right of the center opening 22, which are the curved side walls 12, corresponds to the “**first sidewall**” and “**second sidewall opposite the first sidewall.**” (*See id.*)

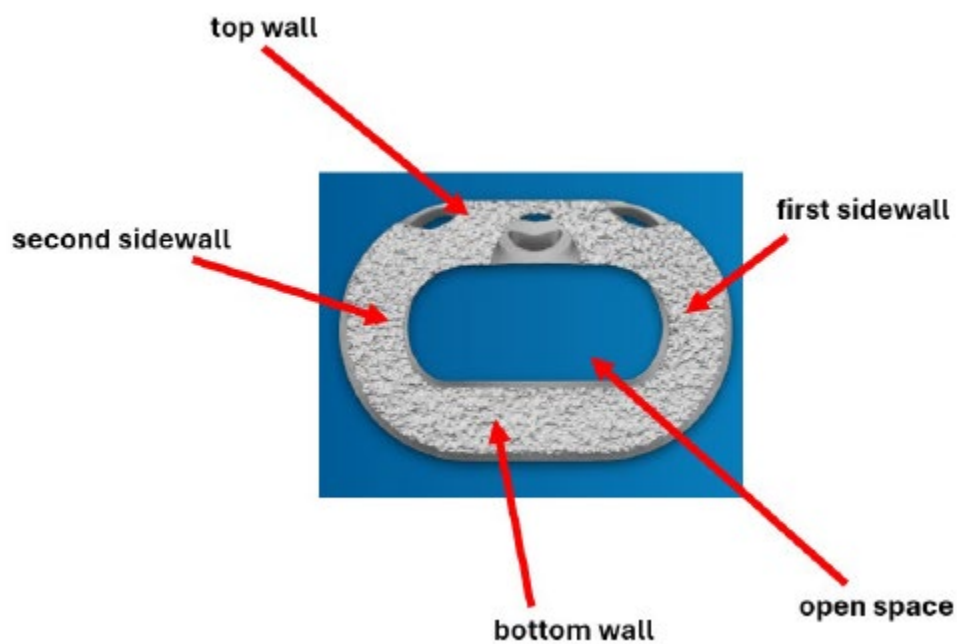


(*Id.*, Fig. 1 (annotated).)

The analysis above is consistent with how Patent Owner alleged infringement for Petitioner's products. (See Ex. 1044, 4 (excerpt below); see Ex. 1050, 2 (excerpt below).) As seen in the images below, Patent Owner labeled portions of one *continuous* piece in two of Petitioner's accused products as the "top wall," "bottom wall," "first side wall," and "second side wall." Thus, under Patent Owner's interpretation of the term "**wall**," Byrd discloses claim limitation [43.a].



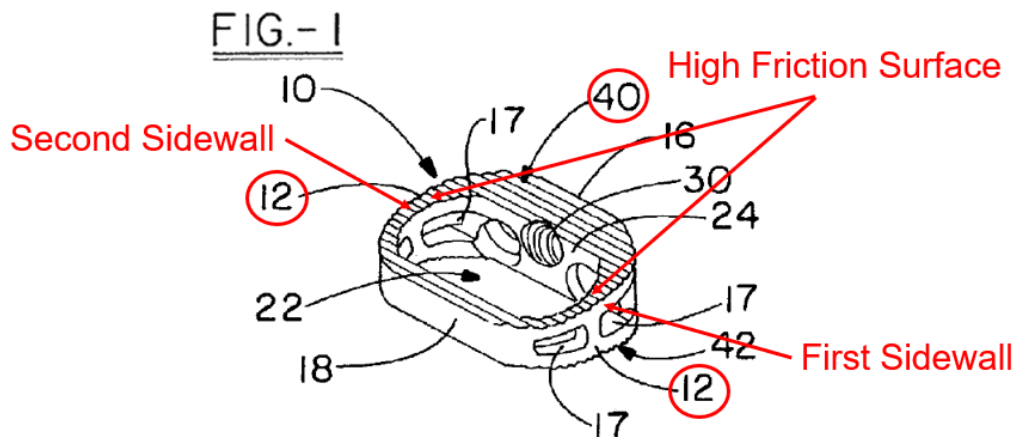
(Ex. 1044, 4 (excerpted).)



(Ex. 1050, 2 (excerpted).)

- iii) [43.b] “each of the first sidewall and the second sidewall having a surface configured to contact one of the adjacent vertebral bodies when the intervertebral cage is inserted into the disc space,”

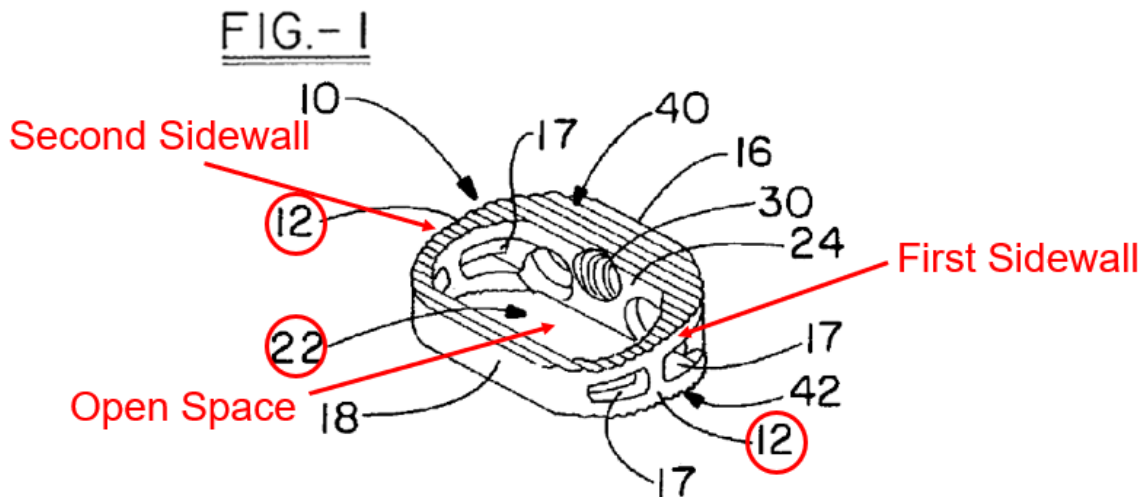
Byrd discloses this limitation. (Ex. 1002, Appendix-A [43.b].) Byrd’s implant has “top and bottom surfaces 40, 42” with “a high friction surface to resist the force pushing the wedge forward out of position between the vertebrae,” *e.g.*, this surface is preferably toothed or ratcheted. (Ex. 1007, 5:63-67.) As shown in figure 1 (reproduced below), the high friction surface is part of the “**first sidewall**” and “**second sidewall**.” A POSITA would have understood that the top and bottom surfaces 40, 42 of the implant are configured to be in direct contact with the adjacent vertebral bodies in order for them to provide “friction” against the vertebrae. (Ex. 1002, Appendix-A [43.b].) Byrd thus discloses limitation [43.b].



(Ex. 1007, Fig. 1 (annotated).)

- iv) [43.c] “wherein at least the first sidewall and the second sidewall bound an open space capable of receiving bone filling for the biological bone fusion”

Byrd discloses this limitation. (Ex. 1002, Appendix-A [43.c].) As shown in figure 1 (reproduced below), there is a center opening 22 bound by the top wall, bottom wall, and both sidewalls. “The center opening is for the inclusion of a suitable bone graft material used to promote fusion.” (Ex. 1007, 5:40-42.) The bone graft material facilitates “**biological bone fusion.**” (*Id.*, 5:29-42; *see also id.*, 1:54-57 (“bone graft material . . . promotes the growth of two vertebrae into a solid segment”).) Thus, Byrd discloses limitation [43.c].

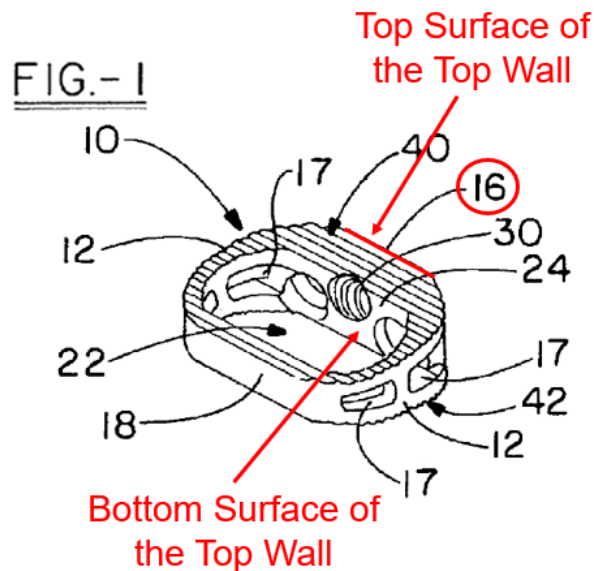


(*Id.*, Fig. 1 (annotated).)

- v) [43.d] “wherein the top wall includes a top surface and a bottom surface opposite the top surface,”

Byrd discloses this limitation. (Ex. 1002, Appendix-A [43.d].) “At the front or anterior surface 16, the cage 10 has a substantially solid wall including a plurality

of angled screw passages 30.” (Ex. 1007, 5:43-45.) As shown in figure 1 (reproduced below), the front or anterior surface with the angled screw passages 30 corresponds to the “**top surface**.” Further, as shown below, the surface of the top wall 16 directly facing the opening 22 corresponds to the “**bottom surface**” of the top wall. The two surfaces are opposite each other. Byrd thus discloses limitation [43.d].



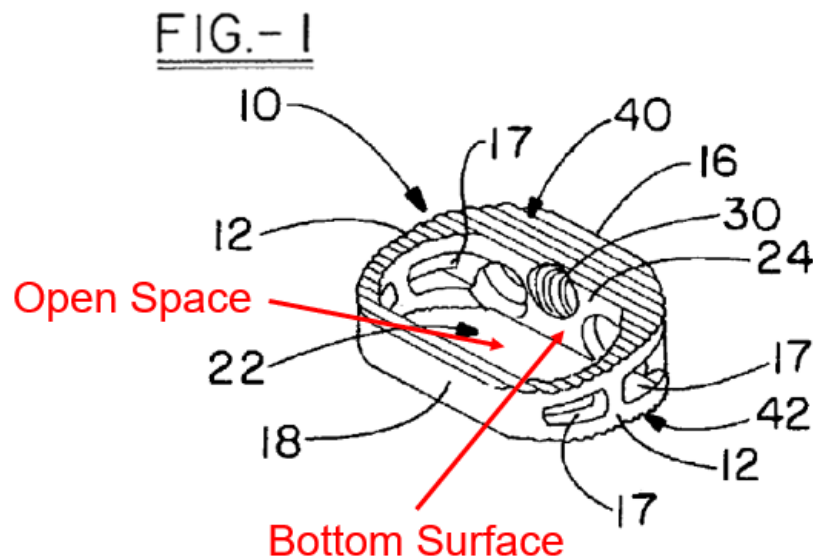
(*Id.*, Fig. 1 (annotated).)

- vi) [43.e] “the top surface configured to have a zero-profile with respect to the adjacent vertebral bodies when the intervertebral cage is inserted into the disc space, and the bottom surface facing the open space; and”

Byrd alone or in combination with Waugh discloses or suggests this limitation. (Ex. 1002, Appendix-A [43.e].) As discussed above in Section X.A.1.i, Byrd itself renders obvious a “**zero-profile**” implant and alternatively, it would have

been obvious for a POSITA to combine the teachings of Byrd and Waugh to arrive at a “zero-profile, intervertebral cage.” The “**top surface**” of such a “**zero-profile**” implant is necessarily configured to have a “**zero-profile**” with respect to the adjacent vertebral bodies when the cage is inserted into the disc space. (*Id.*; *see also id.*, ¶62.)

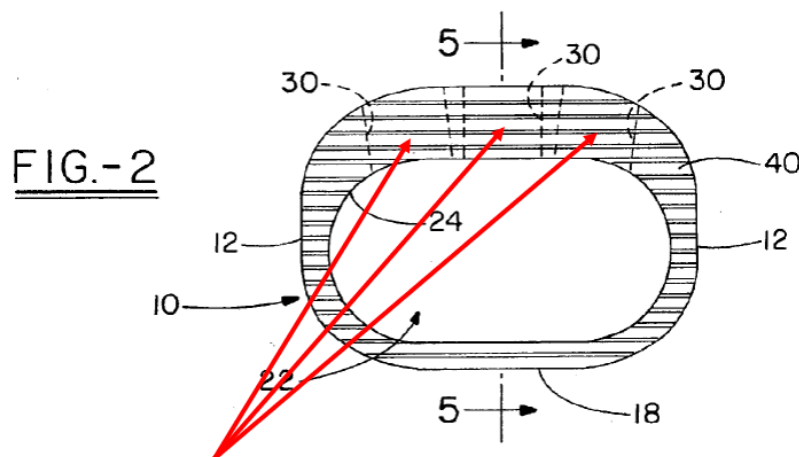
Moreover, as shown in figure 1 (reproduced below), a POSITA would have understood that the bottom surface of the top wall faces the center opening 22, which is the “**open space**.” Byrd thus discloses “**the bottom surface facing the open space**.”



(Ex. 1007, Fig. 1 (annotated).)

- vii) [43.f] “an internal screw trajectory guide for guiding a trajectory of a screw through the intervertebral cage,”

Byrd discloses this limitation. (Ex. 1002, Appendix-A [43.f].) “At the front or anterior surface 16, the cage 10 has a substantially solid wall including a plurality of angled screw passages 30.” (Ex. 1007, 5:43-45.) These passages are preferably threaded and “permit fixation means, and preferably screws 60 to be inserted through the anterior wall into the end walls of the adjacent vertebrae.” (*Id.*, 5:59-62.) As shown in figure 2 (reproduced below), each angled screw passage and its corresponding screw extends through the top wall, thereby defining a fixed path within the intervertebral cage. A POSITA would have understood that this fixed path constrains and directs the screw, and therefore corresponds to “**an internal screw trajectory guide.**” (Ex. 1002, Appendix-A [43.f].) Byrd thus discloses limitation [43.f].



Internal Screw
Trajectory Guides (Hidden)

(Ex. 1007, Fig. 2 (annotated).)

The screw passages 30 can be further seen in figures 3, 5 and 6, which label one of the passages angled upwards as passage 34. (*Id.*, 5:43-47.)

