

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIFE SPINE, INC.,
Petitioner,

v.

GLOBUS MEDICAL, INC.,
Patent Owner.

IPR2022-01600
Patent 10,973,649 B2

Before DEVON ZASTROW NEWMAN, CYNTHIA M. HARDMAN, and
MICHAEL A. VALEK, *Administrative Patent Judges*.

NEWMAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review challenging the patentability of claims 1–20 of U.S. Patent No. 10,973,649 B2 (“the ’649 patent,” Ex. 1001). We have jurisdiction under 35 U.S.C. § 6.

Petitioner has the burden of proving unpatentability of the challenged claims by a preponderance of the evidence. 35 U.S.C. § 316(e). Having reviewed the parties’ arguments and cited evidence, for the reasons we discuss below, we find that Petitioner has demonstrated by a preponderance of the evidence that claims 1–20 are unpatentable as obvious over the cited prior art.

A. Procedural History

Petitioner Life Spine, Inc., filed a Petition requesting *inter partes* review of claims 1–20 of the ’649 patent. Paper 1 (“Pet.”). Patent Owner Globus Medical, Inc., filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). With our authorization, Petitioner filed a Preliminary Reply and Patent Owner filed a Preliminary Sur-reply. Papers 8, 9. In view of the then-available record, we instituted an *inter partes* review. Paper 10 (“Inst. Dec.”).

After institution, Patent Owner filed a Response to the Petition. Paper 16 (“Response”). Petitioner filed a Reply. Paper 21 (“Reply”). Patent Owner filed a Sur-reply. Paper 29 (“Sur-reply”).

On March 13, 2024, we held an oral hearing, the transcript of which is of record. Paper 34.

B. Real Parties in Interest

Petitioner and Patent Owner each identify themselves as the real party in interest. Paper 19, 2 (Petitioner’s Updated Mandatory Notices); Paper 5, 2 (Patent Owner’s Updated Mandatory Notices).

C. Related Matters

The parties identify *Globus Medical, Inc. v. Life Spine, Inc.*, 1:21-cv-01445 (D. Del.), as involving the ’649 patent. Paper 19, 2; Paper 5, 2. The parties also identify a number of patent applications related to the ’649 patent, including 12/875,637, 13/530,691, 13/531,844, 13/531,700, 13/531,943, 13/793,481, 13/793,668, 13/961,603, 14/466,468, 15/142,142, 15/391,133, 15/900,833, 15/996,792, 16/870,260, 16/910,279, 17/192,231, 17/409,079, 17/410,335, 17/589,029, and 17/931,913. Pet. 1–2; Paper 5, 2–3. There are a number of related *inter partes* review proceedings, including IPR2022-01434, IPR2022-01435, IPR2022-01599, IPR2022-01601, IPR2022-01602, IPR2022-01603, and IPR2023-00041. Paper 19, 2; Paper 5, 2.

D. The ’649 patent (Ex. 1001)

The ’649 patent, titled “Expandable Fusion Device and Method of Installation Thereof,” relates to an expandable device for insertion between adjacent vertebrae to facilitate vertebral fusion. Ex. 1001, code (54), 1:26–30. According to the Specification, a need exists for a fusion device that is “capable of being installed inside an intervertebral disc space at a minimum to no distraction height and . . . that can maintain a normal distance between adjacent vertebral bodies when implanted.” *Id.* at 1:65–2:2. The ’649 patent purports to meet this need with a fusion device including first and second

endplates and a central ramp capable of moving in a first direction to push the endplates outwardly to expand the device. *Id.* at 2:10–14.

The Specification describes exemplary expandable fusion devices for installing in an intervertebral disc space to facilitate intervertebral fusion. *Id.* at 2:6–10. One exemplary device is depicted in Figure 60, reproduced below.

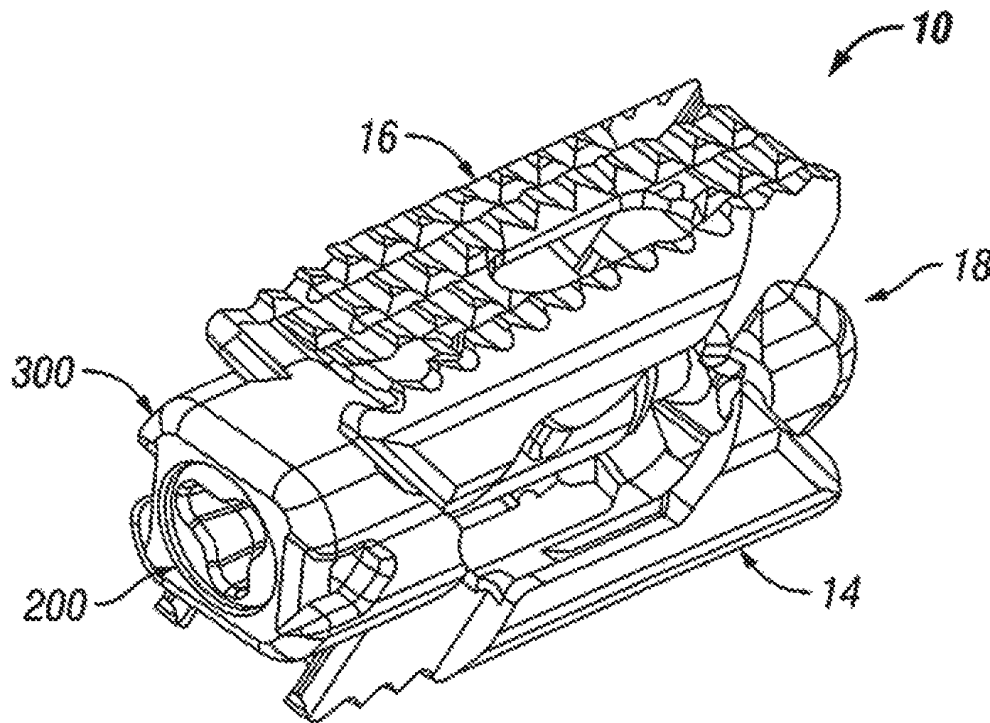


FIG. 60

Figure 60 of the '649 patent, reproduced above, is a perspective view of expandable fusion device 10 in an expanded position. *Id.* at 5:17–19, 22:45–46. Expandable fusion device 10 includes first endplate 14, second endplate 16, central ramp 18, actuator assembly 200, and driving ramp 300. *Id.* at 22:46–49. Actuator assembly 200 functions to pull central ramp 18 and driving ramp 300 together, which forces apart endplates 14 and 16. *Id.* at 22:49–52.

Figure 58 of the '649 patent, reproduced below, is an exploded view of the expandable fusion device shown in Figure 60. *Id.* at 5:10–12.

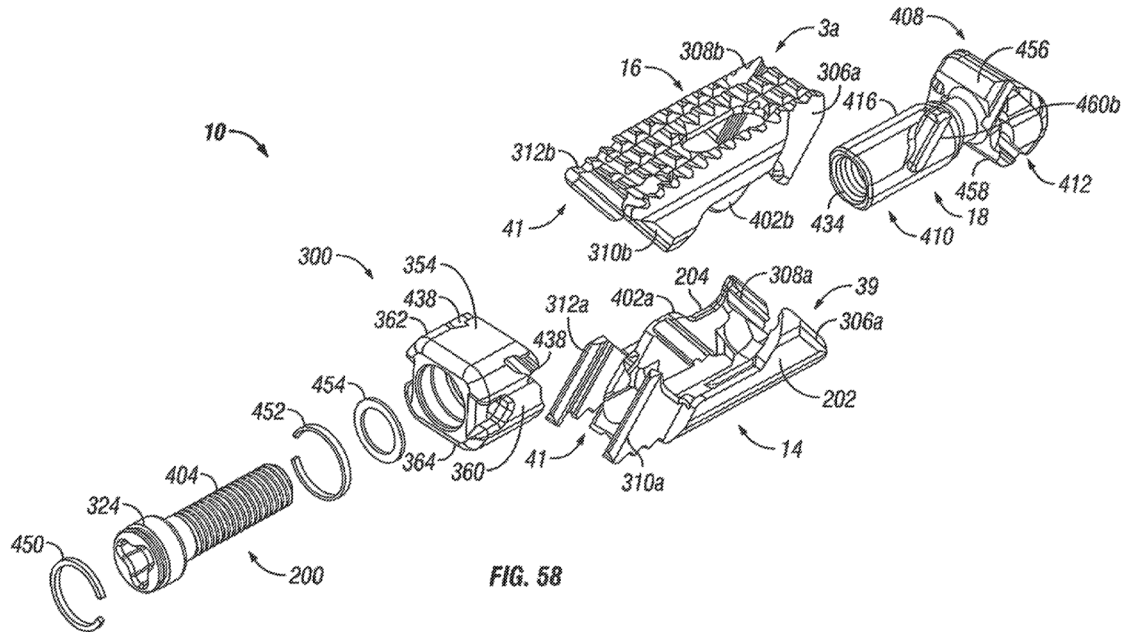


Figure 58, reproduced above, depicts central ramp 18 with a first end 408 and second end 410, expansion portion 412, and a rod-receiving extension 416 extending longitudinally from the expansion portion 412. *Id.* at 23:57–62. Driving ramp 300 includes side portions 360 and 362, each having ramped portion 438. *Id.* at 24:40–48.

Figure 61 of the '649 patent, reproduced below, is a side cross-section view of the expandable fusion device of Figure 58 in an expanded position. *Id.* at 5:20–22.

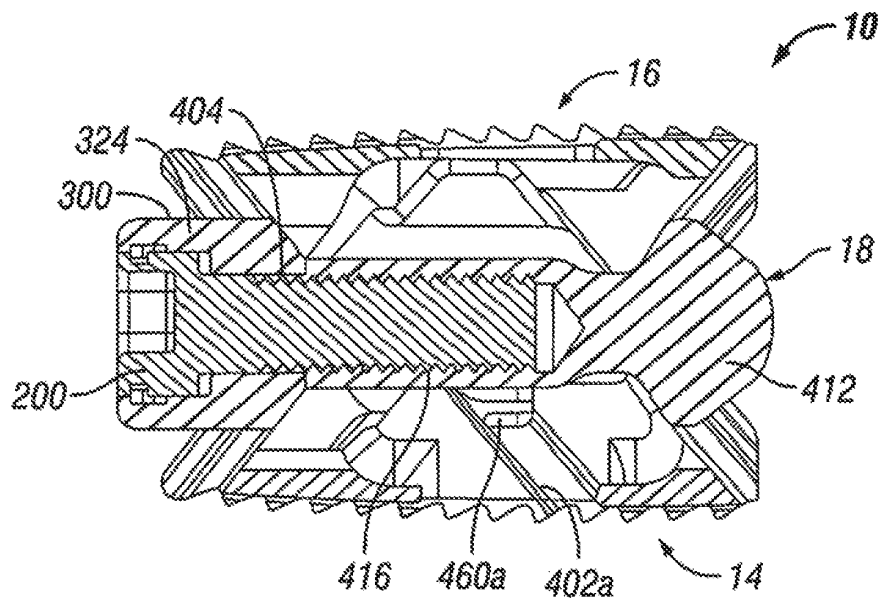


FIG. 61

Figure 61 of the '649 patent, reproduced above, depicts the expandable fusion device having actuator assembly 200, which includes head portion 324 and an extension 404. *Id.* at 23:43–45. Rod-receiving extension 416 of central ramp 18 is threaded to receive threading of extension 404 of actuator assembly 200. *Id.* at 24:8–11.

In operation, expandable fusion device 10 is inserted into an intervertebral disc space and seated into position. *Id.* at 24:57–59. An instrument is used to engage head portion 324 of actuator assembly 200. *Id.* at 25:7–8. Rotating actuator assembly 200 in a first direction pulls central ramp 18 linearly towards driving ramp 300 and pushes driving ramp 300 linearly towards central ramp 18. *Id.* at 25:9–17. Ramped portions of central ramp 18 and driving ramp 300 push against corresponding ramped portions of endplates 14 and 16, which forces the endplates outward into an expanded position. *Id.* at 25:18–33, 25:39–42.

E. Challenged Claims

Petitioner challenges all 20 claims of the '649 patent. Claims 1 and 10 are independent. Claim 1, reproduced below with bracketed lettering added,¹ is illustrative:

1. [pre] An expandable intervertebral implant, the expandable implant capable of moving from a collapsed position to an expanded position, the expandable implant comprising:
 - [a] a first endplate extending from a proximal end to a distal end, wherein the first endplate has a first surface, a second surface, a first side surface and a second side surface,
 - [b] a second endplate extending from a proximal end to a distal end, wherein the second endplate has a first surface, a second surface, a first side surface and a second side surface;
 - [c] a central ramp positioned between the first endplate and the second endplate, the central ramp positioned proximate the distal end of the first endplate and the distal end of the second endplate;
 - [d] a driving ramp positioned proximate the proximal end of the first endplate and the proximal end of the second endplate, wherein the driving ramp is operably connected with the central ramp,
 - [e] an actuator assembly configured to move at least one of the central ramp and the driving ramp;

¹ For ease of reference, we use the same bracketed lettering Petitioner uses in the Petition. *See* Pet. 24–32, 44–52.

[f] wherein the expandable implant defines a horizontal plane that extends through the central ramp, driving ramp and the actuator assembly;

[g] wherein the first side surface of the first endplate includes at least one ramped portion,

[h] wherein the first side surface of the second endplate includes at least one ramped portion,

[i] wherein in the collapsed position, the at least one ramped portion of the first side of the first endplate extends through the horizontal plane such that the at least one ramped portion of the first endplate is positioned on both sides of the horizontal plane.

Ex. 1001, 32:55–33:21.

Claim 1 recites that “the expandable implant defines a *horizontal plane* that extends through the central ramp, driving ramp and the actuator assembly” (limitation 1[f]), and that, when “in the collapsed position, the at least one ramped portion of the first side of the first endplate extends through the *horizontal plane* such that the at least one ramped portion of the first endplate is positioned on both sides of the horizontal plane” (limitation 1[i]). *Id.* (emphases added). The parties refer to these limitations in claim 1 as the “Horizontal-Plane limitation” Pet. 8–9; Prelim. Resp. 5–6.