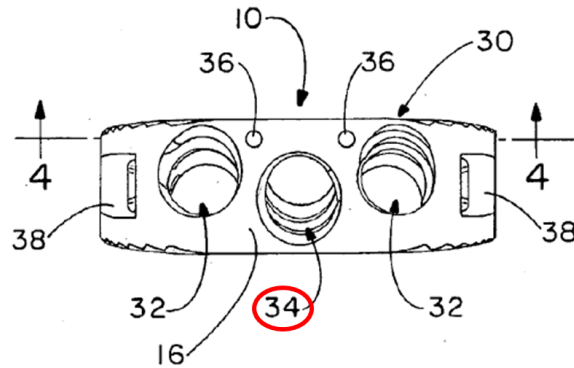
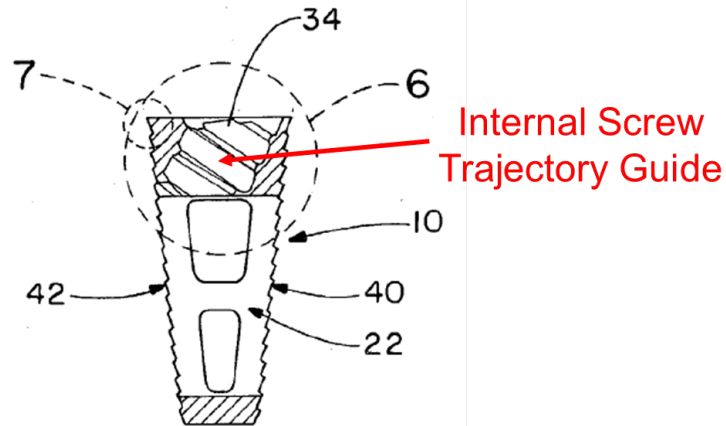


FIG.-5



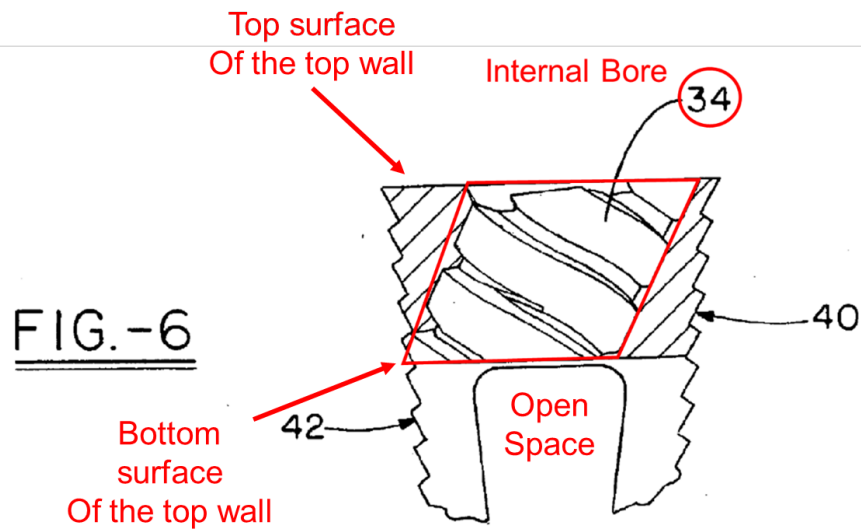
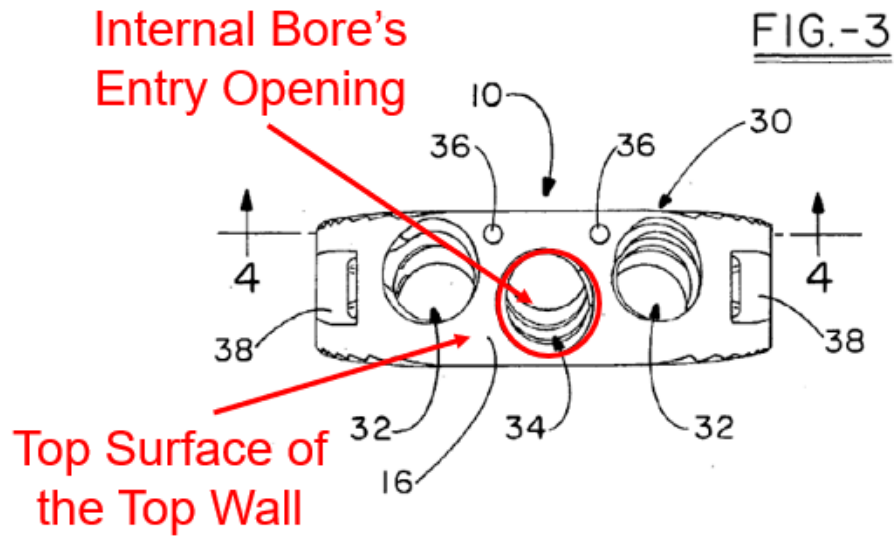
(*Id.*, Fig. 3 (annotated), Fig. 5 (annotated).)

- viii) [43.g] “the internal screw trajectory guide having an internal bore with an entry opening and an exit opening,”

Byrd discloses this limitation. (Ex. 1002, ¶¶55-61, Appendix-A [43.g].) As discussed in Section X.A.1.vii, the screw passages 30 are the internal screw

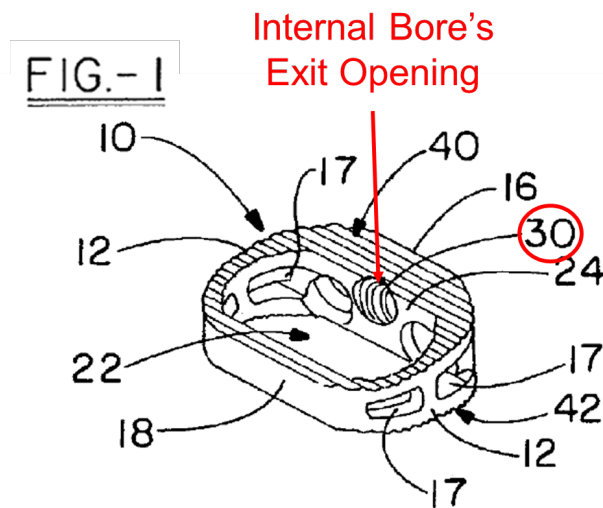
trajectory guides. Furthermore, as shown in the figures below, the screw guides have an internal bore with entry and exit openings because the screws extend through and out the body of the implant. The “**internal bore**” is the portion of the screw trajectory guide that receives the threaded portion of the screw (*i.e.*, the portion of the screw, which is not the screw head). This is evident from claims 44 and 48 of the '293 patent, which recite “**an internal screw guide having an internal bore**” and a “***counterbore formed at least partially in the top surface of the top wall for accommodating a screw head of a screw***” (emphasis added). This implies that the counterbore accommodates the screw head whereas the “**internal bore**” receives the threaded portion of the screw.

Turning back to figure 3 of Byrd, element 34 therein refers to a passage in the wall 16 that holds the threaded portion of the screw. The threaded portion of the passage 34 is further visible in figure 6 (reproduced below). Thus, element 34 is an “**internal bore**” with an “**entry opening**” in the “**top wall.**” Byrd thus discloses limitation [43.g].



(Ex. 1007, Fig. 3 (annotated), Fig. 6 (annotated).)

Figure 6 above also shows an “exit opening” of the internal bore, which is also visible in figure 1 below.

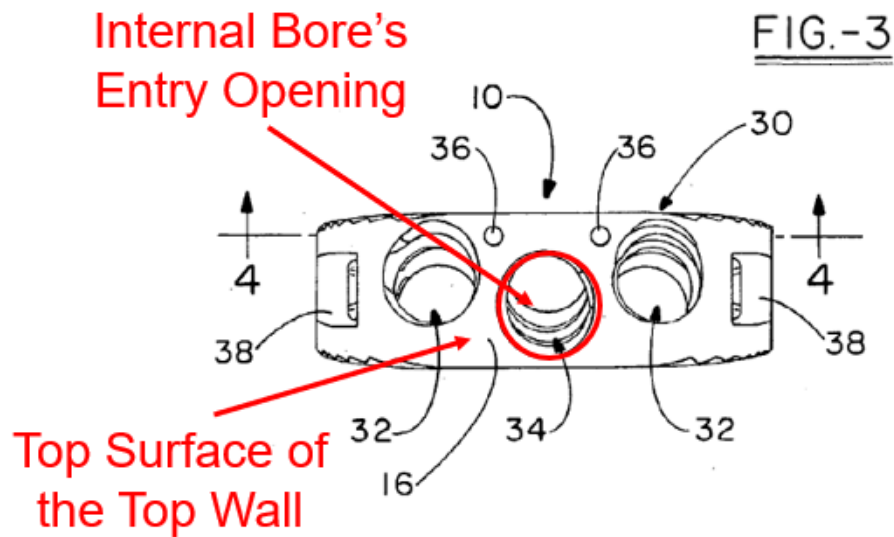


(*Id.*, Fig. 1 (annotated).)

- ix) [43.h] “the internal bore of the entry opening formed only in the top surface of the top wall,”⁶

Byrd discloses this limitation. (Ex. 1002, ¶58, Appendix-A [43.h].) As evident from figure 3 (reproduced below), the “entry opening” is formed “only in the top surface of the top wall.”

⁶ Claim limitation [43.h] is awkwardly worded because it recites an “internal bore of the entry opening” as opposed to an “entry opening of the internal bore.” An opening does not have a “bore.” In view of the other claims of the ’293 patent, such as claim 42, which recites “entry opening of the internal bore,” and solely for the purpose of this IPR, Petitioner interprets claim limitation [43.h] as reciting an “entry opening of the internal bore formed only in the top surface of the top wall.”



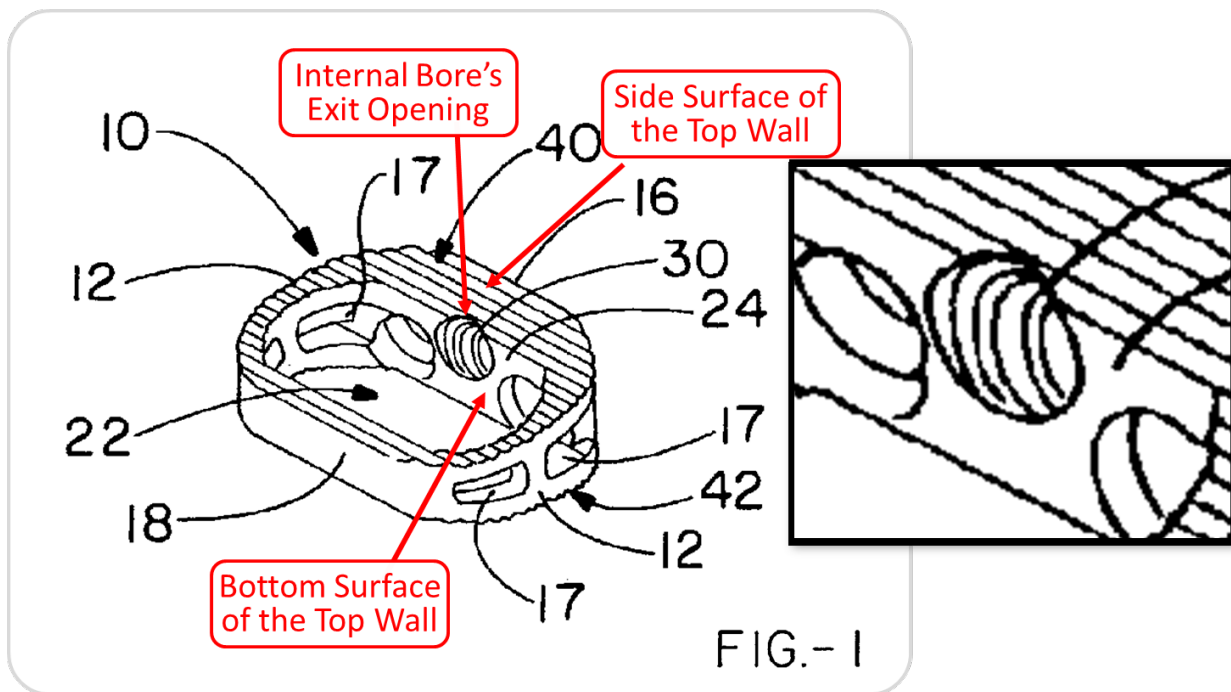
(Ex. 1005, Fig. 3 (annotated).)

- x) [43.i] “and the internal bore of the exit opening formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall.”⁷”

Byrd discloses this limitation. (Ex. 1002, ¶61.) As shown in figure 1 (reproduced below), the surface of the top wall 16 directly facing the opening 22

⁷ Claim limitation [43.i] is awkwardly worded because it recites an “internal bore of the exit opening,” as opposed to an “exit opening of the internal bore.” An opening does not have a “bore.” In view of the other claims of the ’293 patent, such as claim 42, which recites “exit opening of the internal bore,” and solely for the purpose of this IPR, Petitioner interprets claim limitation [43.i] as reciting that the

corresponds to the “**bottom surface**” of the top wall. The surface of the top wall adjacent this “**bottom surface**” is the “**side surface**” of the top wall. As also shown in figure 1, the exit opening of Byrd’s internal bore is “**formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall**” since the passage 30 cuts both the side and bottom surfaces of the top wall.



(Ex. 1007, Fig. 1 (enlarged view, annotated).)

“exit opening of the internal bore [is] formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall.”

**B. Ground 2: Messerli Alone or in View of Waugh Renders Obvious
Claim 43 of the '293 Patent**

1. Claim 43⁸

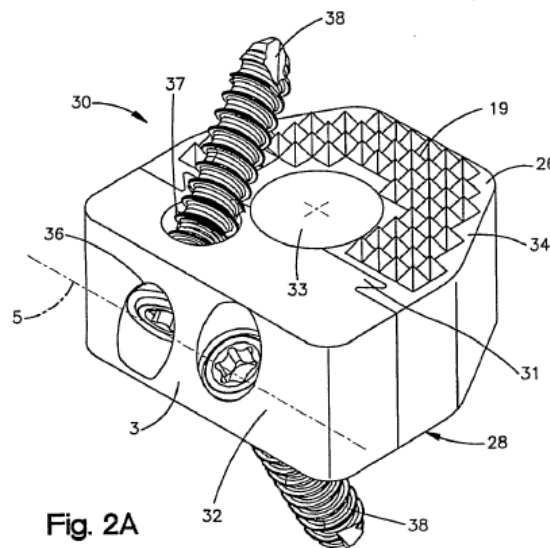
i) [43.pre]

Messerli discloses or suggests this limitation alone or in combination with Waugh. (Ex. 1002, ¶¶96-103, Appendix-B [43.pre].) According to Messerli, “[t]he present invention relates generally to intervertebral implants.” (Ex. 1005, ¶2.) An example of such an implant is shown in figures 2A-2C, which disclose an “intervertebral implant 30” having “opposing screw fixation” to secure the implant to “upper” and “lower” vertebrae. (*Id.*, ¶48, Fig. 2A (reproduced below).) “A pair of holes or openings 36 accept two screws 38, which penetrate the vertebral bodies and secure the implant in place.” (*Id.*, ¶48.) Specifically, “the implant is placed between adjacent vertebrae, screws 38 are inserted through the holes 36 to penetrate the vertebrae and hold the implant in position, *i.e.*, one screw is inserted into the upper vertebrae and the other is inserted into the lower vertebrae.” (*Id.*)

Messerli’s implant also includes an “opening 33” that can receive “bone graft material,” which is a material known to facilitate biological bone fusion. (*Id.*, ¶48; Ex. 1002, Appendix-B [43.pre] (explaining that bone graft material is known to facilitate biological bone fusion); *see also* Ex. 1006, ¶28; *see also* Ex. 1007,

⁸ Claim language is not included in the headings but can be found in Section X.A.1.

1:54-57.) Moreover, a POSITA would have understood that an intervertebral implant with a hollow central opening, such as opening 33, would be considered an “**intervertebral cage.**” (Ex. 1002, Appendix-B [43.pre].) Messerli thus discloses an “**intervertebral cage sized and configured to be inserted into a disc space between adjacent vertebral bodies and to provide fusion of the adjacent vertebral bodies via biological bone fusion and screw fusion.**”



(Ex. 1005, Fig. 2A.)

Messerli’s implant is also configured to be “**zero-profile.**” Messerli expressly states that “[t]he present invention relates . . . more particularly, to a **zero** or low profile fusion implant.” (*Id.*, ¶2 (emphasis added).) Messerli further states that the disclosed implant will “minimize . . . irritation of soft tissues” and “minimize surgical trauma.” (*Id.*, ¶4.) Given these disclosures, a POSITA reading Messerli *as a whole*, would have understood that Messerli is at least suggesting that the implant

of figures 2A-2C could be configured as a “**zero-profile**” intervertebral cage. (Ex. 1002, ¶¶96-99.) That is, Messerli is suggesting that its implant can be implanted in the disc space such that no portion thereof protrudes outside of the disc space. Messerli thus discloses or suggests that the implant of figures 2A-2C is “[a] **zero-profile**” intervertebral cage.

Moreover, in view of Waugh, a POSITA’s knowledge, and Messerli’s own teachings of “zero profile” implant, a POSITA would have been motivated to combine the teachings of Messerli and Waugh to configure and use Messerli’s cage as a “**zero-profile**” implant. (Ex. 1002, ¶¶100-103.) Waugh, as discussed below in Section X.C.1.i discloses a “zero-profile” intervertebral cage. Waugh expressly states that the implantable device 100 “is capable of being entirely contained within the disc space.” (Ex. 1006, ¶36.) According to Waugh, “patient trauma [] can occur if organs and tissues are able to easily contact the implantable device outside the disc space.” (*Id.*) Moreover, other prior art (*e.g.*, Michelson ’019 and Simpson) also suggested confining the implant to the disc space to avoid trauma and injury to delicate blood vessels and tissues located immediately adjacent the disc space. (Ex. 1002, ¶98; *see supra* Section X.A.1.i.) Thus, not only would a POSITA have been motivated to configure and use Messerli’s implant as a “**zero-profile**” implant, such an implementation of Messerli’s cage would also have been a predictable design

choice given the recognized benefits of a “**zero-profile**” implant discussed in both Messerli and Waugh. (Ex. 1002, ¶¶99-103.)

Moreover, faced with the limited choice of designing an implant that either protrudes out of, or fits within, the intervertebral disc space, it would have been obvious to try a version of the implant that fits within the intervertebral disc space, *i.e.*, “zero-profile.” (*Id.*, ¶102.) *See Uber*, 957 F.3d at 1341. This is particularly so given that, unlike other prior art implants, Messerli does not use support structures, such as pedicle screws, that would need to be placed outside the intervertebral disc space. (Ex. 1002, ¶102.) Furthermore, varying the dimensions of Messerli’s implant, such as by downscaling it or varying its aspect ratio, to achieve a zero-profile implant would have been a matter of routine experimentation or optimization, well within the level of ordinary skill. (*Id.*)

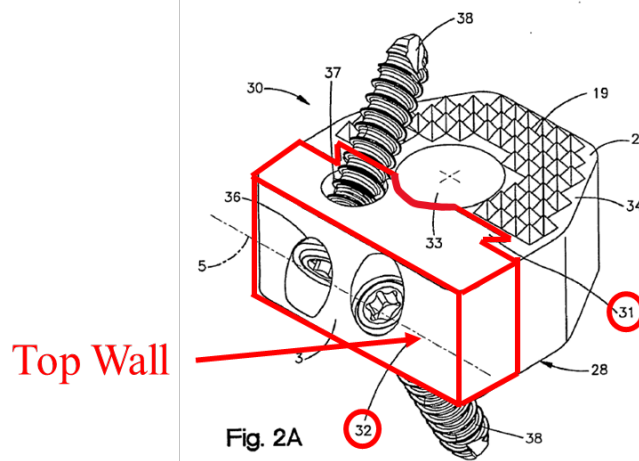
Additionally, a POSITA would have had a reasonable expectation of success in configuring and using Messerli’s implant to reside entirely within the disc space, especially considering Messerli’s own disclosure that “[t]he present invention relates . . . more particularly, to a **zero** or low profile fusion implant.” (Ex. 1005, ¶2 (emphasis added).) For example, no modifications would have been needed to the design of Messerli’s disclosed intervertebral cage; a POSITA would only need to ensure that the dimensions of the cage were such that it would fit entirely within the intervertebral space, as shown by Waugh. (Ex. 1002, ¶103.) In fact, Messerli

recognizes that “various changes, substitutions, and alterations can be made herein without departing from the spirit and scope of the invention” (Ex. 1005, ¶77.) Thus, modifying the cage dimensions to make it “**zero-profile**” aligns with the spirit and scope of Messerli’s invention as it would not alter the functionality of Messerli’s implant.⁹

ii) [43.a]

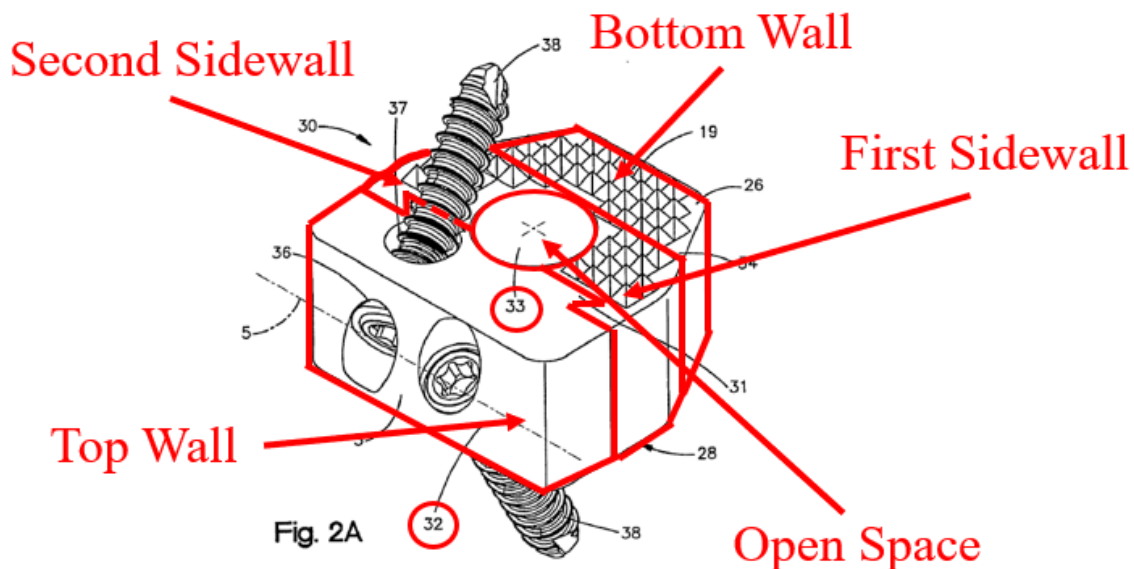
Messerli discloses this limitation. (Ex. 1002, Appendix-B [43.a].) Messerli’s intervertebral cage has “a plate 32 and a spacer/graft 34.” (Ex. 1005, ¶48.) Plate 32 constitutes “**a top wall.**” “The plate 32 is . . . connected to the spacer 34 by a dovetail joint 31” (*Id.*, ¶49.)

⁹ Configuring Messerli’s implant to be “zero-profile” does not impact Messerli’s disclosure of limitations [43.a]-[43.d] and [43.f]-[43.i] because the design of Messerli’s implant need not be altered to make the implant zero-profile. (Ex. 1002, ¶103.)



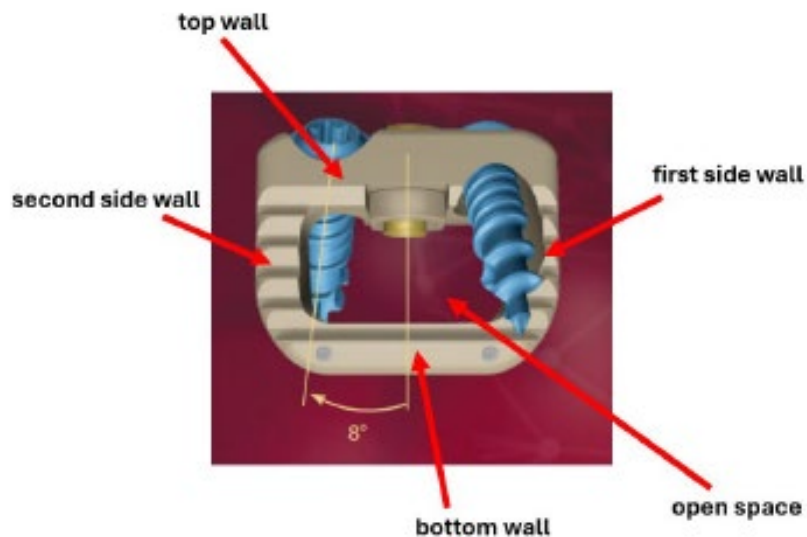
(*Id.*, Fig. 2A (annotated).)

Moreover, Messerli's spacer/graft 34 has one or more openings 33 for receiving bone graft material. (*Id.*, ¶48.) The portion of the spacer/graft 34 located behind the opening 33 and opposite the plate 32 corresponds to the “**bottom wall**” of the intervertebral cage. (*See id.*, Fig. 2A (reproduced below).) The portions of the spacer/graft 34 to the left and right of the opening 33 correspond to the “**first sidewall**” and “**second sidewall opposite the first sidewall.**” (*See id.*)

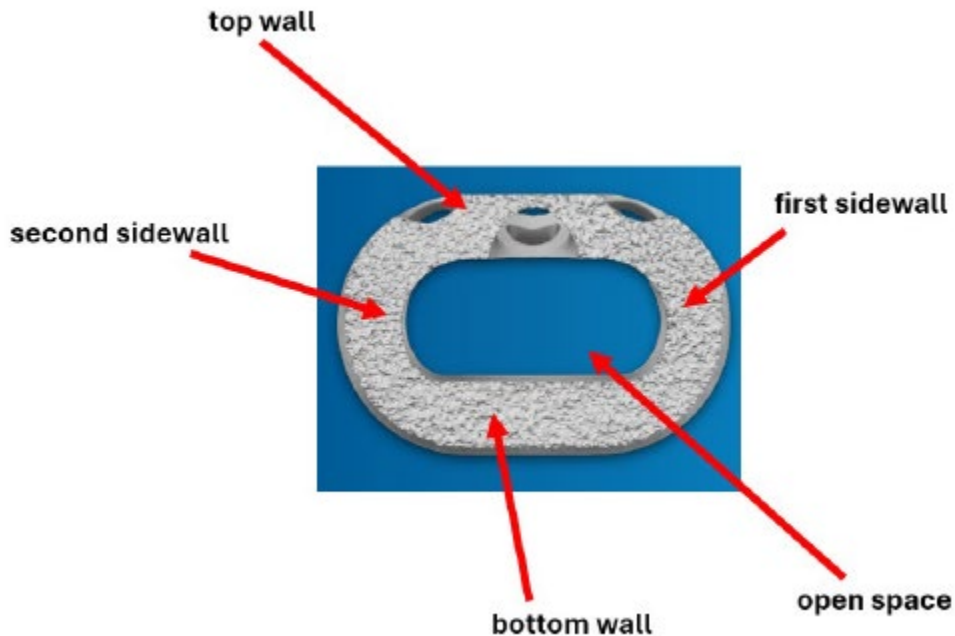


(*Id.*, Fig. 2A (annotated).)

The analysis above is consistent with how Patent Owner alleged infringement for Petitioner's products. (*See* Ex. 1044, 4 (excerpt below); *see* Ex. 1050, 2 (excerpt below).) As seen in the images below, Patent Owner labeled portions of one ***continuous*** piece in two of Petitioner's accused products as the "top wall," "bottom wall," "first side wall," and "second side wall." Thus, under Patent Owner's interpretation of the term "**wall**," Messerli discloses claim limitation [43.a].



(Ex. 1044, 4 (excerpted).)



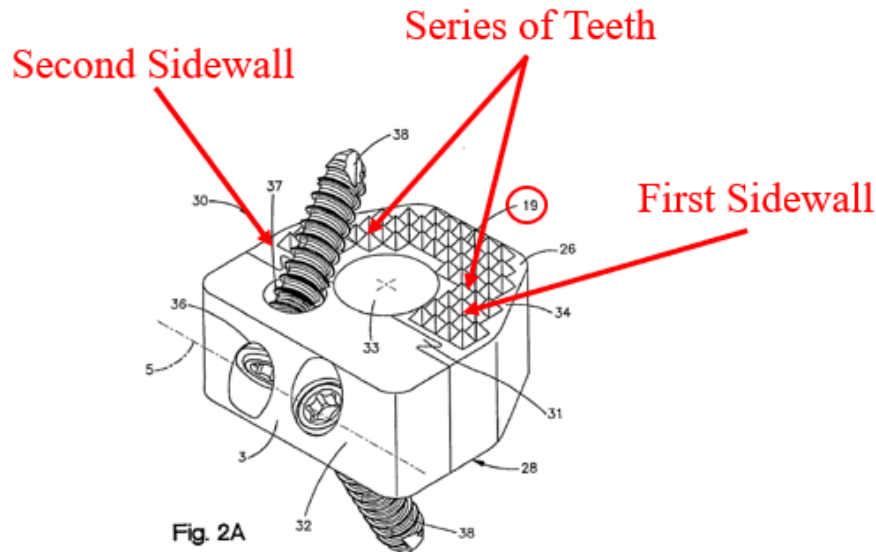
(Ex. 1050, 2 (excerpted).)

iii) [43.b]

Messerli discloses this limitation. (Ex. 1002, Appendix-B [43.b].) Messerli's implant has upper and lower surfaces, 26, 28 that may have "a series of teeth 19, or other similar projections, to aid in securing the implant to the vertebral endplates," *i.e.*, the claimed "**adjacent vertebral bodies.**" (Ex. 1005, ¶48.) As shown in figure 2A (reproduced below), these teeth 19 are part of the "**first sidewall**" and "**second sidewall.**" Messerli thus discloses "**each of the first sidewall and the second sidewall having a surface configured to contact one of the adjacent vertebral bodies when the intervertebral cage is inserted into the disc space.**" This contact between the teeth and the vertebrae can be further seen in figures 4A and 4B of

Messerli, which corresponds to an embodiment related to Messerli's figures 2A-2C.

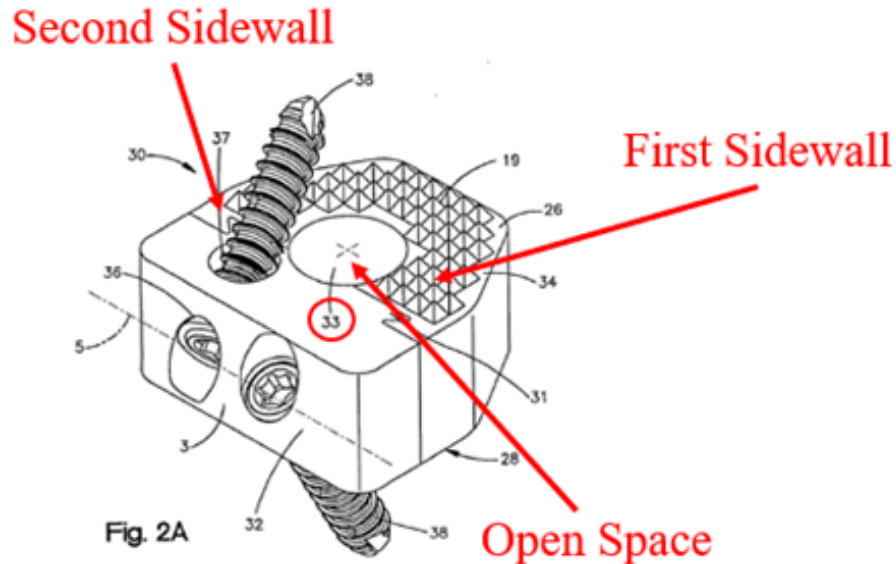
(*Id.*, ¶50, Figs. 4A, 4B.)



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

iv) [43.c]

Messerli discloses this limitation. (Ex. 1002, Appendix-B [43.c].) As shown in figure 2A (reproduced below), Messerli's graft/spacer 34 has an opening 33 which is bound by the two sidewalls. Moreover, the graft/spacer 34 is "designed to receive bone graft material." (Ex. 1005, ¶48.) A POSITA would have understood that bone graft material facilitates "**biological bone fusion.**" (*See supra* Section X.B.1.i.) Messerli thus discloses limitation [43.c].

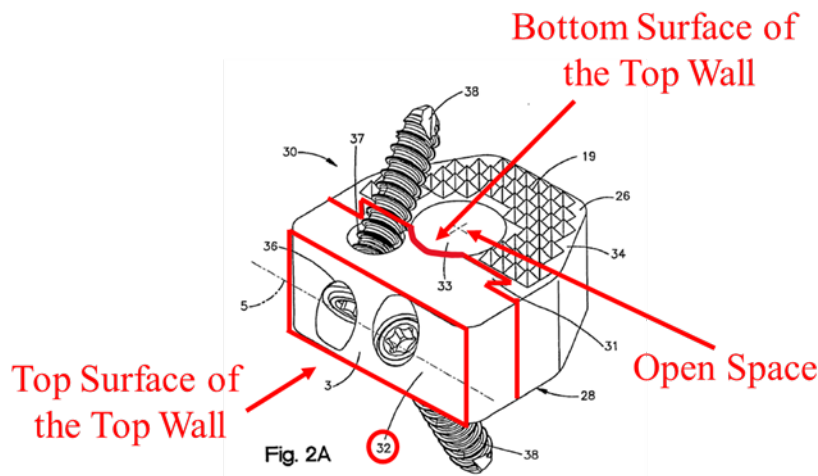


(Ex. 1005, Fig. 2A (annotated).)

v) [43.d]

Messerli discloses this limitation. (Ex. 1002, Appendix-B [43.d].) Messerli discloses that “the exit openings 37, 39 for the screw holes 36 are formed in the plate [32]” and that “plate 32 is preferably connected to the spacer 34 by a dovetail joint 31.” (Ex. 1005, ¶49.) As shown in figure 2A (reproduced below), the surface of the plate 32 (“**top wall**”) with the screw openings corresponds to the “**top surface**.” Further, as shown below, the surface of plate 32 contacting the spacer/graft 34 via the dovetail joint 31 corresponds to the “**bottom surface**” of the top wall, and the top and bottom surfaces of the top wall are opposite one another. While the plate 32 is shown attached to the spacer 34, it is a separate piece that is “connected to the spacer 12 before the implant 10 is implanted.” (*Id.*) Thus, the entire surface of the plate 32 (including the portion that overlaps the open space 33) along the dovetail

joint 31 is the “**bottom surface of the top wall.**” Messerli thus discloses limitation [43.d].