Challenged independent claim 10 is similar to claim 1, but differs with respect to limitations relating to the expandable implant’s configuration in a “collapsed position.” In particular, claim 10 recites several limitations relating to “overlap”: “wherein the first side surface of the first endplate includes at least one ramped portion having an inwardly facing surface and an outwardly facing surface” (limitation 10[f]); “wherein the first side surface of the second endplate includes an inwardly facing surface and an

outwardly facing surface” (limitation 10[g]); and, when, “in the collapsed position, at least a portion of the inwardly facing surface of the ramped portion of the first endplate *overlaps* at least a portion of the outwardly facing surface of the first side surface of the second endplate” (limitation 10[h]). Ex. 1001, 34:3–34 (emphasis added). The parties refer to these limitations in claim 10 as the “Overlap limitation.” Pet. 8–9; Prelim. Resp. 5–6.

Challenged claims 2–9 depend directly or indirectly from claim 1 and recite additional features, including with respect to the endplates (claims 2 and 3), the central ramp comprising an extension (claim 4), the actuator assembly (claims 5–7), and the driving ramp (claims 8 and 9). Ex. 1001, 33:22–34:2. Similarly, challenged claims 11–20 depend directly or indirectly from claim 10 and recite additional features relating to the endplates (claims 11–14), the central ramp (claim 15), the actuator assembly (claims 16 and 18–20), and the driving ramp (claim 17). *Id.* at 34:35–35:26.

F. Asserted Grounds of Unpatentability

We instituted trial based on the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §²	Reference(s)/Basis
1–7, 9–20	102/103	Varela '357 ³
8	103	Varela '357, Oglaza ⁴
1–7, 9–20	103	Olmos, ⁵ Varela '774 ⁶
8	103	Olmos, Varela '774, Oglaza

² The Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103, and set the effective date for these amendments as March 16, 2013. The '649 patent claims benefit to three applications, all of which were filed before March 16, 2013. Ex. 1001, code (63). Petitioner argues, however, that “the claims of the '649 patent are subject to the first-inventor-to-file provisions of the AIA.” Pet. 3. As we concluded in our Decision on Institution, at least claim 8 of the '649 patent has an effective filing date of August 7, 2013, which is after the effective date of the AIA amendments. *See* Inst. Dec. 50. Accordingly, we apply the post-AIA versions of the statutes. *See* MPEP § 2159.02 (stating that “AIA 35 U.S.C. 102 and 103 apply to any patent application that contains or contained at any time a claim to a claimed invention that has an effective filing date that is on or after March 16, 2013” “even if the remaining claimed inventions all have an effective filing date before March 16, 2013”); *see also* AIA § 3(n)(1)(A)–(B). We note, however, that our decision would be the same were we to apply either the pre- or post-AIA version of the statutes.

³ Varela, U.S. Patent Pub. 2012/0226357 A1 (published Sept. 6, 2012) (Ex. 1005, “Varela '357”).

⁴ Oglaza et al., Intl. Pub. No. WO 2010/103344 A1 (published Sept. 16, 2010) (Ex. 1007, “Oglaza”).

⁵ Olmos et al., U.S. Patent Pub. 2008/0140207 A1 (published June 12, 2008) (Ex. 1006, “Olmos”).

⁶ Varela, U.S. Patent Pub. 2011/0172774 A1 (published July 14, 2011) (Ex. 1008, “Varela '774”).

Inst. Dec. 3, 71. Petitioner supports its contentions with the Declaration of Troy D. Drewry (Ex. 1002, “Drewry Decl.”), the Reply Declaration of Troy D. Drewry (Ex. 1030, “Drewry Reply Decl.”), and the Declaration of Paul Hatch (Ex. 1031, “Hatch Decl.”), among other evidence.

Patent Owner disputes Petitioner’s asserted grounds of unpatentability. *See generally* Response. Patent Owner supports its contentions with the Declaration of Brad Culbert (Ex. 2001, “Culbert Decl.”) and the September 2023 Declaration of Brad Culbert (Ex. 2024, “Culbert Second Decl.”), among other evidence.

II. ANALYSIS

A. Principles of Law

In an *inter partes* review, “the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). Petitioner ultimately bears the burden of persuasion to prove unpatentability of each challenged claim by a preponderance of the evidence. 35 U.S.C. § 316(e). This burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

Anticipation under 35 U.S.C. § 102 requires that a prior art reference set forth each and every element of a claim as set forth in the claim. *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987); *see also Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008) (anticipation not only requires that each element of a claim be

present in a prior art reference, but also the arrangement or combination of those elements).

A claim is unpatentable as obvious under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention, as a whole, would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. 35 U.S.C. § 103; *see also KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) any objective indicia of nonobviousness.⁷ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). An obviousness determination requires finding a reason to combine accompanied by a reasonable expectation of achieving what is claimed in the challenged patent. *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016). “[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *KSR*, 550 U.S. at 419–20.

B. Level of Ordinary Skill in the Art

We consider the grounds of unpatentability in view of the understanding of a person of ordinary skill in the art at the time of the

⁷ Patent Owner does not assert objective indicia supporting nonobviousness of the challenged claims. *See generally* Response.

invention. *Graham*, 383 U.S. at 17–18. Petitioner contends that a person of ordinary skill in the art (sometimes abbreviated herein as “POSITA”):

would have had a bachelor’s degree in mechanical engineering or biomedical engineering and two or more years of experience in biomechanical engineering, biomedical engineering, and/or spinal implant devices. A person could also have qualified as a POSITA with some combination of more formal education (e.g., an M.D.) and less technical experience or less formal education and more technical or professional experience in the foregoing fields, and would have had further appreciation of various technical concepts in this field.

Pet. 18 (citing Ex. 1002 ¶¶ 32–35). Patent Owner does not dispute Petitioner’s proposal. *See* Response 8.

We adopt Petitioner’s proposed level of ordinary skill in the art because it is consistent with the cited prior art and is undisputed. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (indicating that the prior art itself may reflect an appropriate skill level).

Based on their statements of qualifications and curricula vitae, we find that Petitioner’s declarant Mr. Drewry, and Patent Owner’s declarant Mr. Culbert, are each qualified to provide technical opinions from the perspective of a person of ordinary skill in the art in this proceeding. *See* Ex. 1002 (Drewry Decl.) ¶¶ 7–12 (Mr. Drewry’s statement of qualifications); Ex. 1003 (Mr. Drewry’s curriculum vitae); Ex. 2001 (Culbert Decl.) ¶¶ 9–14, 18–23 (Mr. Culbert’s statement of qualifications); Ex. 2002 (Mr. Culbert’s curriculum vitae).

Petitioner also relies on a Declaration from Mr. Hatch (Exhibit 1031), whose primary experience is in product and industrial design. *See* Ex. 1031 (Hatch Decl.) ¶ 6; *see also id.* ¶¶ 5–10, 13 (Mr. Hatch’s statement of qualifications). Patent Owner does not dispute that Mr. Hatch is qualified to

provide technical opinions from the perspective of a person of ordinary skill in the art in this proceeding. *See generally* PO Sur-Reply. At a minimum, we consider Mr. Hatch qualified to testify as an expert on issues with which he is “very familiar,” which relevant to this case are “the creation and interpretation of technical drawings used to illustrate and describe mechanical structures.” Ex. 1031 (Hatch Decl.) ¶ 13.

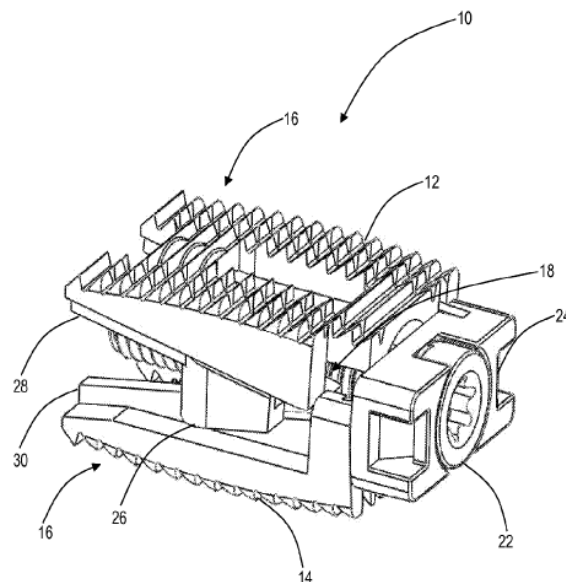
C. Overview of Asserted Prior Art

Before turning to Petitioner’s asserted grounds of unpatentability, we provide a brief summary of the asserted references.

1. Varela ’357 (Ex. 1005)

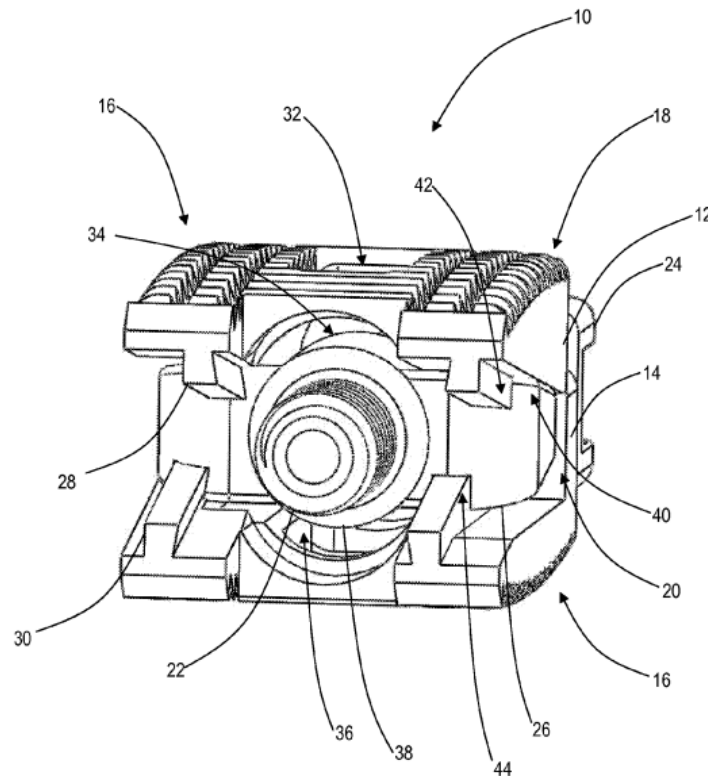
Varela ’357, titled “Expandable Intervertebral Implant and Associated Surgical Method,” relates “to minimally-invasive, surgically-implantable spinal devices and systems.” Ex. 1005, code (54), ¶ 2. Varela ’357 discloses an expandable intervertebral implant selectively deployed in the intervertebral space to provide in-situ distracting, realigning, stabilizing, or fusing a portion of the spine. *Id.* ¶ 5.

We reproduce below Varela ’357’s Figure 1.



Varela '357's Figure 1 depicts expandable intervertebral implant 10 including superior member 12, inferior member 14, and internally-threaded wedge structure 26. *Id.* ¶¶ 15, 65, 67. Rotating screw 22 engages internally-threaded wedge structure 26 to selectively translate the wedge structure along the central axis of expandable intervertebral implant 10. *Id.* ¶ 67. The translation causes internally-threaded wedge structure 26 to interact with associated wedge shapes of superior member 12 and inferior member 14 to force the members apart or together depending on the direction of the translation. *Id.*

We reproduce below Varela '357's Figure 3.



Varela '357's Figure 3 depicts each of superior member 12 and inferior member 14 including respective track structures 28, 30. *Id.* ¶ 68. In particular, track structures 28, 30 are dove-tailed on one or both sides to

engage corresponding channels 42, 44 of wedge structure 26 to secure couple superior member 12 and inferior member 14. *Id.*

2. Olmos (Ex. 1006)

Olmos, titled “Intervertebral Implant,” relates to “[a]n adjustable spinal fusion intervertebral implant.” Ex. 1006, code (54), (57). Figure 16A of Olmos is reproduced below.

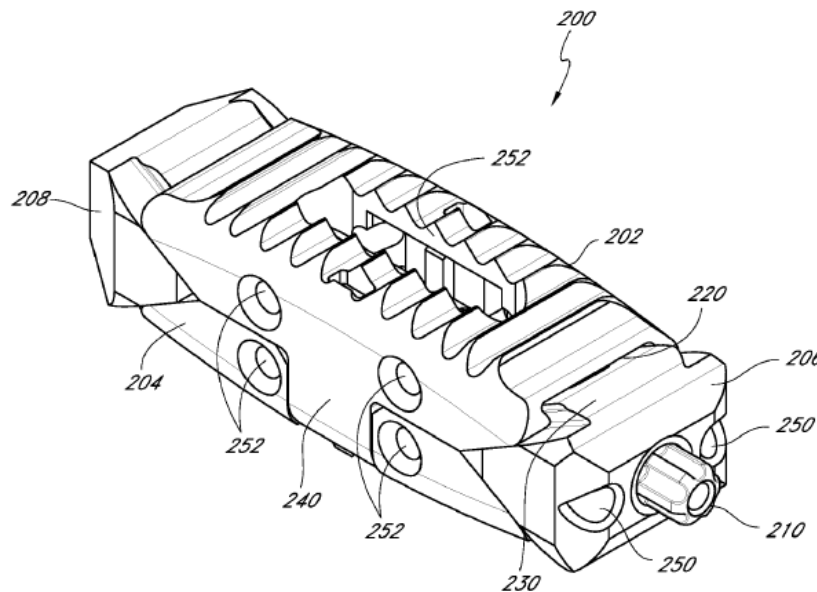


FIG. 16A

Figure 16A of Olmos, reproduced above, is a perspective view of intervertebral implant 200 in an unexpanded state. *Id.* ¶ 152. Implant 200 comprises upper body portion 202, lower body portion 204, proximal wedge member 206, distal wedge member 208, and actuator shaft 210. *Id.* ¶¶ 152, 156. Proximal wedge member 206 includes upper guide member 230 engaging a corresponding slot in upper body portion 202 to enhance stability. *Id.* ¶ 156; *see also id.* (describing that proximal wedge member 208 includes a similar feature).

Figure 18 of Olmos is reproduced below.

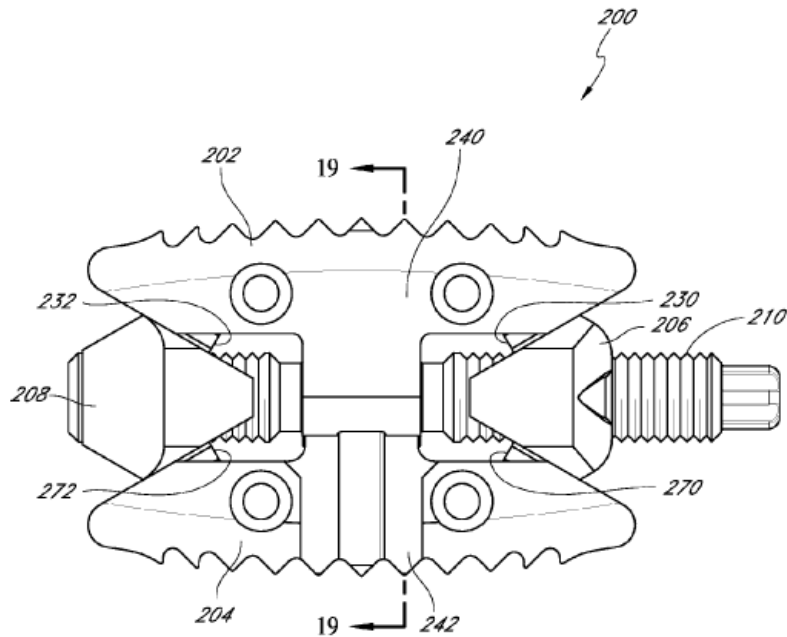


FIG. 18

Figure 18 of Olmos, reproduced above, is a side view of intervertebral implant 200 in an expanded state. *Id.* ¶ 168. Actuator shaft 210 includes threads to engage at least one of the proximal and distal wedge members 206 and 208. *Id.* ¶ 159. Rotating actuator shaft 210 causes proximal and distal wedge members 206 and 208 to move towards each other and separate upper and lower body portions 202 and 204. *Id.* ¶ 155. Proximal wedge member 206 includes upper guide member 230 and lower guide member 270 and distal wedge member 208 includes upper guide member 232 and lower guide member 272. *Id.* ¶¶ 156, 167. Olmos discloses that the guide members and corresponding slots in the upper and lower body portions may have a dovetail shape to ensure secure engagement between the wedge members and the body portions. *Id.*

3. Oglaza (Ex. 1007)

Oglaza, titled “Apparatus for Bone Restoration of the Spine and Methods of Use,” relates to expandable implants for vertebral and spinal correction. Ex. 1007, codes (54), (57). Figure 1A of Oglaza is reproduced below.

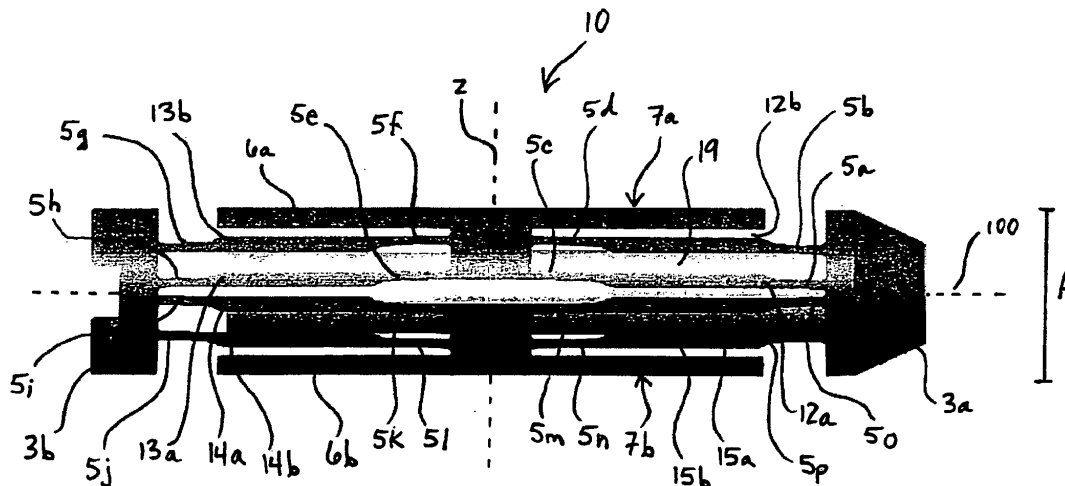


FIG. 1A

Figure 1A of Oglaza, reproduced above, is a perspective view of expandable implant 10 in an unexpanded state. *Id.* ¶ 27. The expandable implant 10 includes end members 3a and 3b that “may be used for positioning the expansible implant between two surfaces, such as two opposed restoration surfaces of bone, and facilitating the expansion of the implant along a plane of expansion between the two surfaces.” *Id.* ¶ 142. In particular, “[o]ne or more of the end members, e.g., 3b, is moveable and may be brought towards the other end member, e.g., 3a, to allow the opening-out/expansion of the implant,” i.e., the movement of opposing plates 6a and 6b axially away from central axis 100. *Id.* ¶¶ 142, 144. As also shown in Figure 1A, the expandable implant 10 includes retaining element 19, that “spans the implant and may be moveably associated with one or more end members 3a and 3b.”

Id. ¶ 149. When engaged, “end member 3b moves along retaining element 19 toward end member 3a,” “thereby causing the implant to expand.” *Id.*

Figure 2A of Oglaza is reproduced below.

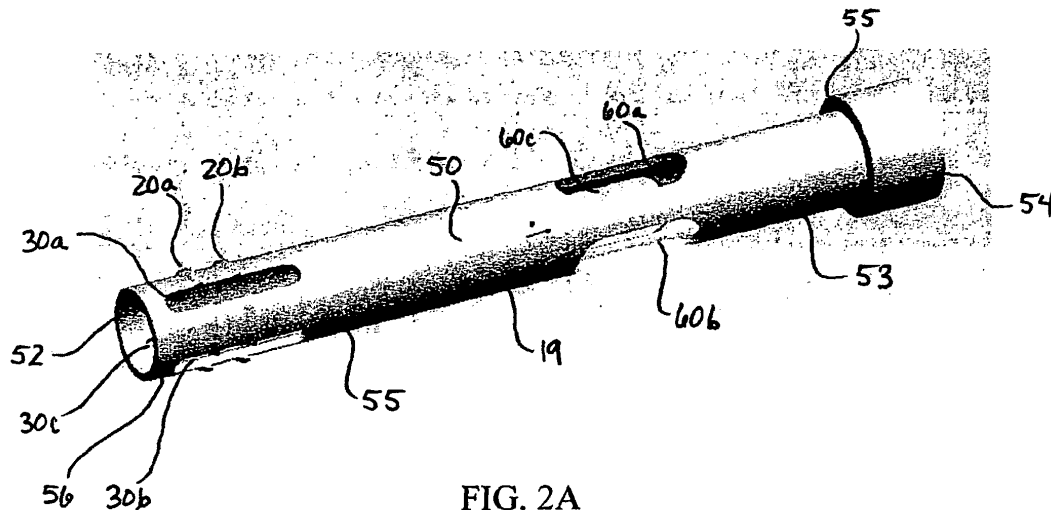
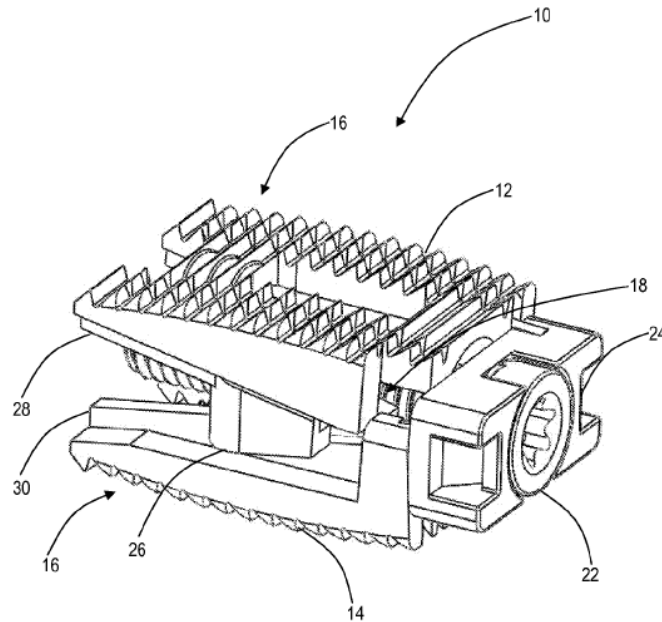


Figure 2A of Oglaza, reproduced above, is a perspective view of retaining element 19. *Id.* ¶ 29. Retaining element 19 includes a passage 52 that extends through the retaining element and “one or more apertures (60) configured for allowing the egress of a fluid that is passed through the passage (52) of the retaining element (19).” *Id.* ¶ 153. In its claims, Oglaza refers to this fluid (or flowable material) as bone cement or bone graft. See *id.* at 55 (claims 10–11), 56 (claims 17–18).

4. Varela '774 (Ex. 1008)

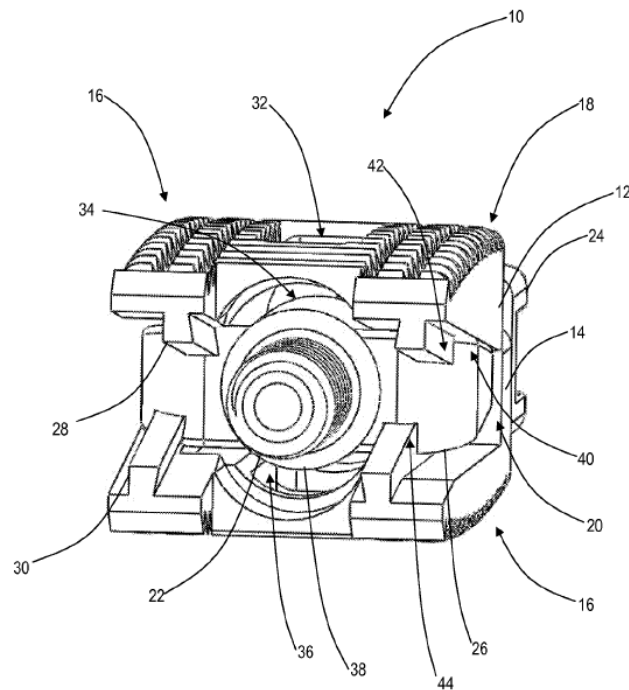
Varela '774, titled “Expandable Intervertebral Implant and Associated Surgical Method,” relates “to minimally-invasive, surgically-implantable spinal devices and systems.” Ex. 1008, code (54), ¶ 2. Varela '774 discloses an expandable intervertebral implant selectively deployed in the intervertebral space to provide in-situ distracting, realigning, stabilizing, or fusing a portion of the spine. *Id.* ¶ 5.

We reproduce below Varela '774's Figure 1.



Varela '774's Figure 1 depicts expandable intervertebral implant 10 including superior member 12, inferior member 14, and internally-threaded wedge structure 26. *Id.* ¶¶ 33, 35. Rotating screw 22 engages internally-threaded wedge structure 26 to selectively translate the wedge structure along the central axis of expandable intervertebral implant 10. *Id.* The translation causes internally-threaded wedge structure 26 to interact with associated wedge shapes of superior member 12 and inferior member 14 to force the members apart or together depending on the direction of the translation. *Id.*

We reproduce below Varela '774's Figure 3.



Varela '774's Figure 3 depicts each of superior member 12 and inferior member 14 including respective track structures 28, 30. *Id.* ¶ 36. In particular, track structures 28, 30 are dove-tailed on one or both sides to engage corresponding channels 42, 44 of wedge structure 26 to securely couple superior member 12 and inferior member 14. *Id.*

D. Claim Construction

In AIA proceedings we interpret a claim “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b). Under this standard, we construe the claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” *Id.*; *see also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–19 (Fed. Cir. 2005) (en banc).

Petitioner asserts that “no terms require constructions differing from their plain and ordinary meaning.” Pet. 19. Patent Owner states that it

“takes no position on Petitioner’s assertion because the Board need not construe any claim term to find that the Challenged Claims are not unpatentable.” Response 8.

We find that for purposes of this Decision, we need not construe any claim term. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

E. Obviousness Over Olmos with Varela ’774

We begin with Ground 3 because it is dispositive to all but claim 8. Petitioner asserts that claims 1–7 and 9–20 are unpatentable as obvious over the combined teachings of Olmos and Varela ’774 (“the Olmos-Varela combination”). Pet. 67–113 (Ground 3); Reply 1–34. In brief, Petitioner relies on Olmos for its teachings of an intervertebral implant meeting most limitations of the claims. Pet. 74–113. More specifically as to claim 1, Petitioner relies on Olmos for its disclosures as follows, with the claim limitations identified using the identifiers Petitioner provides:

Claim 1 “[Preamble] An expandable intervertebral implant, the expandable implant capable of moving from a collapsed position to an expanded position” (Ex. 1006 (Olmos) Abstract, ¶ 152, Figures 16A, B);

“[a] the expandable implant comprising: a first endplate extending from a proximal end to a distal end, wherein the first endplate has a first surface, a second surface, a first side surface and a second side surface” (*Id.* ¶¶ 152, 163–164, 172–173, Figures 18, 21A, 21B);

“[b] a second endplate extending from a proximal end to a distal end, wherein the second endplate has a first surface, a second surface, a first side surface and a second side surface (*Id.* ¶¶ 152, 163–164, 172–173, Figures 18, 20A, 20B);

“[c] a central ramp positioned between the first endplate and the second endplate, the central ramp positioned proximate the distal end of the first endplate and the distal end of the second endplate” (*Id.* ¶¶ 21, 152, Figure 18);

“[d] a driving ramp positioned proximate the proximal end of the first endplate and the proximal end of the second endplate, wherein the driving ramp is operably connected with the central ramp” (*Id.* ¶¶ 21, 152, 155–156, Figure 18);

“[e] an actuator assembly configured to move at least one of the central ramp and the driving ramp” (*Id.* ¶¶ 152, 155, 159, 174, Figures 16A, 16B, 18);

“[f] wherein the expandable implant defines a horizontal plane that extends through the central ramp, driving ramp and the actuator assembly” (*Id.* at Figures 16A, 18; Ex. 1004 (’649 patent prosecution history) 544);

“[g] wherein the first side surface of the first endplate includes at least one ramped portion” (*Id.* ¶¶ 23, 24, 173, Figure 16A, Figure 21A);

“[h] wherein the first side surface of the second endplate includes at least one ramped portion” (*Id.* ¶¶ 23, 24, 173)

Pet. 74–86. Petitioner also relies on Mr. Drewry’s declaration supporting its claim limitation mapping of claim 1. Ex. 1002 (Drewry Decl.) ¶¶ 286–301. For claim limitation 1[i], Petitioner relies on disclosure from Varela ’774 disclosing an expandable implant with a “small undeployed cross-

section...to the use of superior and inferior members that nest....” Pet. 86 (citing Ex. 1008 (Varela ’774) ¶ 2). Petitioner cites Varela ’774’s

superior and inferior members (first and second endplates) [that] have ramped “track structures 28 and 30” that are “are offset from one another relative to the central axis...such that they sit side-by-side when the [implant] is un-deployed [*sic*, un-deployed], thereby making the assembly as compact as possible.