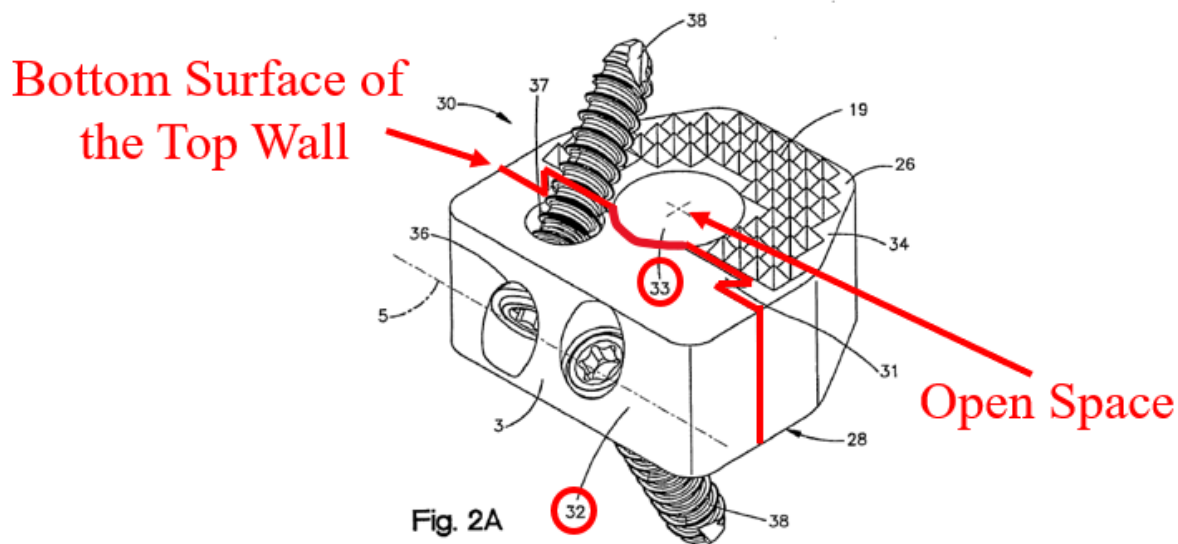


(*Id.*, Fig. 2A (annotated).)

vi) [43.e]

Messerli discloses this limitation. (Ex. 1002, Appendix-B [43.e].) As discussed above, Messerli’s implant can exist entirely in the disc space between adjacent vertebrae after insertion, *i.e.*, a “**zero-profile**” implant. (*See supra* Section X.B.1.i.) Alternatively, it would have been obvious to configure Messerli’s implant to be “zero-profile” in view of Waugh. (*See id.*) A POSITA would have further understood that no portion of the implant, including the “**top surface**” of the top wall, would extend beyond the boundaries of the disc space as defined by the adjacent vertebral bodies (as discussed above, this is what a “**zero-profile**” implant means). (*Id.*; *see also* Ex. 1002, ¶96.) Moreover, as shown in figure 2A below, when plate 32 is connected to spacer 34, the bottom surface of plate 32 faces the

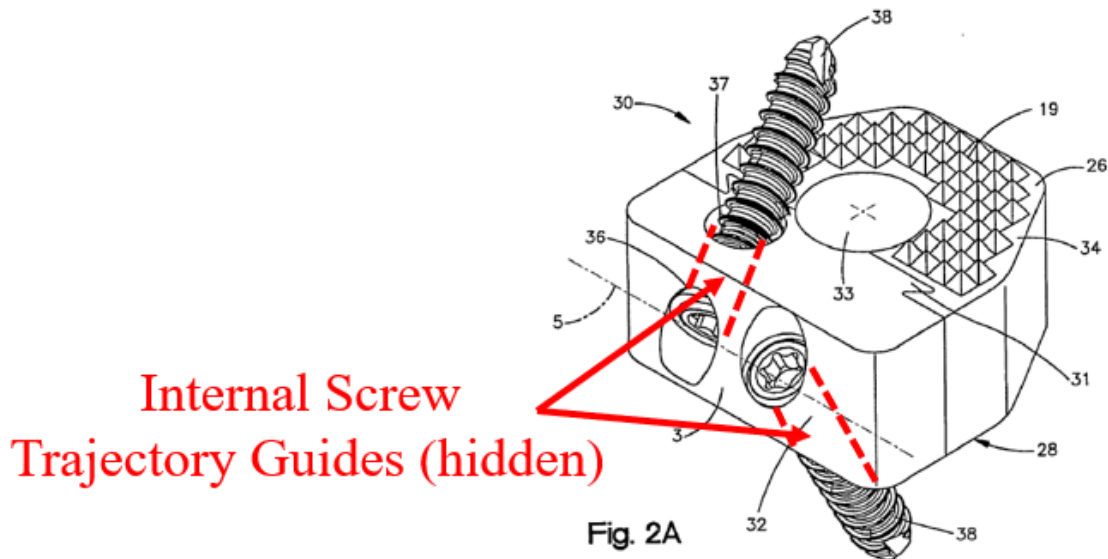
opening 33. Messerli, alone or in combination with Waugh, thus discloses limitation [43.e].



(Ex. 1005, Fig. 2A (annotated).)

vii) [43.f]

Messerli discloses this limitation. (Ex. 1002, Appendix-B [43.f].) Messerli's implant has "[a] pair of holes or openings 36 [to] accept two screws 38, which penetrate the vertebral bodies and secure the implant in place." (Ex. 1005, ¶48.) As shown in figures 2A-2C, each screw 38 extends through the plate 32, thereby defining a fixed screw path within the implant. A POSITA would have understood that this fixed path constrains and directs the screw, and therefore corresponds to an **"internal screw trajectory guide."** (Ex. 1002, Appendix-B [43.f].) Messerli thus discloses limitation [43.f].



(Ex. 1005, Fig. 2A (annotated).)

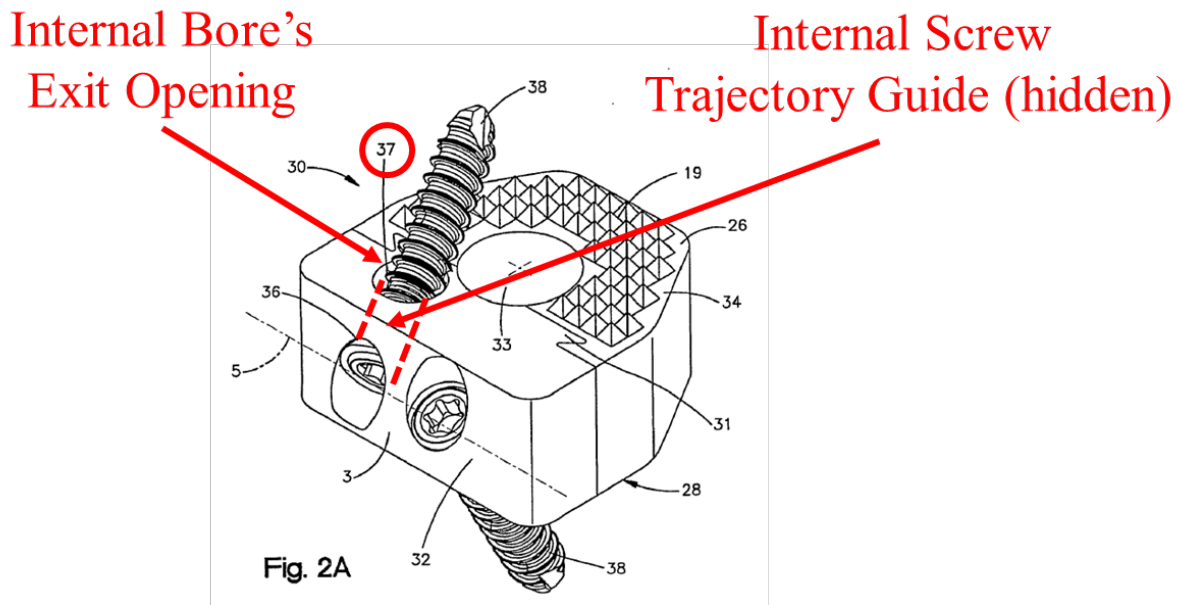
viii) [43.g]

Messerli discloses this limitation. (Ex. 1002, ¶¶75-87, Appendix-B [43.g].)

Messerli’s implant has “[a] pair of holes or openings 36 [to] accept two screws 38, which penetrate the vertebral bodies and secure the implant in place.” (Ex. 1005, ¶48.) Messerli’s implant also has “exit openings 37, 39 for the screw holes 36 [that] are formed in the plate.” (*Id.*, ¶49.) Although figures 2A-2C do not depict the implant with the screws 38 removed, a POSITA would have understood that there is an “**internal bore**” with entry and exit openings based on the screws 38 extending through and out the body of the implant. (Ex. 1002, ¶¶77-80, 88-89.) In other words, Messerli discloses “**the internal screw trajectory guide having an internal bore with an entry opening and an exit opening.**” This is explained further below.

As described above in Section X.A.1.viii, the “**internal bore**” is the portion of the screw trajectory guide that receives the threaded portion of the screw (*i.e.*, the portion of the screw, which is not the screw head). Applying this understanding to Messerli’s figure 2A (reproduced below), the top wall in Messerli also has a “counterbore,” which is the portion of the screw trajectory guide that holds the screw head. There is also necessarily a portion of the screw trajectory guide that receives the threaded portion of the screws 38. A POSITA would have understood that portion as the “**internal bore.**” (*Id.*, ¶80.) Given the lack of a top view with the screws removed, the “**internal bore**” in Messerli is hidden, but can be extrapolated from the figures.¹⁰ For example, the “**exit opening**” of this “**internal bore**” is visible in the figures 2A-2C as opening 37. (*See infra* Section X.B.1.x.) There must also necessarily be an “**entry opening**” of the “**internal bore,**” which is discussed below in Section X.B.1.ix.

¹⁰ The ’293 patent also does not include any figures with the screws removed. Thus, the figures of the ’293 patent also do not clearly show the internal bore or the entirety of the claimed screw trajectory guide.



(Ex. 1005, Fig. 2A (annotated).)

Messerli's disclosure comports with the description of the implant in the '293 patent. Messerli's top surface and the screw holes therein look no different than the screw holes in, for example, figure 2C (reproduced below) of the '293 patent. For example, the heads of Messerli's screws are buried in the top wall just like in figure 2C of the '293 patent.

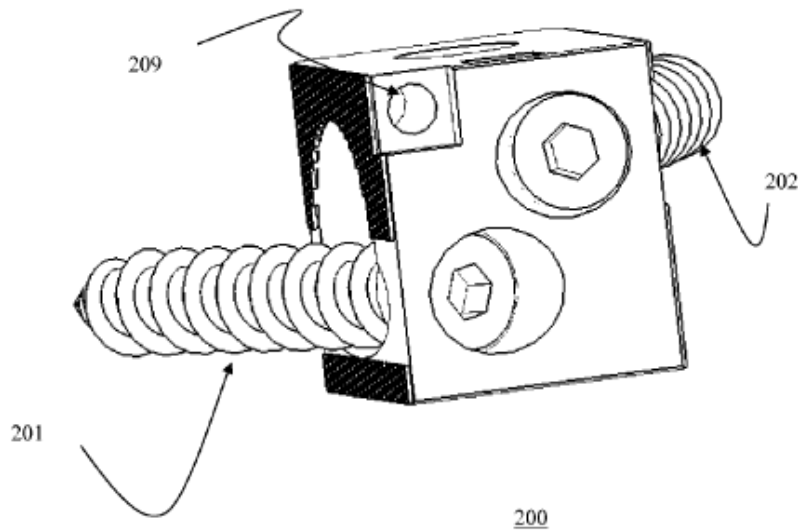


Fig. 2C

(Ex. 1001, Fig. 2C.) Messerli thus discloses the claim limitation [43.g] at least to the same extent that the '293 patent specification describes this limitation. Moreover, it bears noting that the '293 patent specification does not discuss an “internal bore.” This language was added to the claims via amendment.

94. (Currently amended) A universal, intervertebral combination internal screw guide and fixation apparatus configured to be inserted into a disc space between a first vertebral body and a second vertebral body and to provide fusion of the first vertebral body to the second vertebral body via biological bone fusion and screw fusion, the apparatus comprising:

an intervertebral cage including:

a top wall, a bottom wall, and two sidewalls defining an open space capable of receiving bone filling for the biological bone fusion; and

an internal screw guide having an internal bore with an entry opening and an exit opening, the entry opening of the internal bore formed only ~~at least partially~~ in a top surface of the top wall and the exit opening formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall.

(Ex. 1004, 357 (excerpted).) Thus, to the extent claim 43 is supported by the '293 patent based on, for example, the figures of the '293 patent, Messerli necessarily discloses limitation [43.g] owing to the similarity between Messerli's figure 2A and figure 2C of the '293 patent.

The Office's characterization of Messerli during prosecution of the '674 patent further confirms that Messerli discloses limitation [43.g]. (*See supra* Section VIII.B.) According to the Office, Messerli discloses "a vertebral implant wherein the internal screw guide has an internal bore with [an] entry opening and [an] exit

opening . . . and the entry opening of the internal bore is formed only in the top surface of the top wall.” (*Id.*¹¹)

Messerli thus discloses “**the internal screw trajectory guide having an internal bore with an entry opening and an exit opening.**”

ix) [43.h]¹²

Messerli discloses this limitation. (Ex. 1002, ¶¶81-87, Appendix-B [43.h].) As discussed above in Section X.B.1.viii, the “**internal bore**” is hidden in Messerli’s figure 2A just like in the ’293 patent. However, as discussed below, the “**entry opening of the internal bore**” in Messerli is formed “**only in the top surface of the top wall**” in two ways based on Patent Owner’s differing interpretation of this limitation. Again, the Office determined that Messerli discloses such a limitation, a fact that Patent Owner did not dispute. (Ex. 1042, 537 (“Messerli provides the

¹¹ Patent Owner did not dispute the Office’s characterization of Messerli. Instead, Patent Owner chose to cancel then-pending claims in favor of new claims that added a slew of new limitations. (Ex. 1042, 564-581.)

¹² As explained above, *see supra* note 6, Petitioner interprets claim limitation [43.h] as reciting an “entry opening of the internal bore formed only in the top surface of the top wall.”

evidence of the use of a vertebral implant wherein . . . the entry opening of the internal bore is formed only in the top surface of the top wall . . .”).)

(1) Patent Owner’s Interpretation #1

As explained above in Section VI.B, Patent Owner provided annotated figure 2C of the ’849 patent specification, which is a continuation of the ’293 patent and has the same figures as the ’293 patent, indicating what Patent Owner alleges is the “entry opening of the internal bore.”