Pet. 86 (citing Ex. 1008 (Varela ’774) ¶ 39). Petitioner argues that a POSITA would have found it “desirable to have an expandable implant with a low profile when in an unexpanded position that can be expanded to a much greater height after insertion.” *Id.* at 72. Petitioner argues that the POSITA would have been motivated to “reconfigure the upper and lower-body portions in Olmos such that their ramped surfaces would overlap when the implant was in a collapsed position,” as taught in Varela ’774 thus giving the implant a lower profile that “would be more easily inserted as part of a minimally invasive surgical procedure.” *Id.* Petitioner argues that the remaining two claim limitations, the Horizontal-Plane and Overlap Limitations of claims 1 and 10, respectively, are taught in the proposed Olmos-Varela combination. *Id.* at 86–88, 105–107.

Petitioner provides a limitation-by-limitation analysis as to how the Olmos-Varela combination teaches or suggests an intervertebral implant meeting each and every limitation of claim 1. *See generally* Pet. 74–88.

Patent Owner disputes four aspects of Petitioner’s showing, i.e., whether Petitioner has demonstrated that (1) a person of ordinary skill in the art would have been motivated to make the Olmos-Varela combination; (2) when in the collapsed position the Olmos-Varela combination has “at least one ramped portion of the first side of the first endplate [that] extends

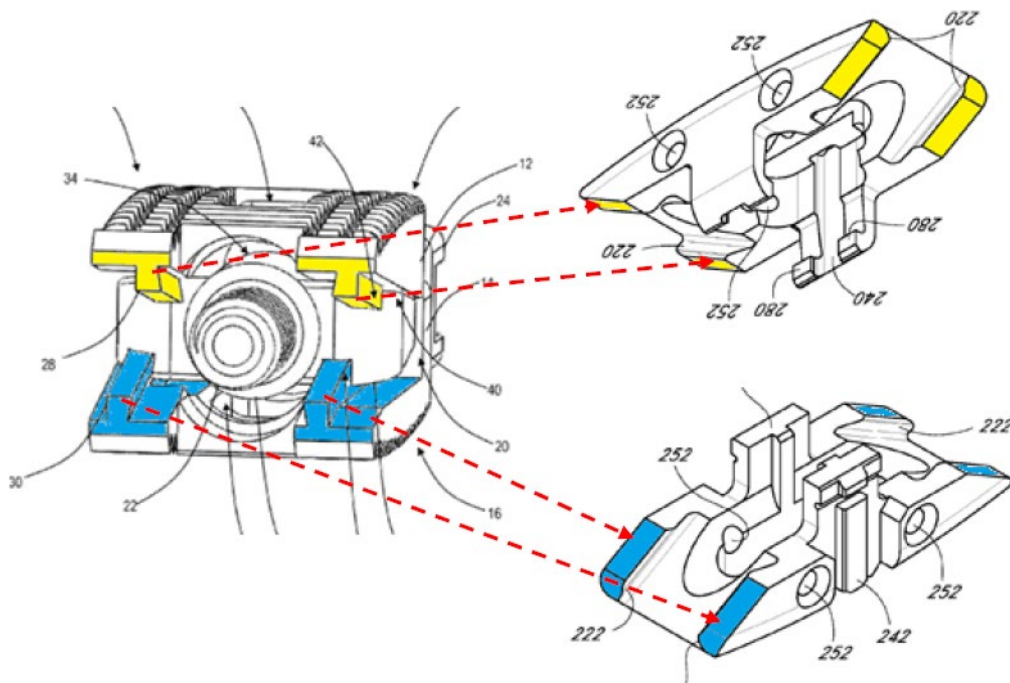
through the horizontal plane such that the at least one ramped portion of the first endplate is positioned on both sides of the horizontal plane” (claim limitation 1[i], the Horizontal-Plane limitation); (3) when in the collapsed position the Olmos-Varela combination has “at least a portion of the inwardly facing surface of the ramped portion of the first endplate [that] overlaps at least a portion of the outwardly facing surface of the first side surface of the second endplate” (limitation 10[h], the Overlap limitation); and (4) whether a POSITA would have understood Olmos’s Figures 16–24 to disclose “wherein the central ramp comprises an extension, the extension including a threaded opening” of claim 4 (hereafter, the “Threaded Extension” limitation). Response 31–35; Sur-reply 1–32.

After considering the arguments and evidence, we find that Petitioner demonstrates by a preponderance of the evidence that Olmos with Varela ’774 renders claims 1–7 and 9–20 unpatentable as obvious.

We adopt as our own Petitioner’s analysis of how the Olmos-Varela combination teaches or suggests each of the limitations of claims 1–7 and 9–20. *See generally* Pet. 74–113; Ex. 1002 (Drewry Decl.) ¶¶ 286–427. We begin our analysis below by briefly summarizing the aspects of Petitioner’s arguments in the Petition relevant to the parties’ disputes, then turn to a detailed analysis of the parties’ disputes regarding whether Petitioner has carried its burden to demonstrate (1) an adequate motivation to make the Olmos-Varela combination; (2) that the Olmos-Varela combination teaches or suggests the Horizontal-Plane, Overlap, and Threaded Extension limitations of claims 1–7 and 9–20.

1. Motivation to Combine Olmos and Varela '774

Petitioner argues that an ordinarily skilled artisan “would have found it predictable and obvious to modify Olmos’ upper-body portion 202 and lower-body portions [*sic*] 204 to include Varela ’774’s track structures 28 and 30.” Pet. 70 (citing Ex. 1002 (Drewry Decl.) ¶¶ 301–309). Petitioner also argues that a POSITA would have found it predictable and obvious “to modify Olmos’ proximal and distal wedges to include Varela ’774’s corresponding channels 42 and 44.” *Id.* Petitioner relies on an annotated version of Olmos’s Figures 20A and 21A and Varela ’774’s Figure 3, reproduced below:



Id. at 71 (citing Ex. 1006 (Olmos) Figures 20A, 21A; Ex. 1008 (Varela ’774) Figure 3). In Petitioner’s annotated version of the prior-art figures, reproduced above, Varela ’774’s device is on the left, and Olmos’s (disassembled) device is on the right. *Id.* Petitioner highlights Varela ’774’s track structure 28 in yellow and track structure 30 in blue. *Id.* Petitioner

highlights the ramps of Olmos’s upper body and lower body portions in yellow and blue, respectively. *Id.*

Petitioner argues that a POSITA would have been motivated to combine Olmos and Varela ’774 because adding Varela ’774’s tracks to Olmos’s upper- and lower-body portions would have resulted in Olmos’s intervertebral implant having: (i) “a lower profile⁸ which would be more easily inserted” in the collapsed position; (ii) “a greater height” in the expanded configuration; and (iii) “a more secure engagement between the upper and lower-body portions (end plates) and the wedge portions (central and driving ramps).” *Id.* at 72–73 (citing Ex. 1006 (Olmos) ¶ 13; Ex. 1008 (Varela ’774) ¶¶ 6, 36; Ex. 1002 (Drewry Decl.) ¶¶ 304–307).

Upon examination of the full trial record, we find that Petitioner’s arguments that a POSITA would have been motivated to make the Olmos-Varela combination out of a desire for more secure engagement or for greater height in the expanded configuration are not persuasive because, among other reasons, the record does not support a need for either proposed motivation. *See* Ex. 1006 ¶¶ 158, 171.

⁸ Petitioner sometimes refers to the profile of the implant as its “form factor” based on Varela ’774’s use of that term. *See* Pet. 22 (describing “form factor” as “both the vertical cross-section and the horizontal footprint” of the expandable intervertebral implant), and Varela ’774 ¶ 6 (“When undeployed, the superior member and the inferior member are configured such that they nest against one another, thereby providing the undeployed expandable intervertebral implant with the smallest possible form factor for insertion through the skin and musculature of the patient and into the intervertebral space.”). We use “form factor” to distinguish the overall size and shape of the implant from “collapsed height,” which measures a single dimension.

However, as explained below, we find that Petitioner’s smaller form factor rationale is itself sufficient to establish a motivation to combine the teachings of Olmos and Varela ’774 by a preponderance of the evidence. Thus, we need not further address these proposed motivations. We review Petitioner’s allegations that a POSITA would have been motivated to make the Olmos-Varela combination because it would have resulted in Olmos’s intervertebral implant having “a lower profile,” Patent Owner’s arguments in response, and the evidence of record below.

Petitioner alleges that a POSITA would have been motivated to combine Olmos and Varela ’774 because the resulting track configuration in the combined device would provide an “expandable implant with a low profile when in an unexpanded position that can be expanded to a much greater height after insertion.” Pet. 72. In support of its argument that this benefit would have motivated a POSITA to make the combination, Petitioner points to Olmos’s disclosure that insertion of an implant “through a minimally invasive procedure” is preferable and Varela ’774’s disclosure that its superior and inferior members can be configured “such that they nest against one another, thereby providing the un-deployed expandable intervertebral implant with the smallest possible form factor for insertion through the skin and musculature of the patient and into the intervertebral space.” *Id.* (citing Ex. 1006 (Olmos) ¶ 13; Ex. 1008 (Varela ’774) ¶ 6; Ex. 1002 (Drewry Decl.) ¶¶ 306–307).

Patent Owner argues that Petitioner’s contention that combining Olmos and Varela ’774 would result in “a lower profile” is “illusory.” Response 16. Patent Owner argues that, when in a collapsed position, the bottom surface of Olmos’s upper-body portion (i.e., endplate 202) abuts the

top surface of Olmos's lower-body portion (i.e., endplate 204). *Id.* at 16 (citing Ex. 2024 (Culbert Second Decl.) ¶¶ 138–140). Patent Owner supports its argument with the annotated version of Olmos's Figure 16A, reproduced below:

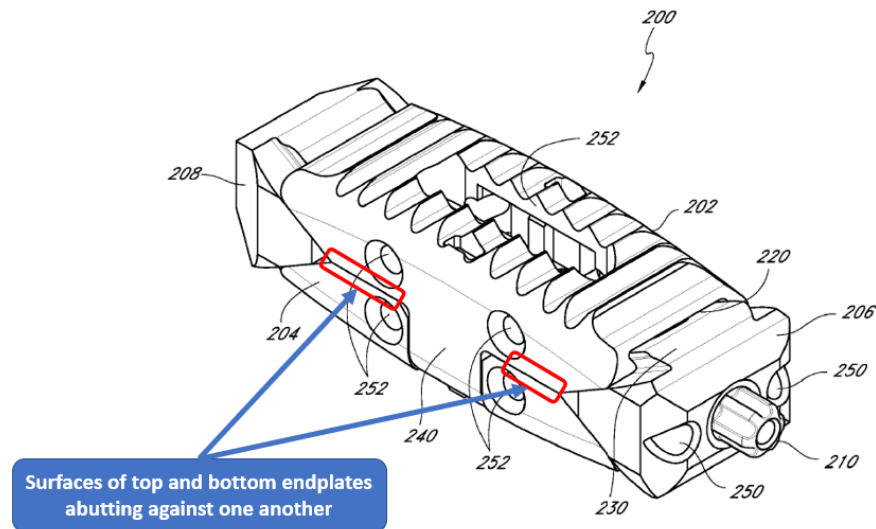


FIG. 16A

Response 16. (citing Ex. 1006 (Olmos) Figure 16A). Figure 16A is a perspective view of an intervertebral implant. Ex. 1006 (Olmos) ¶ 51. In its annotated version, Patent Owner highlights certain abutting portions of Olmos's upper- and lower-body portions with red boxes. *Id.* at 16. Patent Owner argues that these abutting portions would prevent any reduction in Olmos's profile or collapsed height and that simply replacing Olmos's ramped portions with Varela '774's tracks would not be possible without a complete redesign due to the position and size of the actuator, which would require "a completely new actuator-endplate configuration." *Id.* at 16–20 (citing Ex. 2024 (Culbert Second Decl.) ¶¶ 138–147).

Patent Owner also identifies modifications that would be necessary to Olmos's endplates that it claims would be impractical in an implant with a 5 mm collapsed height. *Id.* at 18 (citing Ex. 1006 (Olmos) ¶ 162; Ex. 2024

(Culbert Second Decl.) ¶¶ 138–166). Patent Owner argues that Petitioner lacks evidence supporting a need for an unexpanded height of less than 5 mm and asserts that Olmos’s unexpanded height of 5 mm is already 1.5 mm less than the smallest commercial devices. *Id.* at 20–21 (citing Ex. 1005 (Varela ’357) ¶ 130; Ex. 1002 (Drewry Decl.) ¶ 310; Ex. 2025 (Prolift Expandable Spacer System); Exs. 2026–2031 (various commercial implant brochures); Ex. 2024 (Culbert Second Decl.) ¶¶ 64–66, 149–150). Patent Owner argues that Petitioner’s rationale for a lower-profile arrangement is therefore premised on improper hindsight. *See id.* at 21–22.

Patent Owner also argues that achieving a lower profile would require removal of material from the endplates’ side surfaces to allow the endplates to sit closer together, which requires the undesirable resizing of Olmos’s osseointegration apertures (205). *Id.* at 22 (citing (Ex. 2024 (Culbert Second Decl.) ¶¶ 138–147, 151–153). Patent Owner asserts that this configuration would reduce the available amount of expansion due to the length of Olmos’s complementary structures 240 and 242, would lower the expansion height, and therefore a POSITA would not undertake the great number of changes necessary in light of the lack of benefits obtained from doing so. *Id.*

In reply, Petitioner argues that the ’649 patent “does not contain any claim limitation regarding the size of the implant” and that Patent Owner has no evidence that Olmos’s 5 mm implant meets all potential needs for where using a smallest implant would most benefit a patient. Reply 19. Petitioner asserts that a POSITA would have “found it desirable to have implants smaller than 5 mm” and that an obviousness analysis is not limited to commercial applications. *Id.* (citing Ex. 1030 (Drewry Reply Decl.) ¶¶ 31–32, 63).

Regarding Patent Owner’s arguments about the changes that would be needed to make the Olmos-Varela combination, Petitioner cites *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016), for the proposition that a drawback does not necessarily obviate a reason to combine teachings where the combination may have both advantages and disadvantages. Reply 19.

In sur-reply, Patent Owner argues that Petitioner has not established a motivation to create a lower-profile implant, and Petitioner’s explanation and reliance on an informational printout from “Spine Wave, Inc.” (Ex. 1028) is unclear and unreliable as to devices under 5 mm. Sur-reply 1–3 (referring to Ex. 1030 (Drewry Reply Decl.) ¶ 63). Patent Owner argues that Mr. Drewry’s testimony on the minimum collapsed height of Olmos’s intervertebral implants changed from 5 mm in his first declaration to 7 mm in cross-examination; Patent Owner argues that this change represents a new, improper argument. *Id.* at 3–4 (citing Ex. 1002 (Drewry Decl.) ¶ 310; Ex. 2038 (Drewry Deposition) 23:11–24:19; Reply, 14; *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019)). Patent Owner argues that Olmos “already achieves the smallest desired device height,” which undercuts Petitioner’s alleged motivation, and additionally, that “all commercially relevant devices have a collapsed height of no more than 6.5 mm.” *Id.* at 3, 5 (citing Response 20–23 and evidence cited therein).

Patent Owner argues that “a POSITA would have understood that Petitioners’ proposed redesign of Olmos’s implant compromises the implant’s alignment, interconnection, and stability” and that “the undisputed evidence shows that there is no appreciable benefit to lowering Olmos’s implant profile in the collapsed configuration.” *Id.* at 8. Patent Owner cites

Medtronic, Inc. v. Teleflex Innov. SARL, 70 F.4th 1331, 1347 (Fed. Cir. 2023) in support of its argument that reliance on extensive modifications in a reply brief “[is] more suggestive of hindsight than obviousness.” *Id.* at 8–9.

Upon examination of the full trial record, we find that the evidence supports Petitioner’s argument for motivation to make the Olmos-Varela combination to obtain the smallest possible form factor for an implant at insertion. Varela ’774 and Olmos teach the desirability of expandable spinal implants for use in minimally invasive surgery. *See, e.g.*, Ex. 1008 (Varela ’774) ¶¶ 3–4 (stating that “the use of an alternative intervertebral implant, especially one compatible with minimally-invasive surgical techniques, is desirable” due to the “morbidities associated with . . . more-invasive procedures”); Ex. 1006 (Olmos) ¶ 13 (stating that “there remains a need in the art for an improved intervertebral implant” that “is implantable through a minimally invasive procedure” and “easy to implant and deploy in such a narrow space”). Varela ’774 teaches that its nesting tracks provide for an “expandable intervertebral implant with the smallest possible form factor for insertion . . . into the intervertebral space.” Ex. 1008 (Varela ’774) ¶ 6. These teachings support Petitioner’s argument that a POSITA would have had a reason to modify Olmos’s structure to achieve a smallest possible form factor for minimally-invasive procedures. Moreover, Varela ’774 teaches a structure, i.e., overlapping tracks, for achieving a smaller form factor. *See id.* ¶ 34 (“[w]hen un-deployed, the superior member 12 and the inferior member 14 are configured such that they nest against one another, thereby providing the un-deployed expandable intervertebral implant 10 with the smallest possible form factor”). In addition, Petitioner persuasively

articulates that combining the teachings of Olmos and Varela '774 would have been obvious because the references are analogous art directed to the same field of endeavor as the '649 patent, and both references recognize the value of having expandable implants with a small form factor. *See, e.g.*, Pet. 72; Ex. 1006 (Olmos) ¶ 13; Ex. 1008 (Varela '774) ¶ 6; Ex. 1002 (Drewry Decl.) ¶¶ 158, 304–306 (POSITA would have been motivated to combine the teachings of Olmos and Varela '774 to achieve a smaller form factor).

We find that Petitioner has adequately demonstrated a sufficient motivation to combine with a reasonable expectation of success because Petitioner's proposed combination is no more than "the predictable use of prior art elements according to their established functions." *See KSR*, 550 U.S. at 417. We are not persuaded by Patent Owner's argument that the need to modify Olmos's implant to accommodate Varela 774's track structures would have dissuaded the POSITA, even if the modification would have resulted in removal of any motion-limiting structures as well as other structural changes. "The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." *Medichem S.A. v. Rolabo S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (quoting *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000)). We agree with Petitioner that other known alternatives to a motion-limiting structure could be used if needed. *See* Reply 10; Ex. 1030 (Drewry Reply Decl.) ¶¶ 37, 49, 50. The evidence of record supports that the prior art would have motivated a POSITA to make the Olmos-Varela combination for the purpose of seeking the smallest possible form factor to

reduce trauma at insertion. *See, e.g.*, Ex. 1008 (Varela '774) ¶¶ 3–4; Ex. 1006 (Olmos) ¶ 13.

We are also unpersuaded by Patent Owner's argument that the modifications necessary to Olmos's endplates to incorporate Varela '774's track structures are impractical at a 5 mm implant size or require such extensive changes as to outweigh the potential benefits obtained. *See* Response 18, 22 (citing Ex. 1006 (Olmos) ¶ 162; Ex. 2024 (Culbert Second Decl.) ¶¶ 138–166). The cited paragraph of Olmos (¶ 162) discusses inclusion of apertures to “facilitate osseointegration of the implant **200** within the intervertebral space.” Mr. Culbert explains that the impracticality Patent Owner references is that “Olmos' flat abutting surfaces are directly above these apertures [252], so material cannot be removed from the sides without removing or resizing these critical apertures.” Ex. 2024 (Culbert Second Decl.) ¶ 141. Mr. Culbert testifies that it would be “even more difficult and/or impractical to undergo these modifications to Olmos' implant to achieve a collapsed height of less than 5 [mm].” *Id.* ¶ 142. The balance of Mr. Culbert's cited testimony discusses additional changes that would be allegedly necessary and states that a POSITA would have understood that such changes would require a complete redesign and could “affect the implant's mechanical properties, including, strength, fatigue, and wear.” *Id.* ¶¶ 144–164.

We are not persuaded that these modifications are so substantial as to negate the motivation Petitioner has established is stated in the prior art. *See* Ex. 1008 (Varela '774) ¶¶ 3–4; Ex. 1006 (Olmos) ¶ 13. In his deposition, as Patent Owner noted, Mr. Drewry testified that intervertebral implant designers used computer technology to visualize features and geometries of

an implant, and “can simulate different changes and different components, and again get the ultimate features that they ultimately want out of the performance of the implant.” Sur-reply 7 (citing Ex. 2038 (Drewry Deposition Transcript) 87:13–88:9⁹). These efforts, performed by experienced designers and aided by computer technology as Mr. Drewry testifies, do not rise to the level of impracticality or difficulty that would impair a POSITA’s motivation to make the Olmos-Varela combination. *See Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023) (“If a technique has been used to improve one device, and a [POSITA] would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”) (citation omitted).

We credit Mr. Drewry’s testimony that it would have been well within the ordinary skill of a POSITA to make the proposed modifications. *See* Ex. 1002 (Drewry Decl.) ¶¶ 34, 56–71 (discussing the qualifications of a POSITA and the types of engineering concepts the POSITA would have understood); Ex. 1030 (Drewry Reply Decl.) ¶¶ 37, 48–56, 59–66. To the extent Mr. Culbert testifies otherwise, we do not find such testimony persuasive. Indeed, Olmos itself further supports Mr. Drewry’s testimony that a POSITA would have known how to modify dimensions to fit specific needs and make changes necessary to adapt features from one embodiment to fit another. *See* Ex. 1006 (Olmos) ¶¶ 153, 188 (providing a range of implant sizes and noting that “specific dimensions” of any disclosed

⁹ Patent Owner’s citation to Mr. Drewry’s deposition transcript at 87:13–88:9 appears to be incorrect. We understand that the intended citation is 69:34–70:7.

embodiment can be varied as is apparent to a POSITA and “all features discussed in connection with any one embodiment herein can be readily adapted for use in other embodiments herein to form various combinations and sub-combinations”). Given the POSITA’s ability to make the proposed modifications, we do not find that Patent Owner’s evidence regarding the number of modifications required undermines Petitioner’s articulated reasoning for the combination.

We find unavailing Patent Owner’s arguments that Petitioner and Mr. Drewry’s description in the Reply of particular modifications a POSITA would have made to implement the Olmos-Varela modification is untimely or a different theory than the “simple substitution” alleged in the Petition (*see, e.g.*, Sur-reply 5–7). While it is true that the Petition describes incorporation of Varela ’774’s track structures as a “simple substitution,” the reasoning articulated there focused on creating a smaller form factor by embedding Varela ’774’s track structures inside Olmos’s implant, as guided by known solutions in the prior art. Pet. 71–74. That reasoning was supported by Mr. Drewry’s original testimony regarding the effect of this substitution (*e.g.*, smaller form factor) and the fact that a POSITA would have been motivated to modify Olmos according to the teachings of Varela ’774. Ex. 1002 (Drewry Decl.) ¶¶ 304–306.

The arguments in Petitioner’s Reply and the testimony in Mr. Drewry’s Reply Declaration (*e.g.*, Ex. 1030 ¶¶ 59–61) properly respond to particular issues raised in Patent Owner’s Response regarding the practicality and the effectiveness of the proposed substitution. They do not constitute a new obviousness theory. *See Anacor Pharms., Inc. v. Iancu*, 889 F.3d 1372, 1380–82 (Fed. Cir. 2018) (stating petitioner “may introduce

new evidence after the petition stage if the evidence is a legitimate reply to evidence introduced by the patent owner”); *see also Corephotonics Ltd. v. Apple, Inc.*, 84 F.4th 990, 1008 (Fed. Cir. 2023) (addressing scope of the “responsiveness” restriction under 37 C.F.R. § 42.23(b)).

We also find unavailing Patent Owner’s reliance on *Henny Penny* and *Medtronic* to argue that Petitioner proffered an impermissible new obviousness theory when it addressed the additional changes that would be needed to incorporate Varela ’774’s track structures into Olmos’s implant. *See* Sur-reply 5–9. In *Henny Penny*, the petitioner’s obviousness theory in the petition was “modifying Kauffman’s overall system ‘to include the processor and/or *sensor as taught by Iwaguchi*’ for measuring TPMs.” *Henny Penny*, 938 F.3d at 1331 (emphasis added). In its reply brief, the petitioner’s theory was that “[o]ne could . . . use the electrical signal from the *sensor of Kauffman* as a basis for the processor to calculate TPMs.” *Id.* (emphasis added). The Federal Circuit found that “the petition says nothing about using Kauffman’s measured electrical parameters to calculate TPM levels.” *Id.* Accordingly, the Federal Circuit held that the Board correctly limited the petitioner to its originally-stated theory of obviousness. *Id.*

Here, unlike *Henny Penny*, Petitioner has not altered its theory regarding the elements a POSITA would have incorporated from cited references; Petitioner continues to assert, as it did in the Petition, that modifying Olmos’s upper-body portion 202 and lower-body portion 204 to include Varela ’774’s track structures 28 and 30 would render claims 1–7 and 9–20 obvious. *See, e.g.*, Pet. 67; Reply 1 (“A POSITA would have several reasons to modify Olmos’s implant to utilize the nested rail structure taught by Varela-’774.”).

Patent Owner’s argument based on *Medtronic* is similarly unavailing. In *Medtronic*, the Federal Circuit explained that the Board “did not err in discounting modifications not presented in [the] petition as indicative of hindsight” because “[i]t was within the Board’s discretion not to consider these untimely raised modifications” based on the facts of that proceeding. *Medtronic*, 70 F.4th at 1347. To that end, the Federal Circuit noted the Board’s finding that at least one of the proposed changes may not have been possible in the relevant time period and the supporting testimony explaining that the proposed changes would have had deleterious effects. *Id.* at 1346–47. In contrast, as explained above here, Petitioner and Mr. Drewry have persuasively responded to the issues Patent Owner raises regarding the alleged impracticality of the proposed combination. Thus, on the facts of this case, the additional argument and evidence Petitioner offers in Reply is not indicative of hindsight, but rather reinforces the same reasoning for the combination articulated in the Petition.