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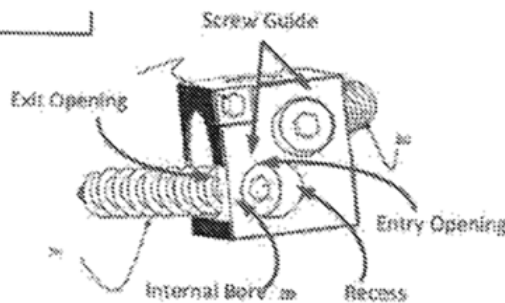
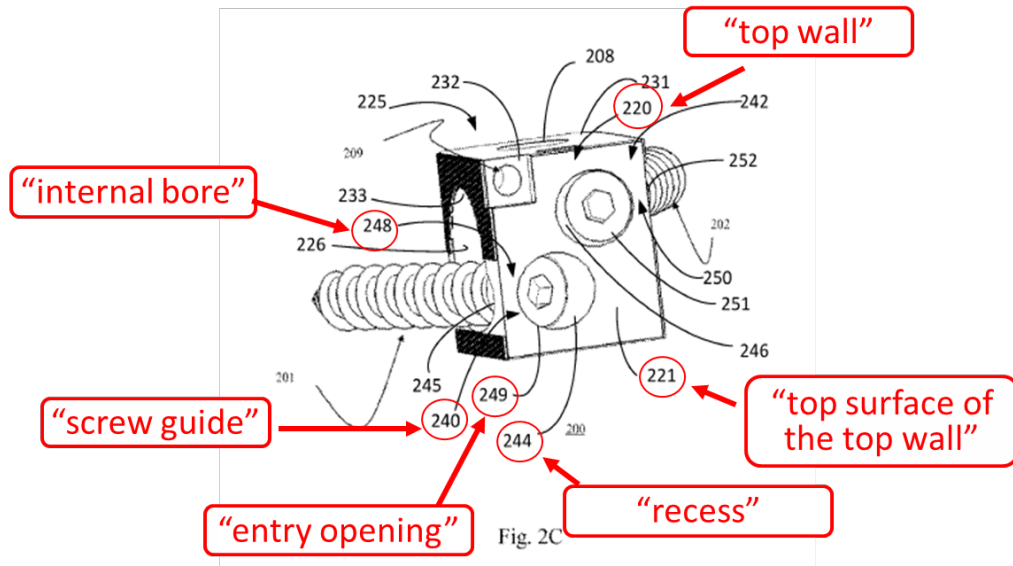


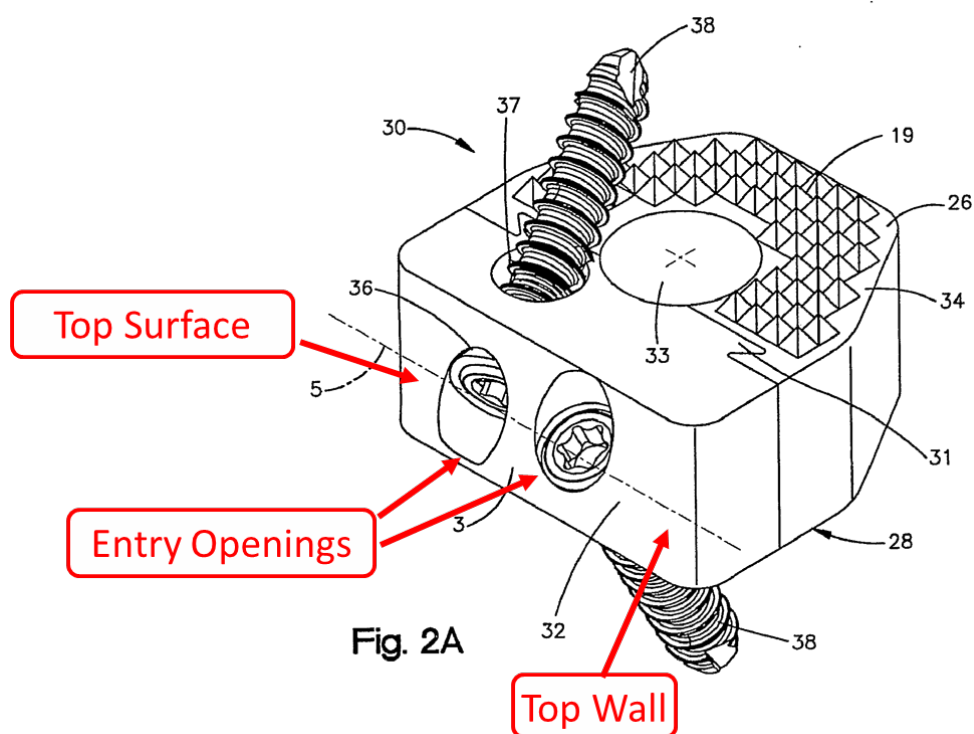
Fig. 2C.

(Ex. 1043, 182.)



(*Id.*, 240 (annotated).)

As apparent from the above figures, Patent Owner pointed to the opening in the top surface of the top wall through which the screw enters the implant as the “**entry opening**” of the “**internal bore**” during prosecution of the ’849 patent. As shown in figure 2A below, Messerli also discloses “**entry opening[s]**” on the top surface of the top wall from where the screws enter the implant. These entry openings are formed “**only in the top surface of the top wall.**” Thus, based on Patent Owner’s submissions, Messerli also discloses that the “**entry opening of the internal bore**” is formed “**only in the top surface of the top wall.**”

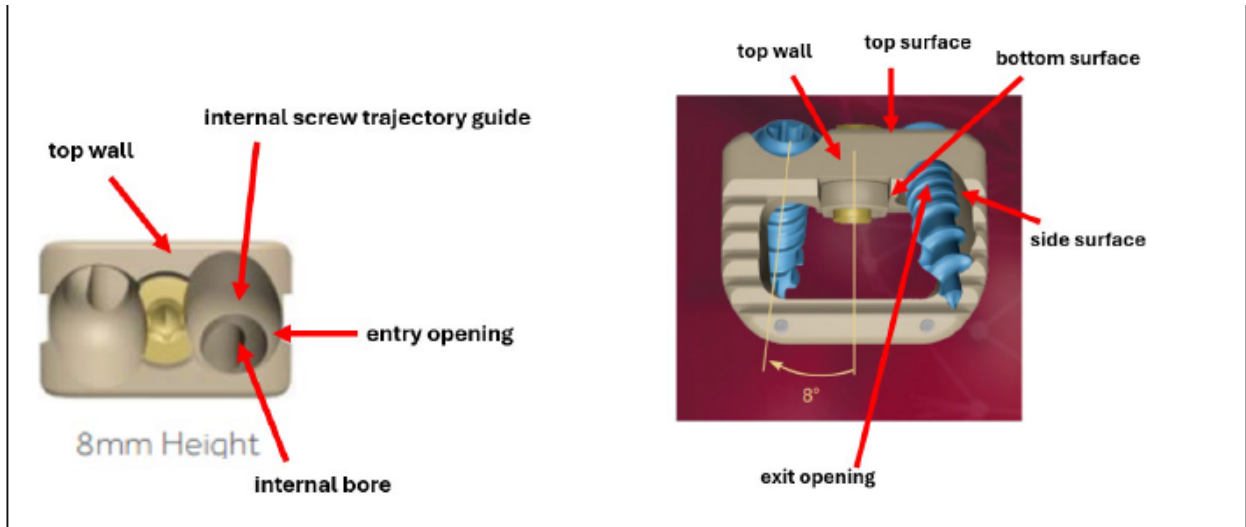


(Ex. 1005, Fig. 2A (annotated).)

(2) Patent Owner's Interpretation #2

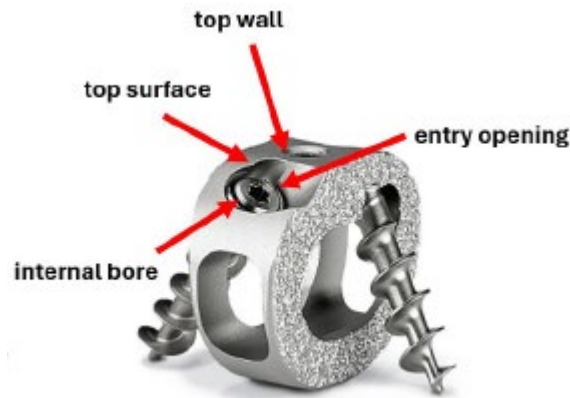
Patent Owner appears to offer a different understanding of the “**entry opening**” of the “**internal bore**” in its litigation against Petitioner. As can be seen in the images below from Patent Owner’s infringement allegations, there is a recess in the alleged “**top wall**,” and a hole at the base of the recess for the threaded portion of the screw. Patent Owner appears to be referring to that hole as the “**internal bore**” and taking the position that the “**entry opening**” is “**formed *only* in the *top surface of the top wall***” so long as the “**entry opening**” is formed in a “recess” in

the “**top wall**,” irrespective of whether the recess is formed “**only in the top surface of the top wall**” (emphases added).¹³



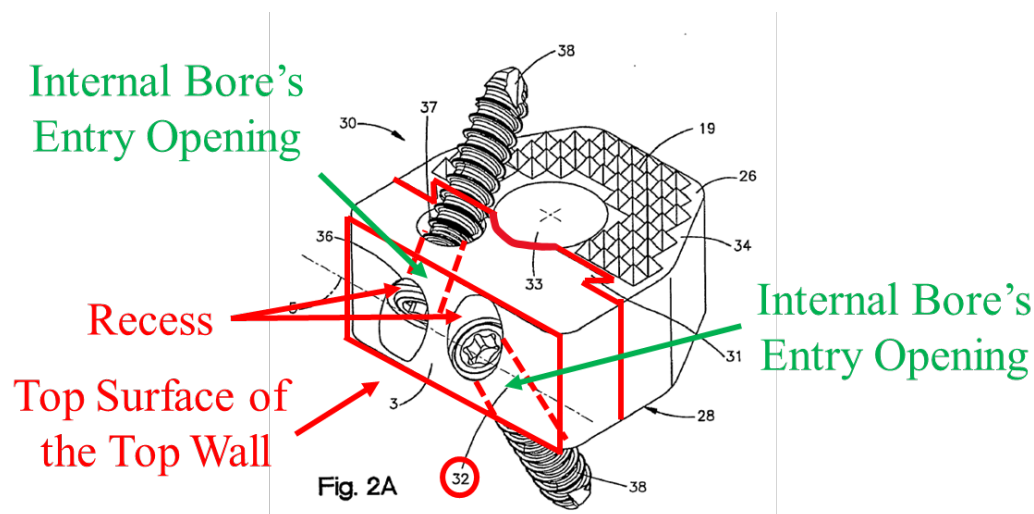
(Ex. 1044, 5 (excerpted).)

¹³ Patent Owner attempted to claim this relationship between the “**entry opening**” of the “**internal bore**” and a “recess” in the “**top wall**” during prosecution of the ’849 patent. (Ex. 1043, 232 (“a recess extending into the top surface of the top wall” such that “the entry opening of the internal bore [is] formed at a juncture between the internal bore and the recess, the entry opening of the internal bore formed only in the top surface of the top wall”).) The Office expressly rejected Patent Owner’s above interpretation noting that “[i]t is unclear how the entry opening can be formed both at a juncture between the internal bore and the recess AND formed only in the top surface of the top wall.” (*Id.*, 253.)



(Ex. 1052, 4 (excerpted).)

Applying Patent Owner’s understanding, Messerli discloses the relevant limitation. As apparent from figure 2A of Messerli, there is a recess in the “**top wall.**” The screw head of the two screws 38 sits inside the recess. There also must be an entry opening inside the recess from where the threaded portion of the screw enters. An approximate location of the “**entry opening**” of the “**internal bore**” is shown below. Messerli thus discloses an “**entry opening**” of the “**internal bore**” inside a recess in the “**top wall.**” Under Patent Owner’s second interpretation, Messerli discloses that an “**entry opening**” of the “**internal bore**” is formed “**only in the top surface of the top wall.**”



(Ex. 1005, Fig. 2A (annotated).)

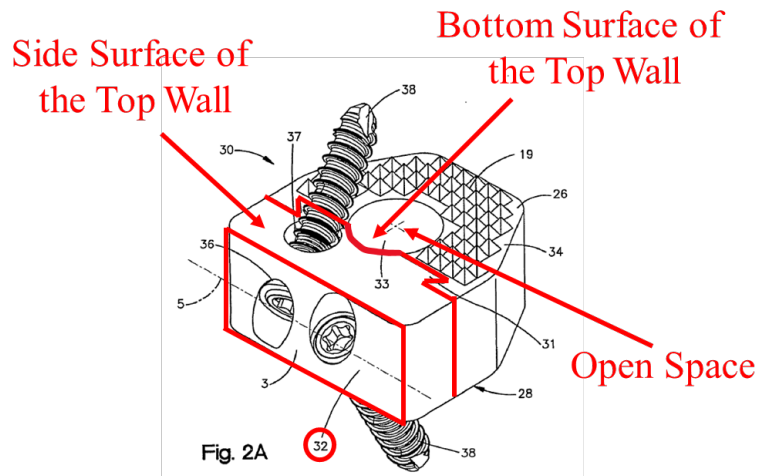
x) [43.i]¹⁴

Messerli discloses this limitation. (Ex. 1002, ¶¶88-92, Appendix-B [43.i].)

Messerli’s implant has “exit openings 37, 39 for the screw holes 36 [that] are formed in the plate [32].” (Ex. 1005, ¶49.) As shown in figure 2A (reproduced below), the surface of plate 32 (“**top wall**”) with the screw openings corresponds to the “**top surface**.” Further, as shown below, the surface of plate 32 that contacts the spacer/graft 34 via the dovetail joint 31 corresponds to the “**bottom surface**” of the

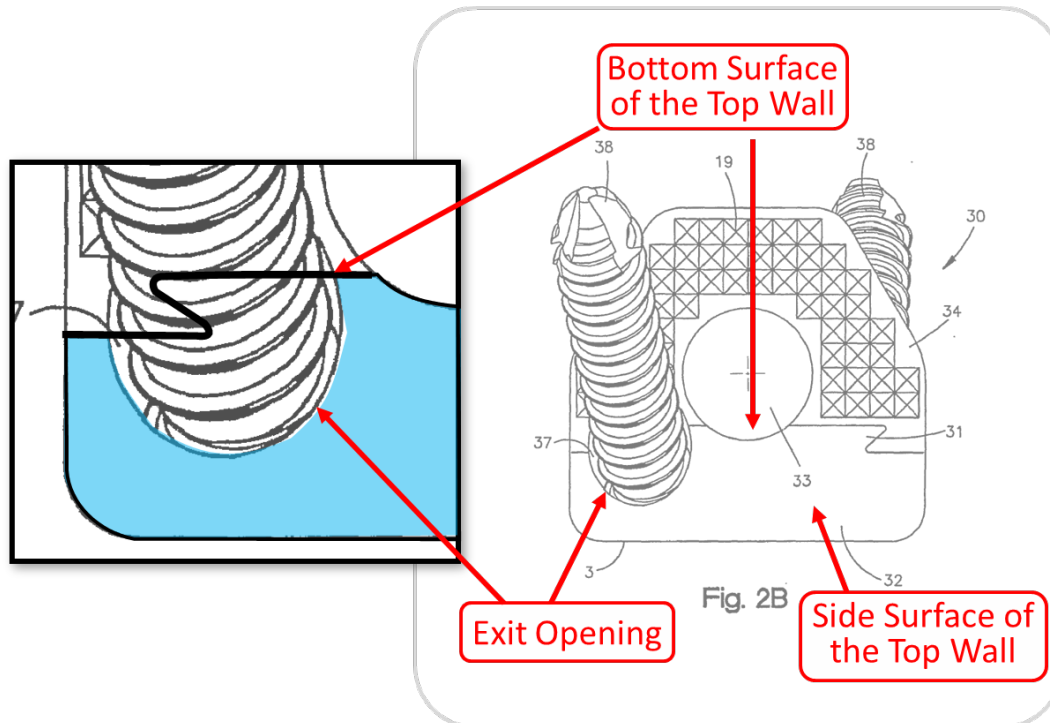
¹⁴ As explained above, *see supra* note 7, Petitioner interprets claim limitation [43.i] as reciting that the “exit opening of the internal bore [is] formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall.”

top wall. The surface of plate 32 adjacent to the “**bottom surface**” is a “**side surface**” of the top wall.



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

As evident from figure 2B (reproduced below), the exit opening 37 is formed at least partially in the side surface of plate 32 (the “**top wall**”). This exit opening is also the “**exit opening**” of the “**internal bore**” because the threaded portion of the screw exits the implant from this opening.