We further find unavailing Patent Owner’s argument that a POSITA would not have been motivated to make the proposed combination because Olmos already achieves a collapsed height smaller than that of the smallest commercially-available implants.¹⁰ See Sur-reply 5. Patent Owner’s evidence shows that commercially-available implants come in a variety of

¹⁰ We are not persuaded by Patent Owner’s argument that Mr. Drewry’s testimony on the minimum collapsed height of Olmos’s intervertebral implants changed from 5 mm to 7 mm. See Sur-reply 3. As Mr. Drewry explains in his deposition, his reference to 5 mm relates to Olmos’s lowest disclosed range, while his reference to 7 mm relates only to the embodiment disclosed in Figures 16–26. See Ex. 2038 (Drewry Deposition Transcript) 18:24–23:10, 23:11–24:19.

sizes with different collapsed and expanded heights. *See, e.g.*, Response 20–21 (citing Ex. 2025–2031 (brochures for commercial intervertebral spacer systems); Ex. 2024 (Culbert Second Decl.) ¶¶ 64–66, 149–150). Petitioner alleges that adding Varela 774’s tracks to Olmos’s implant would permit the embodiment of Olmos’s Figures 16–26 to have a smaller form factor than it would otherwise have for an implant of the same size, which the prior art suggests would meet the established need for intervertebral inserts implantable with minimally-invasive surgical techniques. Pet. 72 (citing Ex. 1006 (Olmos) ¶ 13; Ex. 1008 (Varela ’774) ¶ 6; Ex. 1002 (Drewry Decl.) ¶¶ 306–307). Patent Owner’s observation about existing commercial options does not overcome the established need for intervertebral inserts implantable using minimally-invasive surgical techniques.

We disagree with Patent Owner that Petitioner’s rationale for a lower profile arrangement is hindsight (Response at 21–22). Indeed, Patent Owner has not identified, and we do not discern, any portion of Mr. Drewry’s testimony that is gleaned solely from Patent Owner’s own disclosure as opposed to the teachings in Olmos and Varela ’774. *See In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) (“Any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning, but so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant’s disclosure, such a reconstruction is proper.”).

Having determined that Petitioner has established a motivation to combine the teachings of Olmos and Varela ’774 by a preponderance of the evidence, we turn to the remaining disputes between the parties, i.e., whether

the proposed combination teaches or suggests the Horizontal-Plane and Overlap limitations.

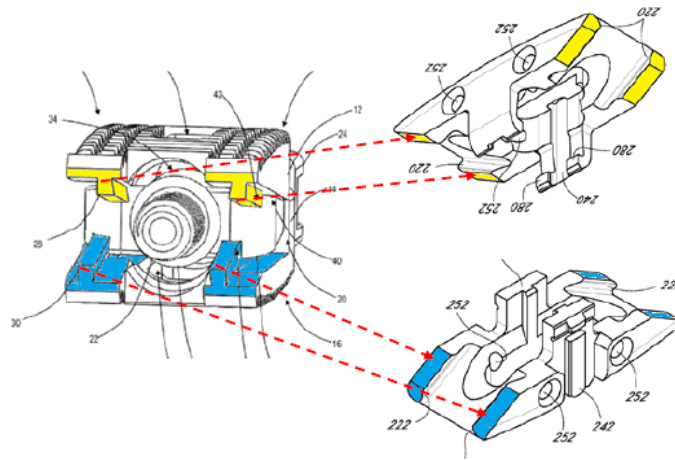
2. Whether the Olmos-Varela Combination Teaches the “Horizontal Plane” and “Overlap” Limitations in Claims 1–7 and 9–20

Below we analyze the parties’ arguments regarding whether the Olmos-Varela combination teaches or suggests limitations 1[i], the Horizontal Plane limitation and 10[h], the Overlap limitation. *See* Ex. 1001, 33:17–21, 34:30–34. We begin by summarizing Petitioner’s arguments, then turn to analyzing those arguments and Patent Owner’s responses thereto.

a. Horizontal Plane Limitation 1[i]

i. Brief Summary of Petitioner’s Arguments

Petitioner argues that the Olmos-Varela combination teaches the Horizontal Plane limitation. Pet. 86–88; Ex. 1002 (Drewry Decl.) ¶¶ 304–312. Petitioner asserts that Varela ’774 discloses an expandable implant that “has a very small undeployed [vertical] cross-section... [due] to the use of superior and inferior members that nest...” Pet. 86 (citing Ex. 1008 (Varela ’774) ¶ 2). Petitioner asserts that Varela ’774 discloses superior and inferior members. *Id.* We reproduce Petitioner’s annotation of Figures 5 of Varela ’774 (left) and Figures 20A and 21A of Olmos (right) below.



Id. at 87. Petitioner’s annotation of Figures 5 of Varela ’774 (left) and Figures 20A and 21A of Olmos (right) above shows a planar end view of an expandable intervertebral implant (Varela ’774) and a top and bottom perspective version of the upper and lower body portions of a disassembled expandable intervertebral implant (Olmos). Ex. 1008 (Varela ’774) ¶ 15; Ex. 1006 (Olmos) ¶¶ 56, 58. Petitioner explains that the annotations show the “first endplate in yellow and the second endplate in blue.” Pet. 87.

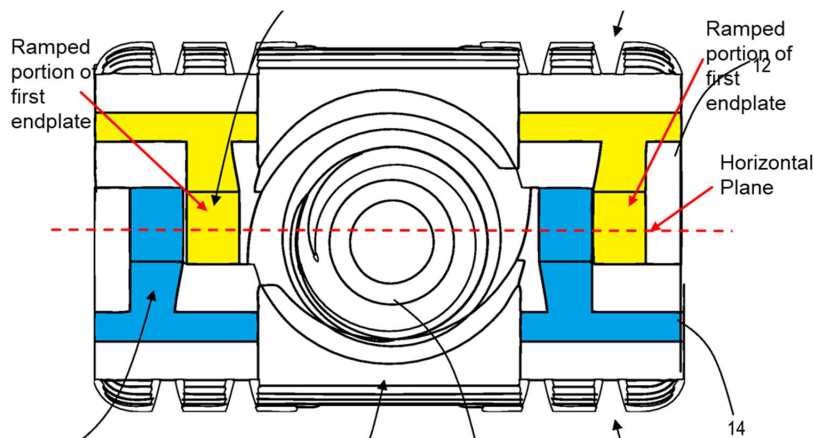
Petitioner cites Varela ’774’s disclosure that:

track structures 28 and 30 of the superior member 12 and the inferior member 14, respectively, are offset from one another relative to the central axis of the expandable intervertebral implant 10 such that they sit side-by-side when the [implant] is un-deployed [*sic*, un-deployed], thereby making the assembly as compact as possible.

Ex. 1008 (Varela ’774) ¶ 39. Petitioner argues that the Olmos-Varela combination would similarly have ramped track structures that are offset from one another, “thus allowing the endplates to ‘nest against one another.’” Pet. 86 (citing Ex. 1002 (Drewry Decl.) ¶¶ 305–306). According to Petitioner, in this nested structure, the Olmos-Varela combination would have track members that “necessarily extend through a horizontal plane

extending through the central ramp, driving ramp, and actuator assembly.
Id. at 86–87 (citing Ex. 1002 (Drewry Decl.) ¶ 306).

Petitioner relies on an annotated version of Varela '774's Figure 5, reproduced below.



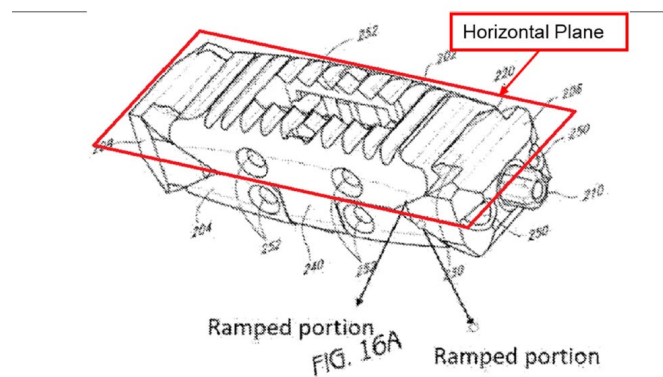
Id. at 88. Figure 5 of Varela '774 shows a planar view of an unexpanded closed (‘nested’) intervertebral insert. Ex. 1001 ¶ 15. In Petitioner’s annotated version of Figure 5, Petitioner highlights the ramped portion of Varela '774’s superior member (i.e., first endplate) in yellow, and the ramped portion of Varela '774’s inferior member (i.e., second endplate) in blue. *Id.* at 87–88 (citing Ex. 1002 ¶ 36). Petitioner also adds a red-dashed line to illustrate a horizontal plane through the center of the figure. *Id.* Petitioner argues that, once combined, ‘the Olmos-Varela’774 device’ in the collapsed position would have nesting track structures that ‘necessarily extend through a horizontal plane extending through the central ramp, driving ramp, and actuator assembly.’ *Id.* at 86–87 (citing Ex. 1002 ¶¶ 305–306). For this reason, Petitioner asserts the Olmos-Varela combination teaches the Horizontal-Plane limitation. Pet. 86–88, 105–107; Ex. 1002 (Drewry Decl.) ¶¶ 304–312.

Patent Owner opposes these arguments. *See* Response 25–27; Sur-reply 25–27.

ii. Analysis

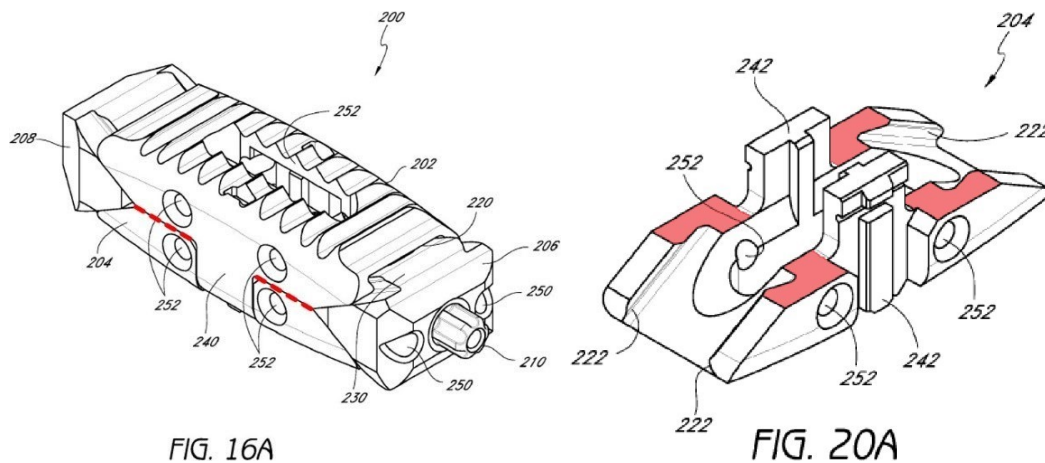
After considering the arguments and evidence, we find that Petitioner has demonstrated by a preponderance of the evidence that the Olmos-Varela combination teaches the Horizontal-Plane limitation. We discuss our reasoning in more detail below, in addressing Patent Owner’s arguments.

Patent Owner disputes that Petitioner’s “proposed combination [of] simply replacing Olmos’ ramped portions with Varela-774’s tracks” teaches or suggests the Horizontal-Plane limitation because, on implementation, the “flat side portions of Olmos’ endplates and the configuration of Olmos’ endplates encapsulating the actuator prevent Olmos’ implant from collapsing any further.” Response 26. Patent Owner provides an annotated version of Olmos’s Figure 16A to explain its reasoning, which we reproduce below.



Id. at 27. Olmos’s Figure 16A is a perspective view of an unexpanded intervertebral implant. Ex. 1006 (Olmos) ¶ 51. Patent Owner argues that when Olmos’s ramped portions are replaced by Varela ’774 tracks, “the flat side portions of Olmos’ endplates still prevent the ramped portions from extending through the implant’s horizontal plane, when the implant is in the collapsed position.” *Id.* at 26–27 (citing Ex. 2024 (Culbert Second Decl.)

¶¶ 167–171) (emphasis omitted). Mr. Culbert opines that the non-ramped/flat portions of Olmos’s endplates preclude the ramped portions from extending through the implant’s horizontal plane. Ex. 2024 (Culbert Second Decl.) ¶¶ 169–171. To illustrate this point, Mr. Culbert provides annotated versions of Olmos’s Figures 16A and 20A, which we reproduce below.

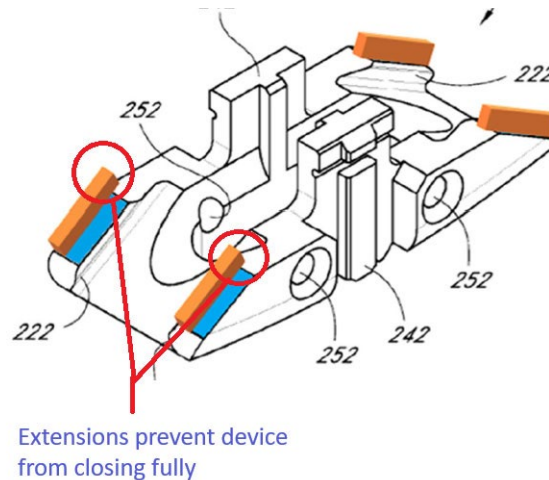


Ex. 2024 (Culbert Second Decl.) ¶ 169. Olmos’s Figure 16A is a perspective view of an unexpanded intervertebral implant and Figure 20A is a bottom perspective view of a lower body portion of an intervertebral implant. Ex. 1006 (Olmos) ¶¶ 51, 56. In the annotated figures, Mr. Culbert uses “red lines/area” to show where he contends “the endplates meet to prevent further collapse.” Ex. 2024 (Culbert Second Decl.) ¶ 169.

As discussed above (*supra* Section II.E.1.c), Petitioner argues in Reply that a POSITA would have been able to make modifications to the overall device that are necessary to achieve the nesting structure as needed. In addition, as Petitioner explains, Varela ’774’s tracks extend along the ramped portions of Olmos’s endplates and nest against one another in the

collapsed position. Reply 20–21 (citing Ex. 1030 (Drewry Reply Decl.) ¶ 53).

In Sur-reply, Patent Owner argues that Petitioner’s arguments about the track extension and the POSITA’s ability to make modifications as necessary to achieve the nesting structure are new. Sur-reply 26. Patent Owner also argues that Varela ’774’s tracks extend “too far to prevent complete closure of the device,” which Patent Owner illustrates in an annotated version of Figure 20A of Olmos, reproduced below.