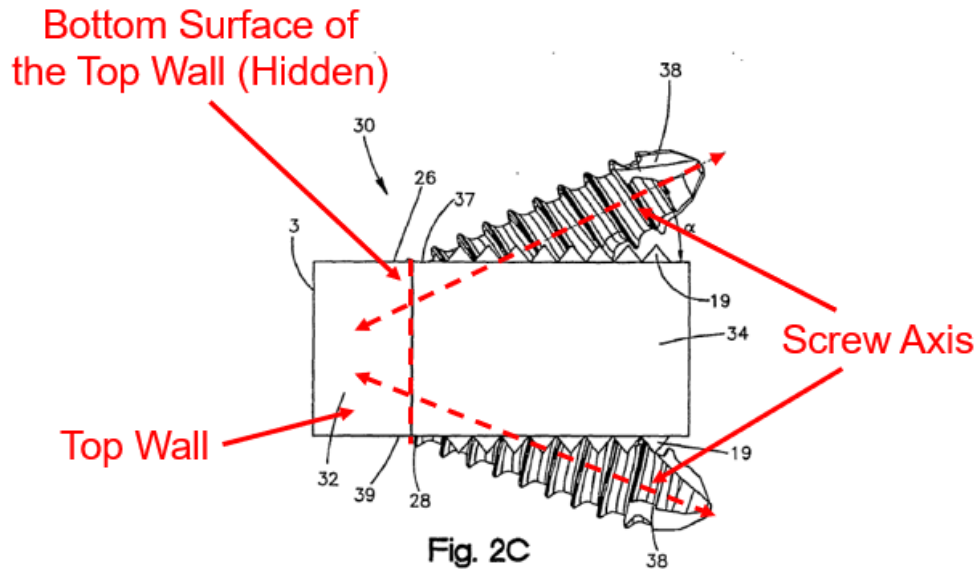


(*Id.*, Fig. 2B (enlarged view, annotated)).¹⁵)

As also seen in figure 2B above, the exit opening is formed partially in the bottom surface of plate 32. This is at least because the exit opening 37 cuts the line marked as the “bottom surface of the top wall.” Such an understanding is further confirmed by figure 2C (reproduced below), which shows that the axis of the screws 38 follows a diagonal path through plate 32 and crosses the bottom surface of plate 32, corresponding to the “**bottom surface of the top wall.**” In other words, each

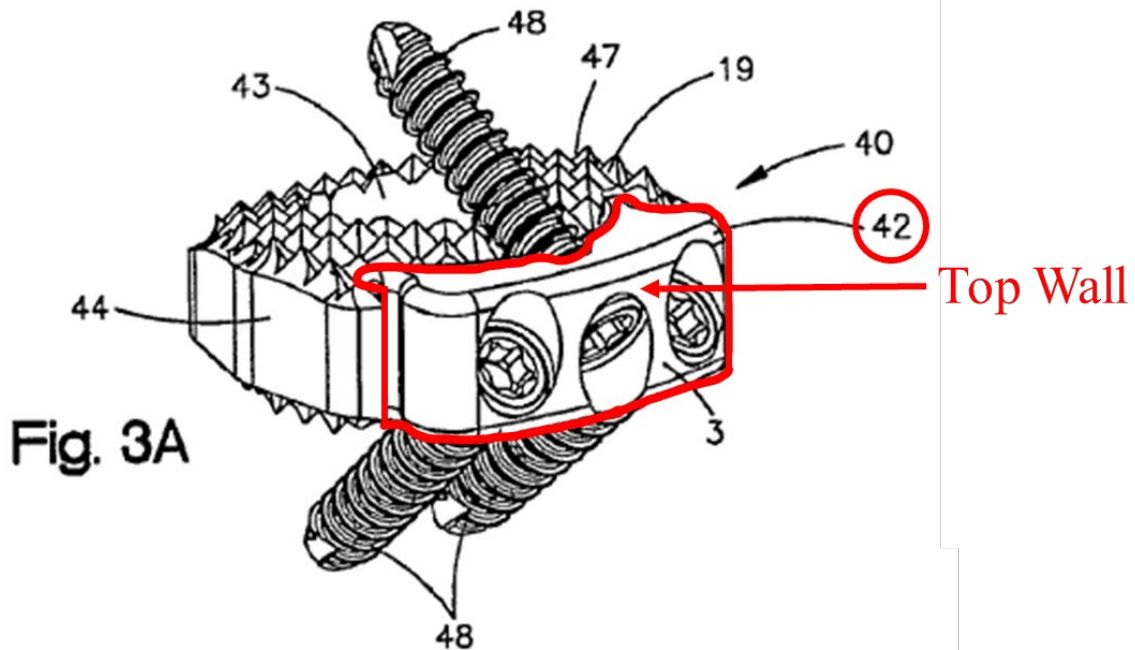
¹⁵ A thick dark line has been added in the callout portion to indicate the dovetail joint 31, which demarcates the bottom surface of the plate 32.

screw (and thus, the internal bore and its exit opening) must also pass through the bottom surface of the top wall. (*See also* Ex. 1002, ¶¶91.)



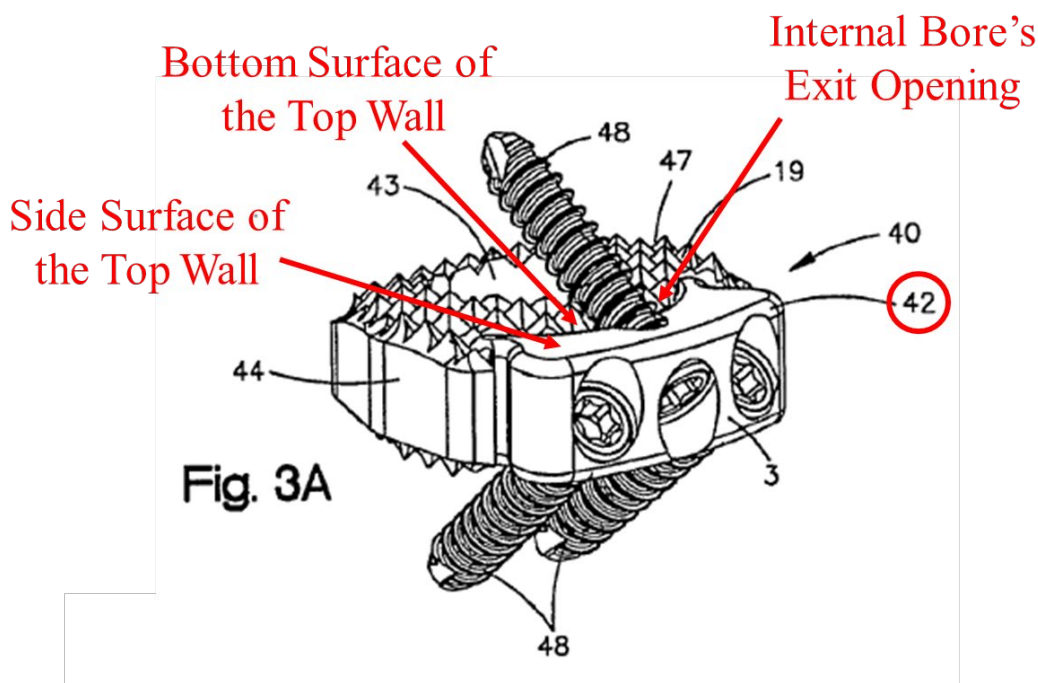
(Ex. 1005, Fig. 2C (annotated).)

Moreover, Messerli discloses other embodiments (*e.g.*, the embodiment of figures 3A-3C), where the “**exit opening**” is formed in both the side and bottom surfaces of the top wall. In the embodiment of figures 3A-3C (reproduced below), Messerli discloses an implant 40 similar to implant 30 described in figures 2A-2C. For example, implant 40 has a plate 42 (“**top wall**”) and spacer 44, joined together like plate 32 and spacer 34 in implant 30. (*Id.*, ¶¶50-51.)



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

According to Messerli, “[i]n the embodiment of FIGS. 3A-3C, the exit openings 47, 49 in the superior and inferior surfaces for the screws are preferably formed at the junction of the plate and spacer, or in the spacer.” (*Id.*, ¶51.) As shown below, the exit opening is formed to cut both the bottom and a side surface of plate 42.



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

The understanding that Messerli discloses limitation [43.i] was also confirmed during prosecution of the '674 patent. According to the Office, Messerli discloses “wherein the internal screw guide has an internal bore with the entry opening and the exit opening . . . and the exit opening is formed at least partially in the bottom surface of the top wall and at least partially in the side surface of the top wall”

(See *supra* Section VIII.B; Ex. 1042, 537.)

Given Messerli's figures 3A-3C embodiment, a POSITA would have understood that one way to configure the exit openings of the figure 2A-2C embodiment is to form them at the junction of plate 32 and spacer 34 (as already indicated in figures 2B and 2C). (Ex. 1002; ¶¶93-95.) Indeed, Messerli expressly

teaches that the angle of the screws may vary. (Ex. 1005, ¶50.) And Messerli further expressly notes that the exit openings can be formed either in the spacer, the plate, or at the junction between the two. (*Id.*, ¶51.) A POSITA would therefore have understood that there are only three options for the exit opening in Messerli's figures 2A-2C embodiment: the exit opening is either formed in the plate 32 completely, in the spacer 34 completely, or at a junction between the two.¹⁶ Selecting between one of these three options would have been a matter of routine experimentation and a POSITA would have selected each option based on how they wanted to configure the angle of the screws relative to the vertebrae. *See Uber*, 957 F.3d at 1341. (Ex. 1002, ¶95.) At a minimum, a POSITA would have good reason to try each of the three options to determine various implant configurations that might have been suitable for individual patient needs and such variations would have been a matter of routine experimentation or optimization of the implant. (Ex. 1002, ¶95.)

Messerli thus discloses or suggests that **“the exit opening”** of the internal bore is **“formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall.”**

¹⁶ If the exit opening is formed at a junction between the plate and the spacer, the opening is necessarily formed in both the side surface and bottom surface of the top wall, as shown in figure 3A of Messerli. (Ex. 1002, ¶95.)

C. Ground 3: Waugh Anticipates Claim 43 of the '293 Patent

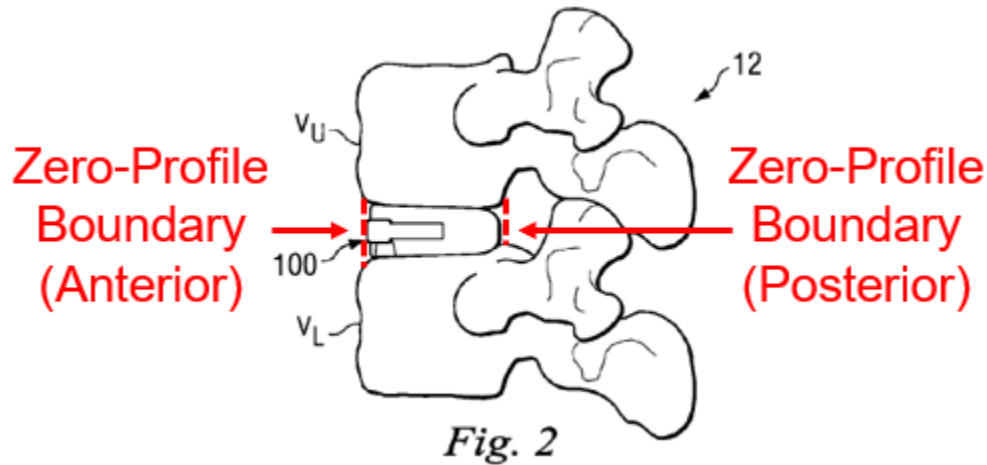
1. Claim 43¹⁷

i) [43.pre]

Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.pre].) Waugh's "implantable device 100" is sized to fit like a natural intervertebral disc between adjacent intervertebral bodies. (Ex. 1006, ¶27, Fig. 2.) Waugh expressly states that the implantable device 100 "is capable of being entirely contained within the disc space." (*Id.*, ¶36.) An example of such an implant is shown in figure 2 (reproduced below) which discloses "two vertebrae with an exemplary implantable device disposed therebetween." (*Id.*, ¶11.) Waugh thus discloses "[a] **zero-profile, intervertebral**" implant "**sized and configured to be inserted into a disc space between adjacent vertebral bodies.**"

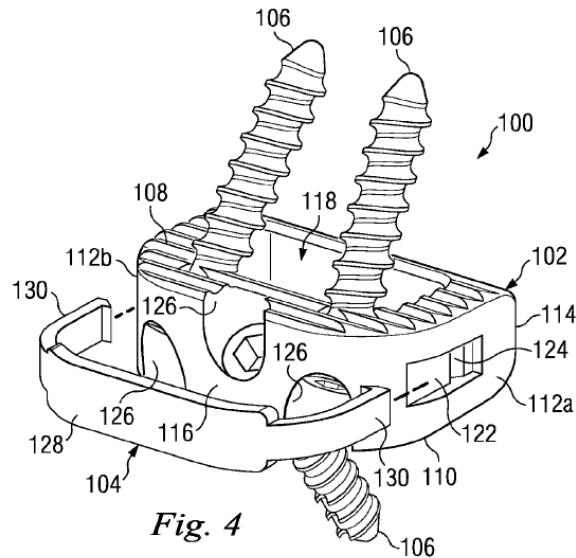
¹⁷ Claim language is not included in the headings but can be found in Section

X.A.1.



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

Waugh's implantable device 100, includes an "implant member 102," which is further described with reference to figures 3 and 4. (*Id.*, ¶28.) The implant member 102 includes a "hollow center 118" that allows "placement of bone growth materials, such as allograft to promote bonding and fusion of the implantable device 100 to the adjacent vertebrae." (*Id.*, ¶28, Figs. 3, 4.) The implantable device 100 also has "anchor members 106" (*i.e.*, screws) that "extend through the anchor member apertures 126 . . . and out the hollow center 118 and into the bearing endplates of the vertebrae, 14, 16" to facilitate screw fusion. (*Id.*, ¶30.) Waugh's implant thus provides "**fusion of the adjacent vertebral bodies via biological bone fusion and screw fusion.**" Moreover, a POSITA would have understood that an intervertebral implant with a hollow central opening, such as hollow center 118, would be considered an intervertebral "**cage.**" (Ex. 1002, Appendix-C [43.pre].)

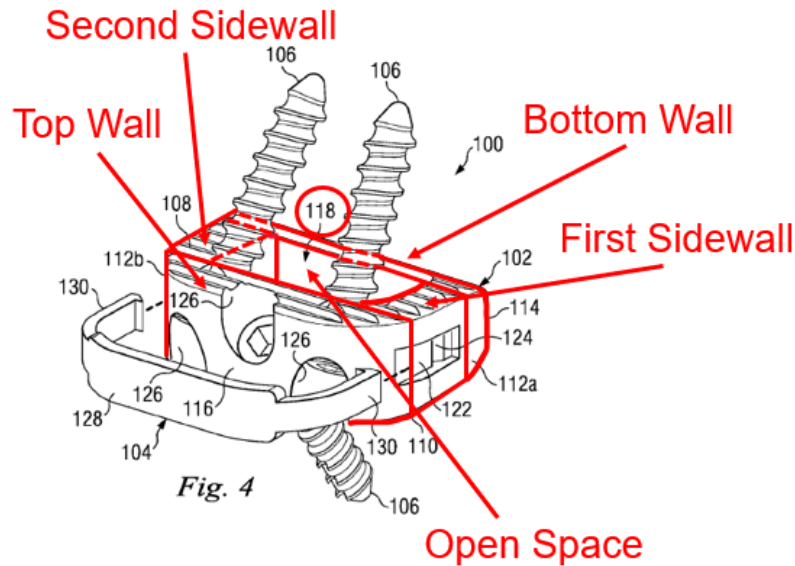


(Ex. 1006, Fig. 4.)

Waugh thus discloses limitation [43.pre].

ii) [43.a]

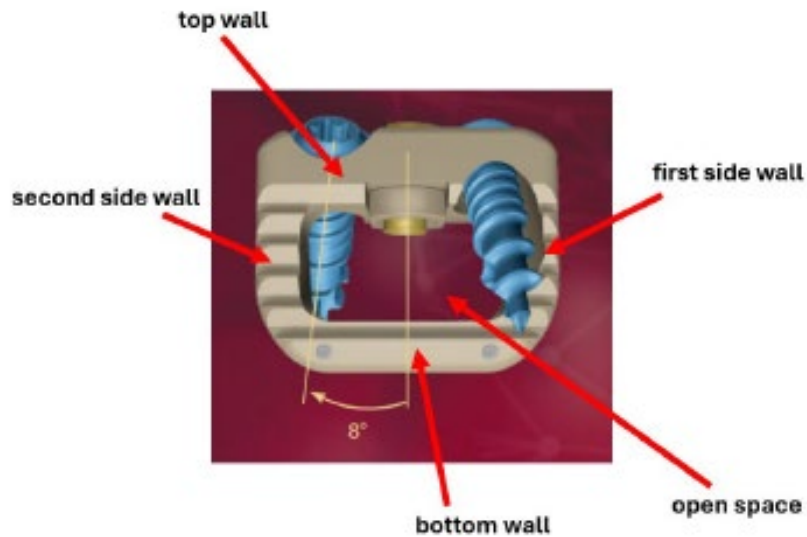
Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.a].) Waugh's implant member 102 has "an upper surface 108, a lower surface 110, side surfaces, 112a-b, a rear surface 114 and a front surface 116." (Ex. 1006, ¶28, Fig. 4 (reproduced below).) Moreover, Waugh's implant has a hollow center 118. (*See id.*, Fig. 4.) The portion of the implant member 102 located above the hollow center 118 corresponds to "**top wall**" whereas the portion located below corresponds to the "**bottom wall opposite the top wall.**" (*See id.*) The portions of the implant to the left and right of the hollow center 118 and between the top wall and the bottom wall correspond to the "**first sidewall**" and "**second sidewall opposite the first sidewall.**" (*See id.*)



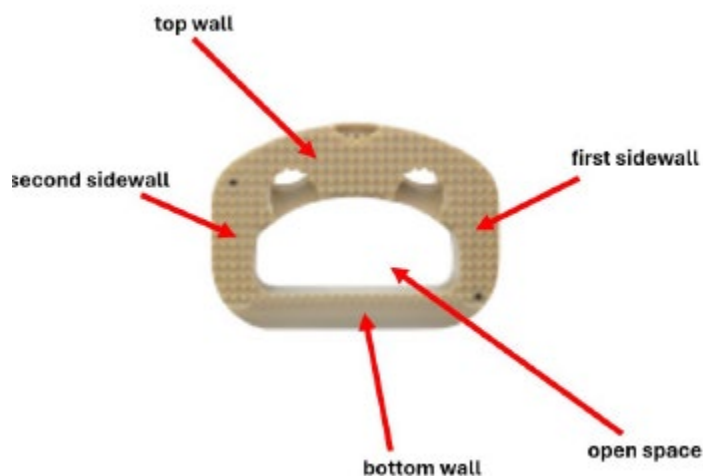
(*Id.*, Fig. 4 (annotated).)