Sur-reply 26–27. Patent Owner’s annotated version of Figure 20A of Olmos, reproduced above, shows a bottom perspective view of a lower body portion of an intervertebral implant.

Patent Owner’s arguments are unavailing. We find that Varela ’774’s track structures, when in the Olmos-Varela combination articulated by Petitioner, meet the Horizontal-Plane limitation. For example, Varela ’774 discloses that the superior member 12 (i.e., first endplate) and the inferior member 14 (i.e., second endplate) have “track structures 28 and 30” that are “are offset from one another relative to the central axis of the expandable intervertebral implant 10 such that they sit side-by-side when the expandable

intervertebral implant 10 is un-deployed.” Ex. 1008 ¶ 39. “Accordingly,” Varela ’774 continues, “the channels 42 and 44 manufactured into the superior and inferior surfaces of the wedge structure 26, respectively, are also offset from one another relative to the central axis.” *Id.* As discussed above in this section, Varela ’774’s Figure 5, as annotated by Petitioner, shows that the track structures, when in a collapsed position, cross over the horizontal plane bisecting the spinal implant and overlap in a nested configuration. *See also* Pet. 86–88, 105–107. Patent Owner does not dispute this issue. *See generally* Response.

As discussed in Section II.E.1.c above, Petitioner persuasively establishes that a POSITA would have been motivated to make the Olmos-Varela combination to achieve a smaller form factor, and would have had a reasonable expectation of success in doing so. In making the combination, we concluded that a POSITA would have been able to make modifications to the overall device that would have been necessary to achieve the nesting structure as needed. *See also KSR*, 500 U.S. at 424 (“In automotive design, as in many other fields, the interaction of multiple components means that changing one component often requires the others to be modified as well.”).

We are not persuaded by Patent Owner’s annotated drawing of Olmos’s Figure 20A or its argument that Varela ’774’s tracks extend in a manner that would preclude the tracks from nesting inside the implant and thus meeting the Horizontal Plane limitation. “[T]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference.” *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F.3d 1321, 1343 (Fed. Cir. 2020). We

credit Mr. Drewry’s testimony that, after modifications that were within the ordinary skill of a POSITA, in the Olmos-Varela ’774 combination,

the tracks—which are part of the ramped portion—necessarily with [*sic*, will] nest against one another and cross the Horizontal Plane. In other words, at least a portion of the tracks [of] each endplate extend through the horizontal plane such that tracks are positioned on both sides of the horizontal plane.

Ex. 1030 (Drewry Reply Decl.) ¶ 72; *see also id.* ¶ 54 (explaining how “it would have been well within the skill of a POSITA to modify Olmos’[s] endplates” to allow the track “to travel over a longer distance”). We find that Petitioner has shown by a preponderance of the evidence that the Olmos-Varela combination teaches or suggests the Horizontal Plane limitation. Accordingly, we find Petitioner has shown by a preponderance of the evidence that claims 1–3 and 5–7 are unpatentable. We discuss the additional challenge to claim 4 in Section II.E.3 below.

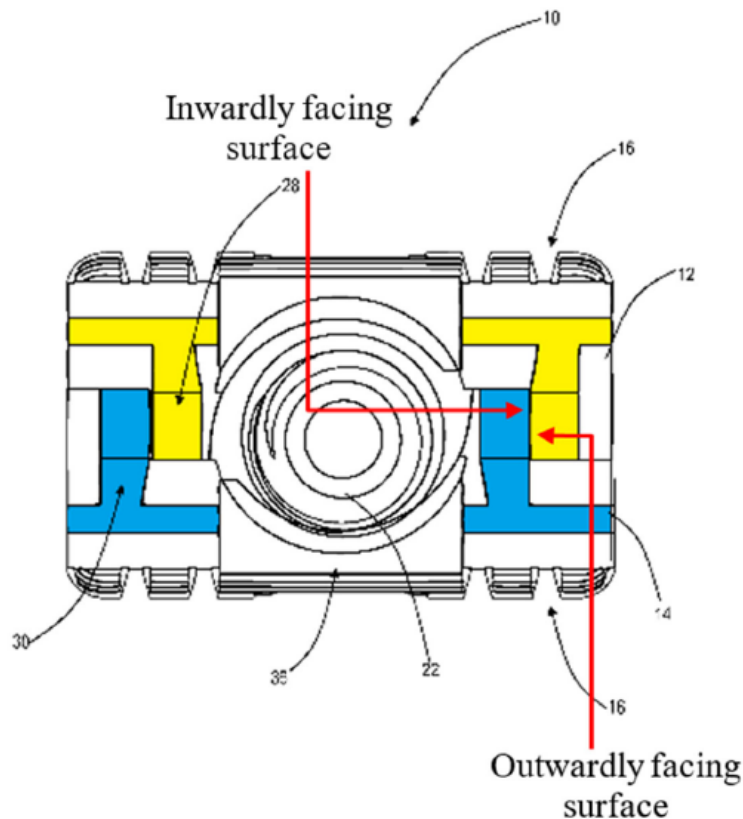
b. Overlap Limitation 10[h]

i. Brief Summary of Petitioner’s Arguments

Petitioner argues that the Olmos-Varela ’774 combination teaches the Overlap limitation. Pet. 105–107; Ex. 1002 (Drewry Decl.) ¶¶ 389–392. Petitioner alleges that Varela ’774 “discloses an expandable implant that ‘has a very small undeployed cross-section or footprint due to the use of superior and inferior members that nest against one another....’” Pet. 105 (citing Ex. 1008 (Varela ’774) ¶ 2). Petitioner argues that Varela ’774 discloses ramped track structures 28 and 30 that are “are offset from one another relative to the central axis...such that they sit side-by-side when the expandable intervertebral implant 10 is un-deployed [*sic*, un-deployed],

thereby making the assembly as compact as possible.” *Id.* (citing Ex. 1008 (Varela ’774) ¶ 39).

To illustrate its allegations, Petitioner relies on another annotated version of Varela ’774’s Figure 5, reproduced below:



Id. at 107 (citing Ex. 1008, Figure 5; Ex. 1002 (Drewry Decl.) ¶¶ 390–391). In this annotated version of Figure 5, Petitioner illustrates an “[i]nwardly facing surface” and an “[o]utwardly facing surface” of Varela ’774’s track structures using red arrows. *Id.* Petitioner argues that, in the collapsed position, “at least a portion of Olmos’s inwardly-facing surface of the ramped portion of the first endplate overlaps at least a portion of the outwardly-facing surface of the first side surface of the second endplate.” *Id.* (citing Ex. 1002 ¶¶ 389–392).

Patent Owner opposes these arguments. *See* Response 27–31; Sur-reply 28–30.

ii. Analysis

After considering the arguments and evidence, we find that Petitioner has demonstrated by a preponderance of the evidence that the Olmos-Varela combination teaches the Overlap limitation. We discuss our reasoning in more detail below, in addressing Patent Owner’s arguments.

Patent Owner first argues that the Olmos-Varela combination does not disclose the Overlap limitation because “the flat side portions of Olmos’s endplates abut thereby preventing the ramped portions from overlapping when the implant is in the collapsed position.” Response 27–28 (citing Ex. 2024 (Culbert Second Decl.) ¶¶ 172–173). This argument is unavailing for the reasons we discussed above Section II.E.1.c, namely that Petitioner persuasively establishes that a POSITA would have been motivated to make the Olmos-Varela combination to achieve a smaller form factor, and would have been able to make modifications to the overall device that would have been necessary to achieve a functional nesting structure not impeded by the flat side portions of Olmos’s endplates.

Patent Owner next argues that, even if the Olmos-Varela combination allowed the ramped portions to nest against one another, the combination would not meet the Overlap limitation. Response 28. Patent Owner argues that Petitioner identifies Olmos’s “outwardly facing surface of the first side surface of the second endplate” as “the outer surfaces facing away from the

ramped portions,” as shown in Patent Owner’s annotated versions of Olmos’s Figure 16B, reproduced below:

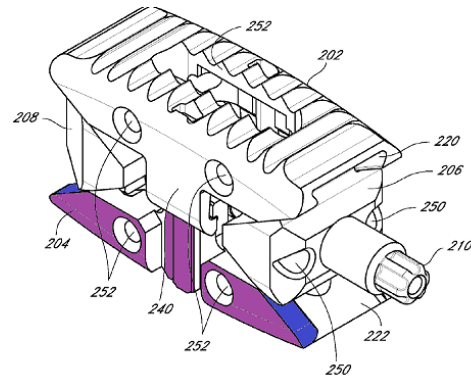
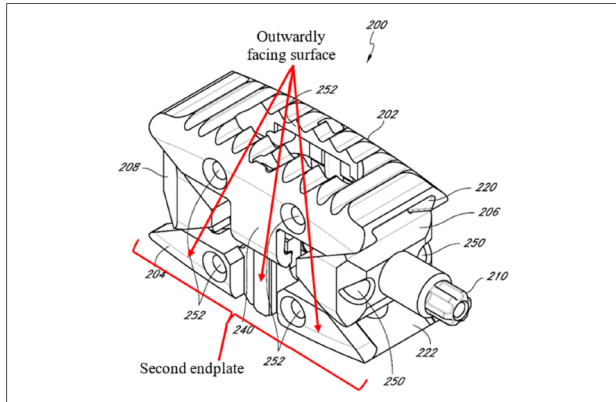


FIG. 16B

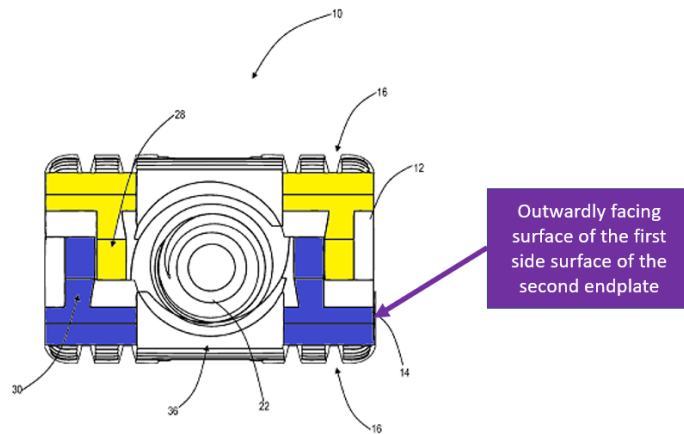
Response 28–29 (citing Pet. 104, relating to limitation 10[g]). Annotated Figure 16B above is a perspective view of an intervertebral implant “wherein the implant is in an expanded state.” Ex. 1006 (Olmos)

¶ 52. Patent Owner argues that the surfaces Petitioner identifies in blue are the ramped portions and the surfaces in purple are the “outwardly facing surfaces.” Response 28–29 (citing Ex. 2024 (Culbert Second Decl.)) ¶ 175).

According to Patent Owner, when the ramped portions shown in blue are replaced with Varela ’774’s track structures, the “outwardly facing surface” identified by Petitioner (purple surface in above figure on the right) does not overlap with the recited “a portion of the inwardly facing surface of the ramped portion of the first endplate” because the track structures “are positioned on the interior of the endplate, a distance from the ‘outwardly facing surface of the first side surface of the second endplate.’” *Id.*

In essence, Patent Owner asserts that Petitioner did not contend that the “outwardly facing surface” of Varela ’774’s tracks corresponds to the *correct* outwardly facing surface required for overlap as recited by the claims, the “outwardly facing surface *of the first side surface of the second*

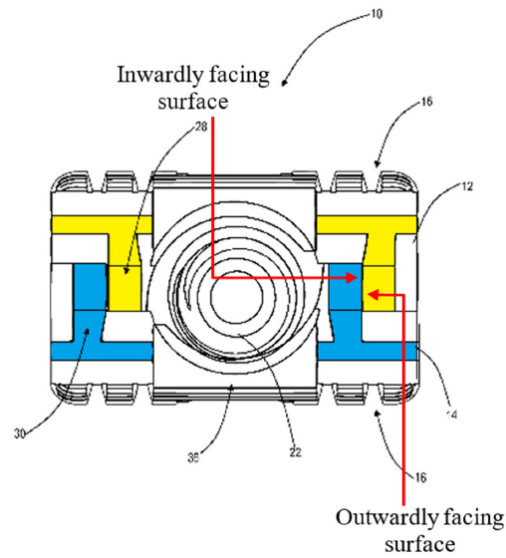
endplate.” *Id.* at 29–30. Patent Owner argues that both parties identified the “outwardly facing surface of the first side surface of the second endplate” as the outermost surface of the second endplate and not a surface of Varela ’774’s tracks, as Patent Owner identifies in the annotated version of Varela ’774, reproduced below.



Response 30 (citing Ex. 1008 (Varela ’774) Figure 5). In this annotated version of Figure 5, Patent Owner illustrates the “[o]utwardly facing surface of the first side surface of the second endplate” of Varela ’774’s track structures using a purple arrow to a blue surface on the outside of Varela ’774’s implant. *Id.*

Patent Owner’s argument is unavailing as it limits, without reason or support, the “outwardly facing surface of the first side surface of the second endplate” to the portion of the surface that faces outward when the implant is collapsed. This limitation is contrary to both Petitioner’s allegations and the prosecution history of the ’649 patent.

Petitioner alleges that the Olmos-Varela combination imports Varela ’774’s track structures, and identifies the “outwardly facing surface of the first side surface of the second endplate” as shown below in Petitioner’s annotated version of Varela ’774’s Figure 5, reproduced again below:



Pet. 107. (citing Ex. 1008 (Varela '774) Figure 5; Ex. 1002 (Drewry Decl.) ¶¶ 390–391). In this annotated version of Figure 5, Petitioner illustrates an “inwardly facing surface” and an “[o]utwardly facing surface” of Varela '774's track structures using red arrows. *Id.* Petitioner argues that, in the collapsed position, “at least a portion of Olmos's [i]nwardly-facing surface of the ramped portion of the first endplate overlaps at least a portion of the outwardly-facing surface of the first side surface of the second endplate.” *Id.* (citing Ex. 1002 ¶¶ 389–392). Thus, Petitioner identifies the entire right side of the blue element shown above as the outwardly facing surface. *See also* Tr. 21:6–8 (“[I]n the Olmos Varela 774 combination, the outwardly facing surface of the first side surface would include the outwardly facing surface of Varela 774's track structures”).