A POSITA would have understood that the bottom wall is bound by the rear surface 114, as well as portions of the upper surface 108, the lower surface 110, and the side surfaces 112a-b. (Ex. 1002, Appendix-C [43.a].) A POSITA would have also understood that the first and second sidewalls are bound by portions of the upper surface 108, the lower surface 110, and the side surfaces 112a-b. (*Id.*)

The analysis above is consistent with how Patent Owner alleged infringement for Petitioner’s products. (See Ex. 1044, 4 (excerpt below); see also Ex. 1051, 3 (excerpt below).) As seen in the images below, Patent Owner labeled portions of one *continuous* piece in two of Petitioner’s accused products as the “top wall,” “bottom wall,” “first side wall,” and “second side wall.” Thus, under Patent Owner’s interpretation of the term “**wall**,” Waugh discloses claim limitation [43.a].



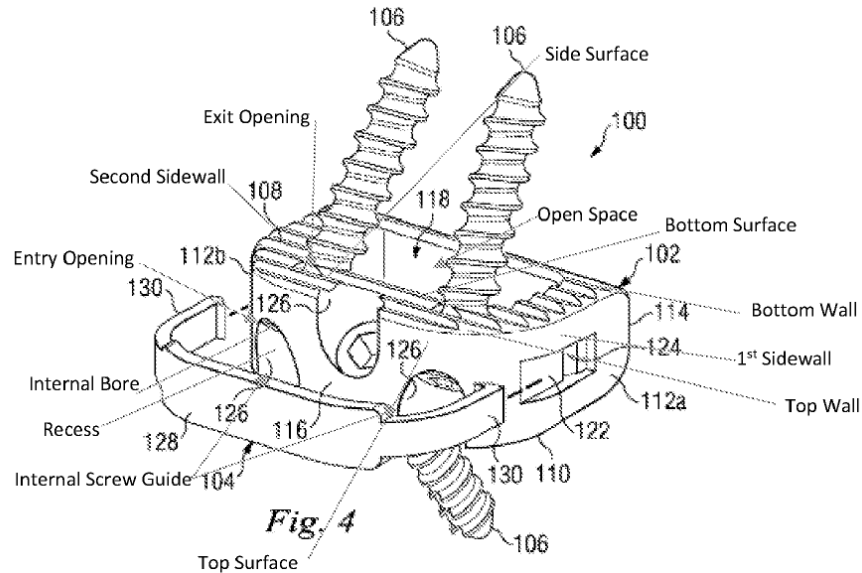
(Ex. 1044, 4 (excerpted).)



(Ex. 1051, 3 (excerpted).)

The Office’s characterization of Waugh during prosecution of the ’849 patent further confirms that Waugh discloses limitation [43.a]. (*See supra* Section VIII.C.) According to the Office, Waugh discloses “an intervertebral implant . . . comprising: a top wall . . . a bottom wall opposite the top wall; a first sidewall; a second sidewall

opposite the first sidewall” (Ex. 1043, 180.)¹⁸ The Office provided the following annotated figure, marking the top wall, bottom wall, first sidewall, and second sidewall in Waugh. (*See id.*, 181 (excerpt below).)



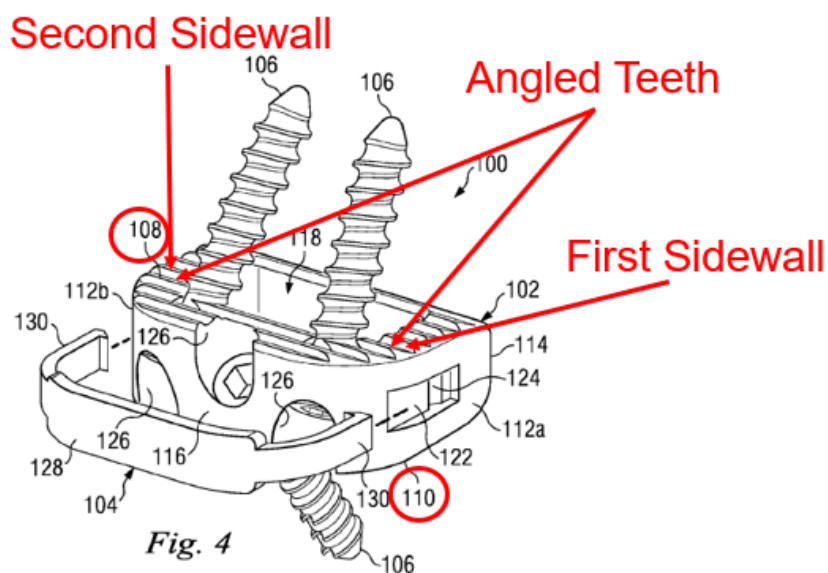
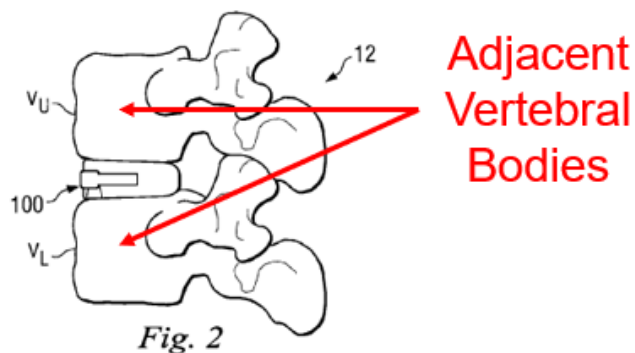
(*Id.*, (excerpted).)

iii) [43.b]

Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.b].) Waugh’s implant has upper and lower surfaces 108, 110 with “bone engaging features 120,” such as angled teeth, that are “configured to reduce slipping or movement of the

¹⁸ Patent Owner did not dispute the Office’s characterization of Waugh. Instead, Patent Owner chose to amend the claim to add a claim limitation that “the intervertebral implant does not include a faceplate to retain the screw in the internal screw guide.” (Ex. 1043, 232, 245-246.)

implant member 102 relative to the vertebrae 14, 16.” (Ex. 1006, ¶29.) Waugh discloses that the “upper and lower surfaces 108, 110 . . . interface with the . . . upper and lower vertebrae” (*Id.*, ¶28.) Because the upper and lower surfaces are part of the “**first sidewall**” and “**second sidewall**,” Waugh discloses limitation [43.b].

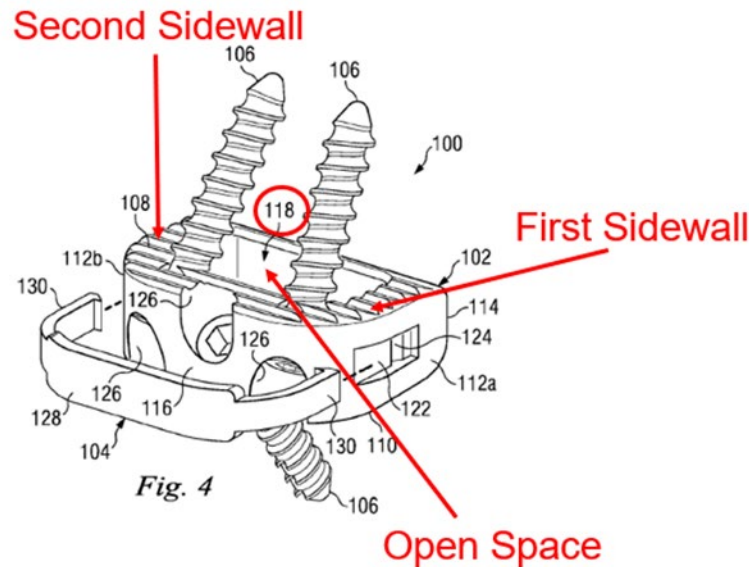


(*Id.*, Fig. 2 (annotated), Fig. 4 (annotated).)

iv) [43.c]

Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.c].) Waugh’s implant has a hollow center 118 that allows for the “placement of bone growth

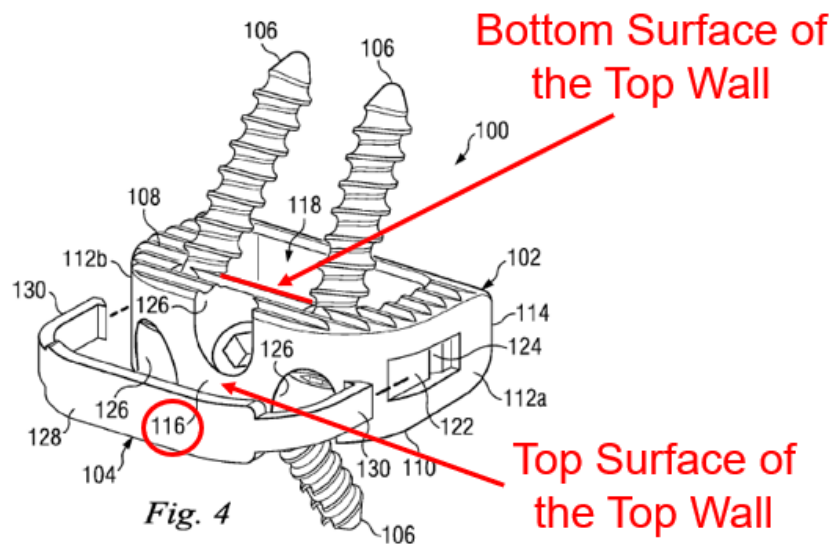
materials, such as allograft to promote bonding and fusion of the implantable device 100 to the adjacent vertebrae.” (Ex. 1006, ¶28.) Moreover, as shown in figure 4 (reproduced below), the hollow center 118 is bound by the top wall, bottom wall, and two sidewalls. Waugh thus discloses limitation [43.c].



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

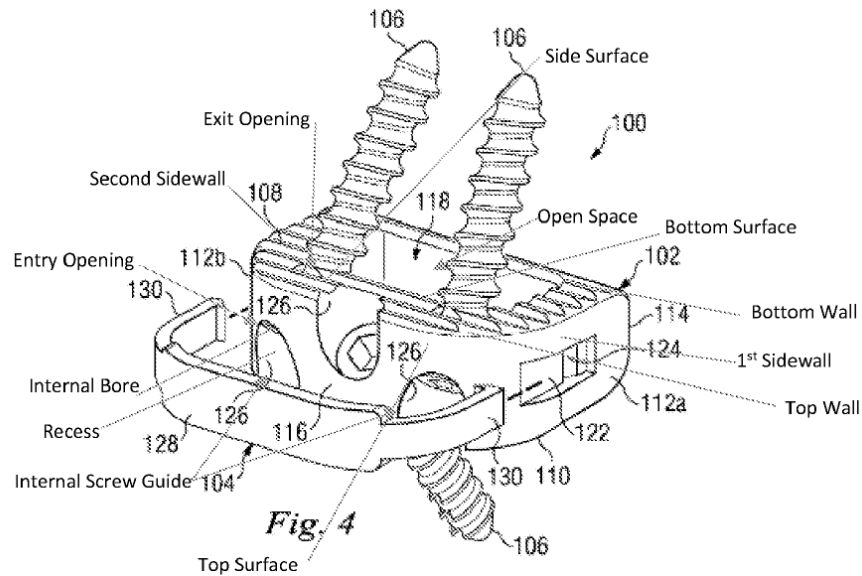
v) [43.d]

Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.d].) Waugh’s implant has “anchor members 106 [that] extend through the anchor member apertures 126 in the front surface 116 and upper and lower surfaces 108, 110 and out the hollow center 118 and into the bearing endplates of the vertebrae 14, 16.” (Ex. 1006, ¶30.) The front surface 116 corresponds to the “**top surface**” of the top wall and the surface of the top wall facing the hollow center 118 corresponds to the “**bottom surface opposite the top surface.**”



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

The Office’s characterization of Waugh during prosecution of the ’849 patent further confirms that Waugh discloses limitation [43.d]. (*See supra* Section VIII.C.) According to the Office, Waugh discloses “an intervertebral implant . . . comprising: a top wall including a top surface and a bottom surface opposite the top surface” (Ex. 1043, 180.) The Office’s annotated figure below confirms this understanding. (*See id.*, 181 (excerpt below).)

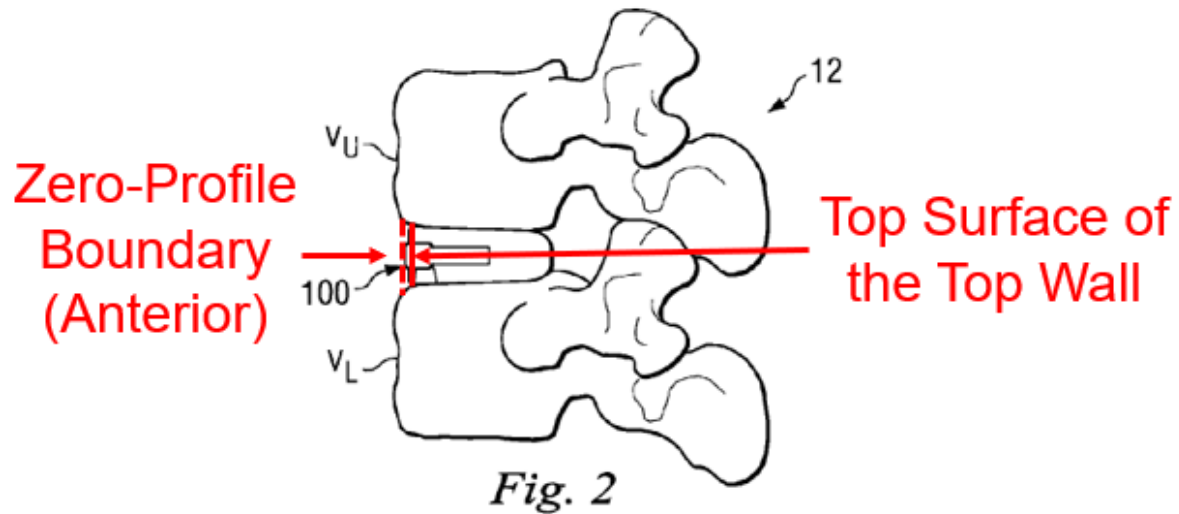


(*Id.*, (excerpted).)

Waugh thus discloses limitation [43.d].

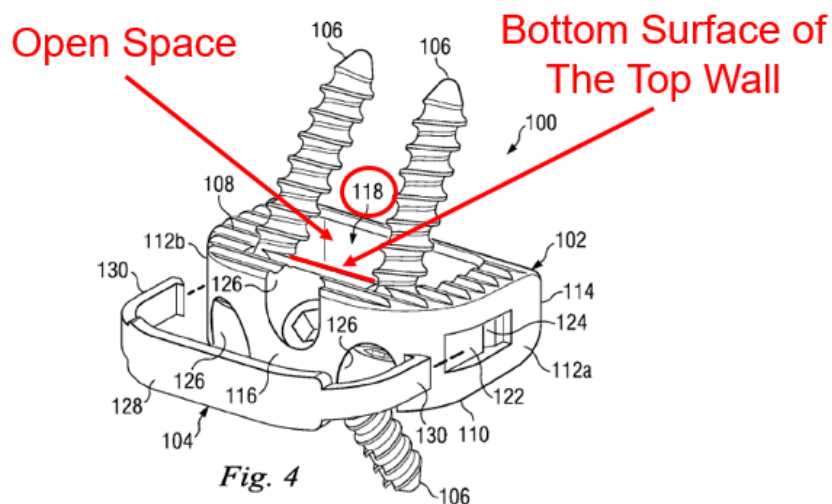
vi) [43.e]

Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.e].) As shown in figure 2 (reproduced below), because Waugh's implant is entirely contained within the disc space, a POSITA would have further understood that no surfaces, including the top surface of the top wall, protrude beyond the boundaries of the disc space as defined by the adjacent vertebral bodies. (*Supra* Section X.C.1.i.) Waugh thus discloses **“the top surface configured to have a zero-profile with respect to the adjacent vertebral bodies when the intervertebral cage is inserted into the disc space.”**



(Ex. 1006, Fig. 2 (annotated).)

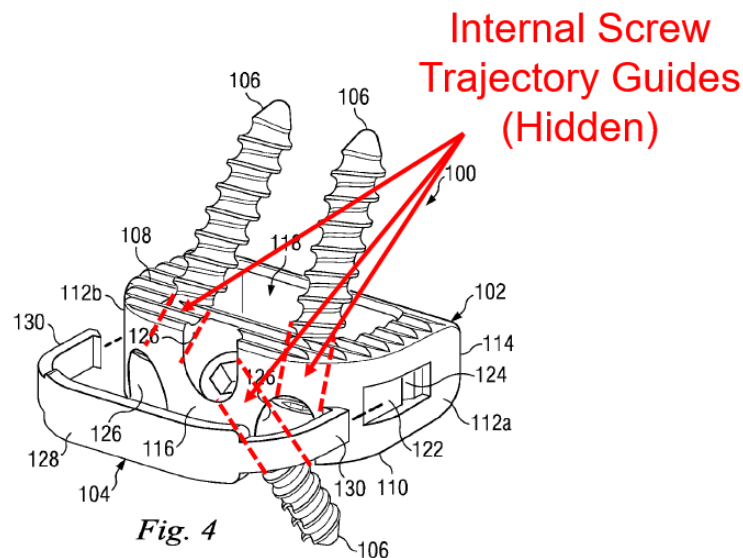
Waugh's implant 100 also has "anchor members 106 [that] extend . . . [into] the front surface 116 and upper and lower surfaces 108, 110 and out the hollow center 118 and into the bearing endplates of the vertebrae 14, 16." (*Id.*, ¶30.) As shown in figure 4 (reproduced below), the surface of the top wall facing the hollow center 118 corresponds to the "**bottom surface facing the open space.**"



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

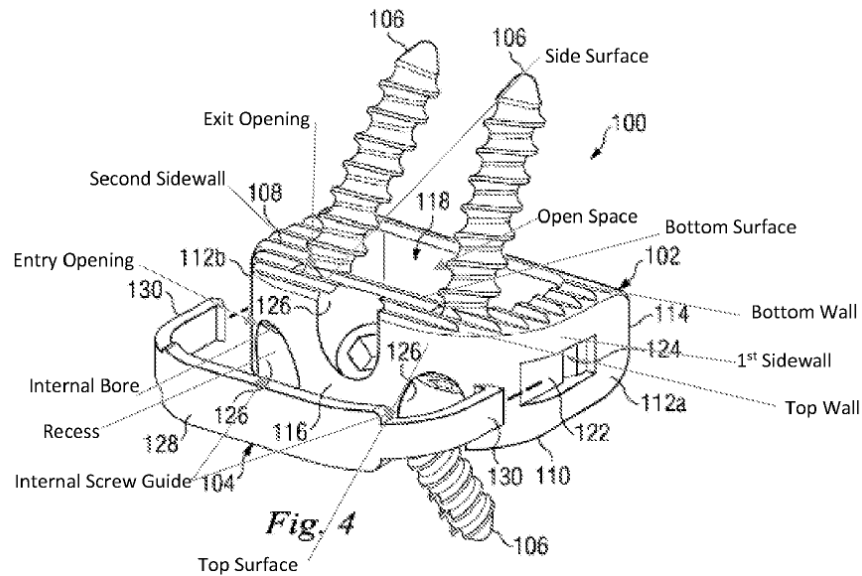
vii) [43.f]

Waugh discloses this limitation. (Ex. 1002, Appendix-C [43.f].) Waugh's implant has "anchor members 106 [that] extend through the anchor member apertures 126 in the front surface 116 and upper and lower surfaces 108, 110 and out the hollow center 118 and into the bearing endplates of the vertebrae 14, 16." (Ex. 1006, ¶30.) As shown in figure 4 (reproduced below), a POSITA would have understood that each passage for the anchor members 106 (*i.e.*, screws) corresponds to the claimed "**internal screw trajectory guide**," as they define a fixed path that constrains and guides the trajectory of the screw. (Ex. 1002, Appendix-C [43.f].)



(Ex. 1006, Fig. 4 (annotated).)

The Office's annotated figure below from prosecution of the '849 patent confirms this understanding. (See Ex. 1043, 181 (excerpt below).) Waugh thus discloses claim [43.f].



(*Id.*, (excerpted).)

viii) [43.g]

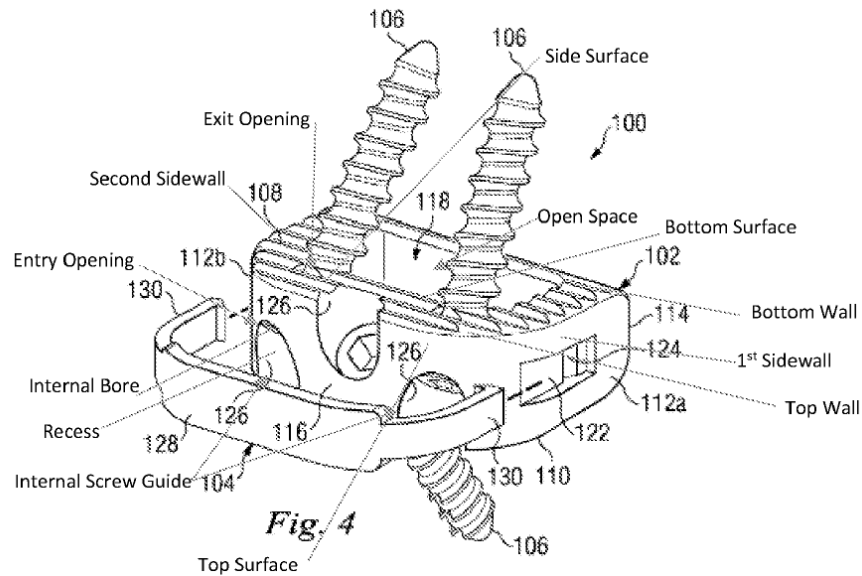
Waugh discloses this limitation. (Ex. 1002, ¶¶107-114, Appendix-C [43.g].)

As described above in Section X.A.1.viii, the “**internal bore**” is the portion of the screw trajectory guide that receives the threaded portion of the screw (*i.e.*, the portion of the screw, which is not the screw head). Applying this understanding to Waugh’s figure 4 (reproduced below), the top wall in Waugh also has a recess (or counterbore), which is the portion of the screw trajectory guide that holds the screw head. There is also necessarily a portion of the screw trajectory guide that receives the threaded portion of the screws 106. A POSITA would have understood that portion as the “**internal bore.**” (Ex. 1002, ¶111.) Given the lack of a top view with the screws removed, the “**internal bore**” in Waugh is hidden, but it can be

extrapolated from the figures.¹⁹ For example, the “**exit opening**” of this “**internal bore**” is visible in figure 4. (*See infra* Section X.C.1.x.) There must also necessarily be an “**entry opening**” of the “**internal bore**,” which is discussed below in Section X.C.1.ix. Waugh thus discloses that there is an “**internal bore**” within the screw trajectory guide.

This understanding of Waugh was also confirmed during prosecution of the ’849 patent. According to the Office, Waugh discloses “an internal screw guide having an internal bore . . . the internal bore having an entry opening and an exit opening” (*See supra* Section VIII.B; Ex. 1043, 180.) The Office’s annotated figure below confirms this understanding. (*See* Ex. 1043, 181 (excerpt below).)

¹⁹ The ’293 patent also does not include any figures with the screws removed. Thus, the figures of the ’293 patent also do not clearly show the internal bore or the entirety of the claimed screw trajectory guide.



(*Id.*, (excerpted).)

Waugh thus discloses limitation [43.g].

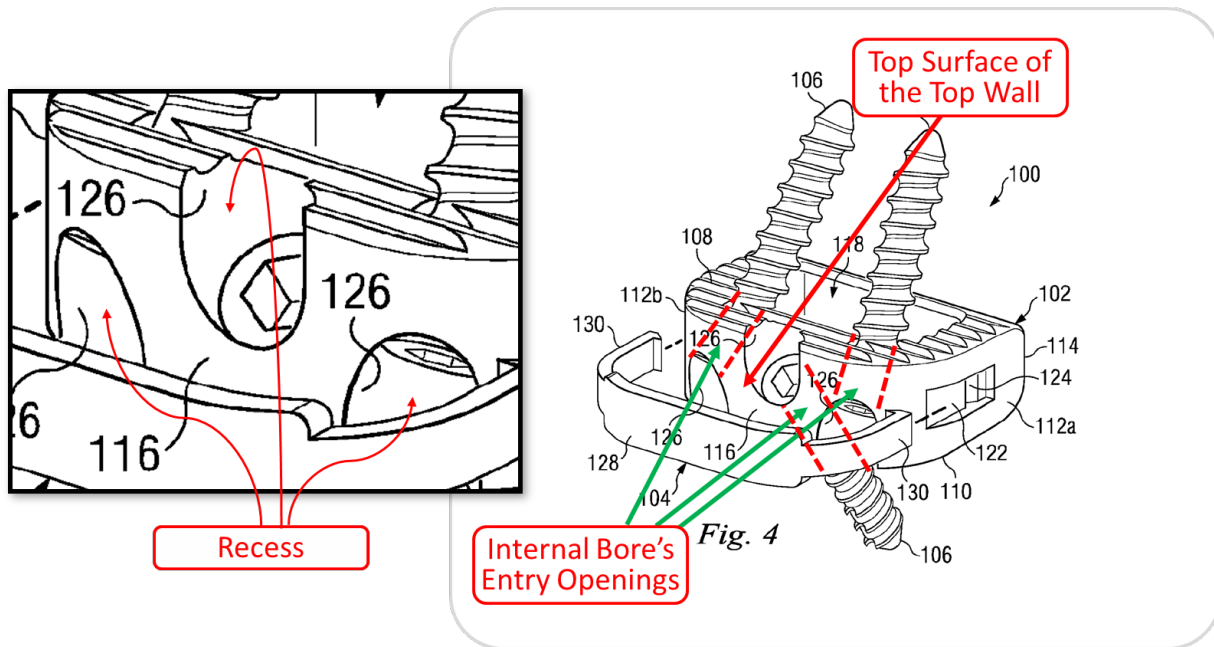
ix) [43.h]²⁰

Waugh discloses this limitation. (Ex. 1002, ¶¶112-113; Appendix-C [43.h].)

In particular, Waugh discloses this limitation under Patent Owner’s interpretation #2 set forth above in Section X.B.1.ix.(2). Under that interpretation, the “**entry opening**” is “**formed *only* in the *top surface* of the *top wall***” so long as the “**entry opening**” is formed in a recess in the “**top wall**,” irrespective of whether the recess is formed “***only* in the *top surface* of the *top wall***” As apparent from figure 4 of

²⁰ As explained above, *see supra* note 6, Petitioner interprets claim limitation [43.h] as reciting an “entry opening of the internal bore formed only in the top surface of the top wall.”

Waugh, there is a recess in the “**top wall.**” The screw head of each of the three screws 38 sits inside their respective recess. There also must be an entry opening inside the recess from where the threaded portion of the screw 106 enters the implant. Thus, Waugh discloses an “**entry opening**” of the “**internal bore**” inside a recess in the “**top wall.**” Under Patent Owner’s interpretation #2, Waugh discloses that an “**entry opening**” of the “**internal bore**” is formed “**only in the top surface of the top wall.**”



(Ex. 1006, Fig. 4 (annotated).)

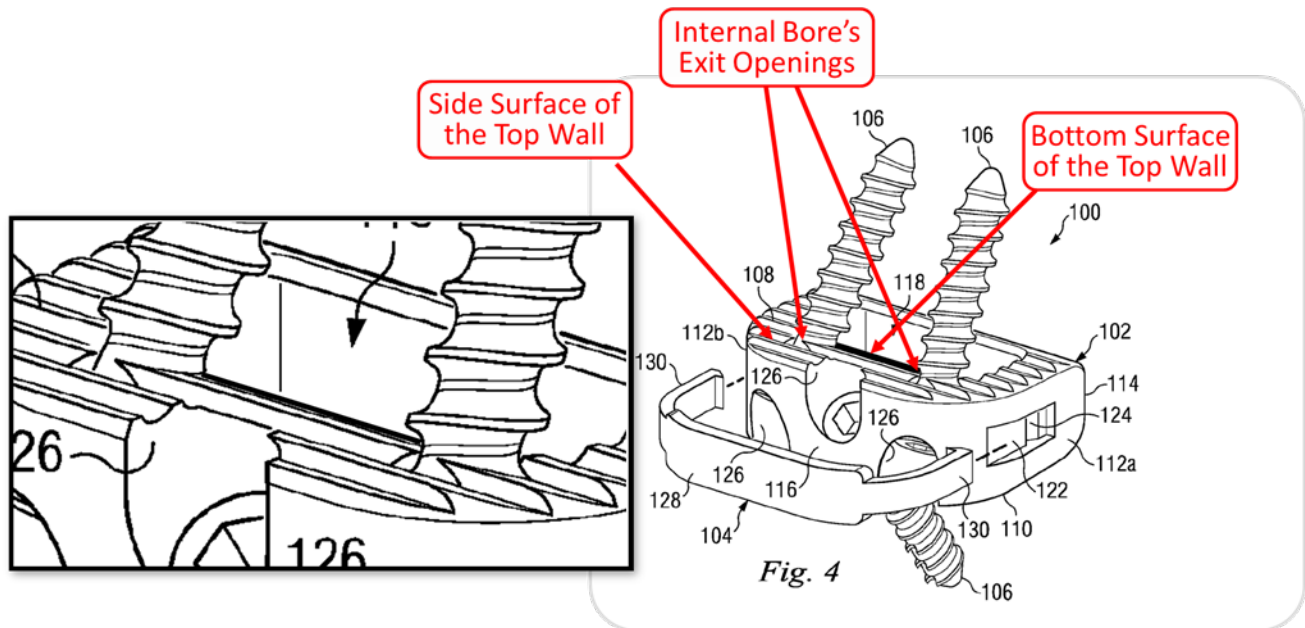
The Office also determined that Waugh has an “**entry opening**” of the “**internal bore**” is formed “**only in the top surface of the top wall,**” a fact that Patent Owner did not dispute. (Ex. 1043, 180 (“Waugh et al. discloses . . . an internal screw guide having an internal bore . . . the entry opening of the internal bore formed

only in the top surface of the top wall”).) Instead, Patent Owner chose to amend the claim to add a claim limitation that “the intervertebral implant does not include a faceplate to retain the screw in the internal screw guide.” (Ex. 1043, 232, 245-246.)

x) [43.i]²¹

Waugh discloses this limitation. (Ex. 1002, ¶114, Appendix-C [43.i].) Waugh’s implant has “anchor members 106 [that] extend through the anchor member apertures 126 in the front surface 116 and upper and lower surfaces 108, 110” (Ex. 1006, ¶30.) As shown in figure 4 (reproduced below), portions of the upper and lower surface 108, 110 correspond to the “**side surface of the top wall**,” and the anchor members 106 (*i.e.*, screws) extend through this side surface of the top wall. Moreover, the “anchor members 106 extend . . . out the hollow center 118 and into the bearing endplates of the vertebrae 14, 16.” (*Id.*) For an anchor member 106 (*i.e.*, a screw) to exit into the hollow center, the exit opening must be formed “**at least partially in the bottom surface of the top wall**.” This is also evident from figure 4 below.

²¹ As explained above, *see supra* note 7, Petitioner interprets claim limitation [43.i] as reciting that the “exit opening of the internal bore [is] formed at least partially in a bottom surface of the top wall and at least partially in a side surface of the top wall.”



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

This understanding of Waugh was also confirmed during prosecution of the '849 patent. According to the Office, Waugh discloses “an internal screw guide having an internal bore . . . the exit opening formed at least partially in the bottom surface of the top wall and at least partially in a side surface of the top wall.” (*See supra* Section VIII.C; Ex. 1043, 180.) Again, Patent Owner did not dispute the Office’s characterization of Waugh. Instead, Patent Owner chose to amend the claim to add a claim limitation that “the intervertebral implant does not include a faceplate to retain the screw in the internal screw guide.” (Ex. 1043, 232, 245-246.) Waugh thus discloses limitation [43.i].

XI. CONCLUSION

Petitioner requests institution of IPR for claim 43 of the '293 patent.

Respectfully submitted,

Dated: September 29, 2025

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

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing
Petition for *Inter Partes* Review of U.S. Patent No. 9,005,293 contains, as
measured by the word-processing system used to prepare this paper, 13,947 words.
This word count does not include the items excluded by 37 C.F.R. § 42.24 as not
counting towards the word limit.

Respectfully submitted,

Dated: September 29, 2025

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

CERTIFICATE OF SERVICE

I hereby certify that on September 29, 2025, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,005,293 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on Patent Center:

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PO BOX 1022
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UNITED STATES

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