As Petitioner explains in Reply, this identification is consistent with the description of the exterior or “outwardly facing” surfaces of ramped portions in the '649 patent and with the way that Patent Owner identified written description support in its priority documents for these same surfaces. Reply 22–25 (citing Ex. 1001, 19:4–15, 19:25–28; Response 63–84,

Ex. 1030 (Drewry Reply Decl.) ¶¶ 80–83). Petitioner also highlights that Patent Owner identified as an “outwardly facing surface” a surface that is offset from the “outermost side surface” of that same endplate. Reply 25 (citing Ex. 1004 (’649 patent prosecution history), 541–543). Patent Owner does not refute these arguments in sur-reply. *See* Sur-reply at 28–30. We conclude the weight of evidence supports Petitioner’s interpretation.

In sum, on the full trial record, we determine that Petitioner has shown by a preponderance of the evidence that the Olmos-Varela combination teaches the Overlap limitation. Accordingly, we find Petitioner has shown by a preponderance of the evidence that claims 9–20 are unpatentable.

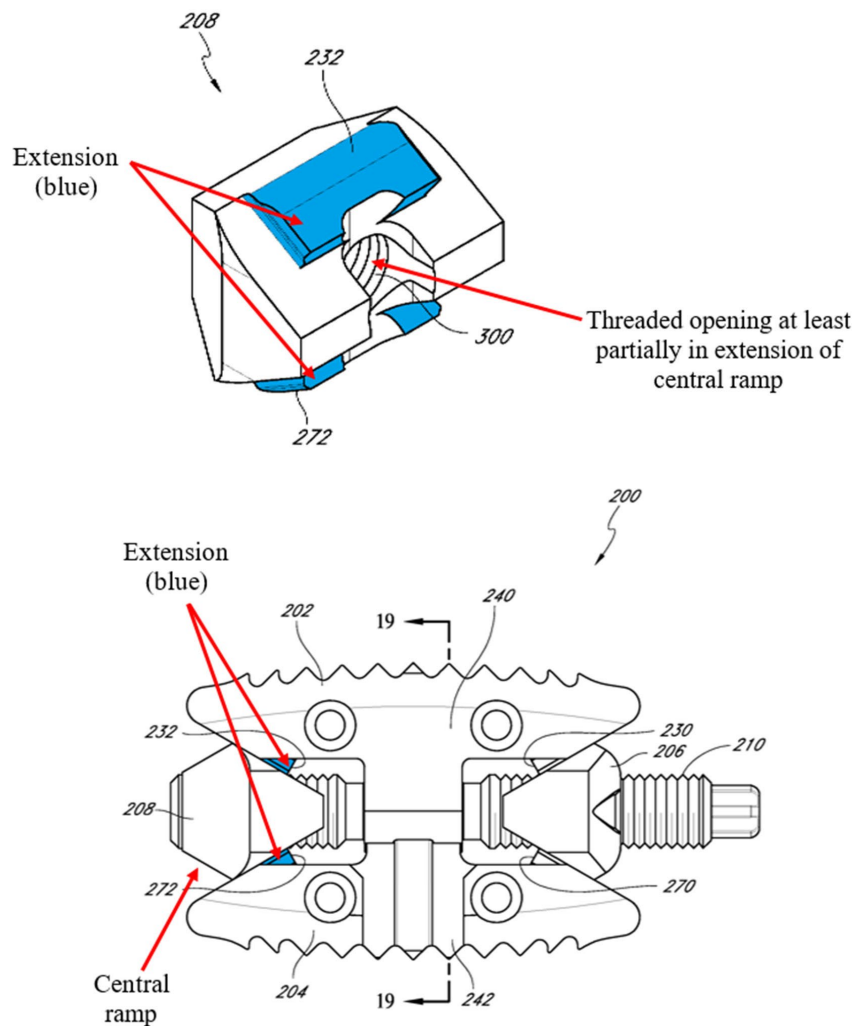
3. Whether the Olmos-Varela Combination Teaches the “extension” Limitation of Claim 4

Aside from the limitations addressed above for independent claim 1, the sole limitation Patent Owner disputes with respect claim 4 is “wherein the central ramp comprises an extension, the extension including a threaded opening.” Ex. 1001, 33:35–37. We refer to this limitation as the “Threaded Extension limitation.” We begin by summarizing Petitioner’s arguments, then turn to analyzing those arguments and Patent Owner’s responses thereto.

a. Brief Summary of Petitioner’s Arguments

Petitioner proffers two arguments about how the Olmos-Varela combination teaches or suggests the Threaded Extension limitation. Pet. 90–94; Ex. 1002 (Drewry Decl.) ¶¶ 328–340. First, Petitioner asserts that Olmos’s guide members 232 and 272 of distal wedge member 208 (the central ramp) meet the Threaded Extension limitation because guide members 232 and 272 “extend longitudinally from the expansion portion of

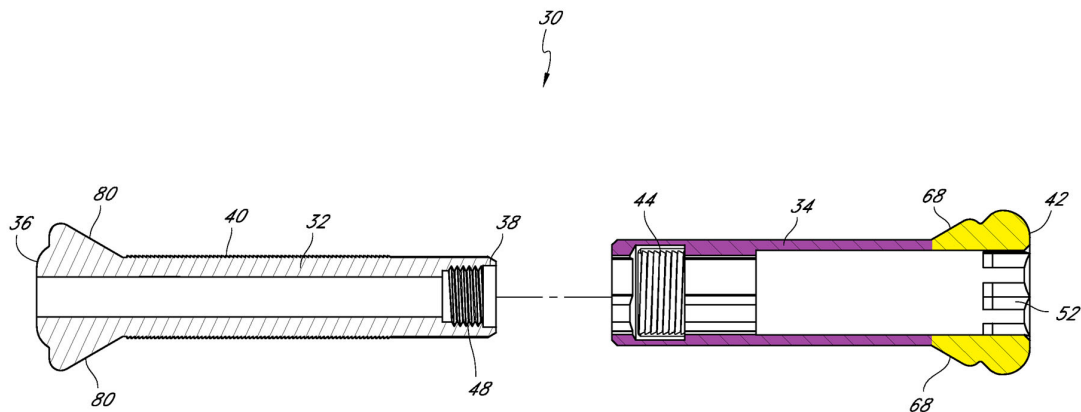
the distal wedge and ‘into a respective slot of the upper and lower body portions.’” Pet. 90–91 (citing Ex. 1006 (Olmos) ¶¶ 156, 178). Petitioner alleges that Olmos depicts that “[a] threaded opening is extending at least partially in both guide members 232, 272.” *Id.* at 91. Petitioner provides annotated versions of Olmos’s Figures 24B and 18 to identify the extension, which we reproduce below.



Id. at 91 (citing Ex. 1006 (Olmos) Figures 24B, 18). Petitioner’s annotated version of Olmos’s Figure 24B depicts a rear perspective view of a distal wedge member of an intervertebral implant with the alleged extension in

blue. Ex. 1006 (Olmos) ¶ 64. Petitioner’s annotated version of Olmos’s Figure 18 depicts a side view of an intervertebral implant with the alleged extension in blue. *Id.* ¶ 54.

Petitioner alternatively alleges that a POSITA would have found it “obvious to add a further extension including a threaded opening to distal wedge member 208 (central ramp) as shown in Olmos’ Fig. 8 embodiment.” Pet. 92 (citing Ex. 1002 (Drewry Decl.) ¶¶ 333–340). Petitioner articulates that the proximal wedge member 68 (driving ramp) can be either formed with or permanently coupled to an outer sleeve member 34 that extends longitudinally from an expansion portion of the driving ramp/proximal wedge and receives the actuator shaft 30. *Id.* (citing Ex. 1006 (Olmos) ¶¶ 106–107). We reproduce below Petitioner’s annotated version of Olmos’s Figure 8:



Id. at 93 (citing Ex. 1006 (Olmos) Figure 8). Petitioner’s annotated version of Olmos’s Figure 8 depicts a side cross sectional view of an actuator shaft of an intervertebral implant, “wherein the actuator shaft has an outer sleeve member and an inner sleeve member.” Ex. 1006 (Olmos) ¶ 35. Petitioner identifies the outer sleeve member as having “internally threaded ‘retention structure[]...44’ for engaging the threaded ‘retention structure[] 40’ of the

distal wedge/central ramp's inner member 32 and aiding in expansion and contraction of the device, similar to how the actuator assembly is used in other embodiments.” Pet. 92. Petitioner identifies the outer sleeve member 34 in purple and the expansion portion in yellow. Pet. 92–93. According to Petitioner, outer sleeve member 34 “extends longitudinally from an expansion portion of the driving ramp/proximal wedge,” and has threading that engages threading on the inner sleeve member to permit expansion and contraction of the implant, similar to how the actuation member is used in the Figure 16 embodiment. *Id.* at 92 (citing Ex. 1006 (Olmos) ¶¶ 90, 106–107; Ex. 1002 (Drewry Decl.) ¶¶ 333–340). We refer to this combination herein as the “Figure 8/16 Expanded Actuator.”

Petitioner offers several reasons why a POSITA would have used Figure 8's extension with the Figure 16 embodiment to make the Figure 8/16 Expanded Actuator. *Id.* at 93–94. First, Petitioner argues that the extension would “allow the actuator to engage the distal wedge member/central ramp more quickly and over a greater distance and/or allow [use of] a shorter actuator.” *Id.* at 93. Second, Petitioner argues that this modification would “make the device more robust and serve Olmos's stated purpose of maintaining minimally invasive surgical procedures, while also maintaining the interconnecting structural components of the primary embodiments.” *Id.* (citing Ex. 1002 (Drewry Decl.) ¶¶ 335–339). Petitioner asserts that the guide members of the ramps and slots of the endplates are “structurally advantageous.” *Id.* (citing Ex. 1006 (Olmos) ¶ 156). Petitioner alleges that “an integrally-formed extension ‘can be advantageous in that fewer parts are required, which can facilitate manufacturing and use of the intervertebral implant.’” *Id.* (citing Ex. 1006 (Olmos) ¶ 107).

Petitioner argues that a POSITA would have had a reasonable expectation of success in making the proposed combination because of Olmos's express teaching of the combinability of its various embodiments. *Id.* at 94 (citing Ex. 1006 (Olmos) ¶¶ 107, 188; Ex. 1002 (Drewry Decl.) Petitioner asserts on reply that Olmos expressly suggests using Figure 8's extension with the Figure 16 embodiment. Ex. 1002 (Drewry Decl.) ¶ 339 (citing Ex. 1006 (Olmos) ¶ 188); *see also* Ex. 1030 (Drewry Reply Decl.) ¶¶ 119–123 (citing Ex. 1006 (Olmos) ¶ 174). ¶¶ 335–340).

With this brief overview, we turn to analyzing the disputed issues between the parties.

b. Whether Guide Members 232/272 Meet the Threaded Extension Limitation

Patent Owner argues that guide members 232 and 272 of distal wedge member 208 (the central ramp) of Olmos's Figure 8 embodiment do not meet the Threaded Extension limitation because the opening containing the threads is located in the central portion of the distal wedge, not in the extension. Response 31–32 (citing Ex. 2024 (Culbert Second Decl.) ¶¶ 179–181). Patent Owner provides an annotated version of Figure 24B of Olmos, which we reproduce below.

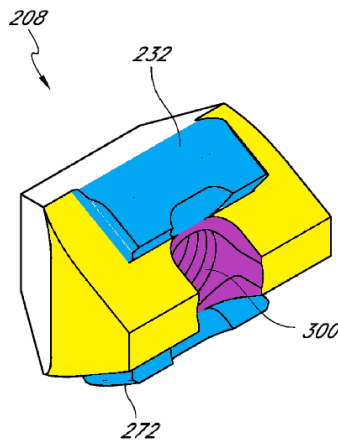


FIG. 24B

Id. at 32. Patent Owner’s annotated version of Figure 24B of Olmos shows a rear perspective view of a distal wedge member of an intervertebral implant. Ex. 1006 (Olmos) ¶ 64. Patent Owner delineates the guide members 232 and 272 in blue, which are alleged to be the extension, the central portion of the distal wedge in yellow, and the threaded opening 300 in purple. *Id.* at 31–32 (citing Ex. 2024 (Culbert Second Decl.) ¶¶ 179–181).

We agree with Patent Owner that, when Olmos’s Figure 24B is correctly annotated, as Patent Owner has done, the threaded opening shown in purple is wholly contained within the central portion of the distal wedge shown in yellow and not within the extension shown in blue (guide members 232/272); in particular, we note that the curved portions of the guide members recess *away* from the threaded opening of the central portion and therefore do not comprise the threaded portion.¹¹ Accordingly, we conclude that Petitioner does not demonstrate by a preponderance of the evidence that

¹¹ This analysis is consistent with our conclusions regarding the “rod-receiving extension” in *Life Spine, Inc. v. Globus Medical, Inc.*, IPR2022-01435, Paper 36 at 75–77 (PTAB Apr. 18, 2024).

Olmos's guide members 232 and 272 meet the Threaded Extension limitation.

c. Whether Petitioner Has Adequately Demonstrated that a Person of Ordinary Skill in the Art Would Have Had a Reason to Use Olmos's Figure 8 Extension With Olmos's Figure 16 Embodiment

Regarding Petitioner's alternative argument based on the Figure 8/16 Expanded Actuator, Patent Owner does not challenge Petitioner's contention that this combination teaches or suggests the Threaded Extension limitation. *See* Response 32–35. Instead, Patent Owner argues that a POSITA would not have been motivated to modify Olmos's Figure 16–24 embodiment with the outer sleeve in Olmos's Figure 8 to achieve the Threaded Extension limitation. *Id.*

Upon examination of the full trial record, we find that Petitioner's arguments that a POSITA would have been motivated to use Olmos's Figure 8 extension with Olmos's Figure 16 embodiments due to Olmos's express suggestion to do so, along with its general teaching that its embodiments can be adapted for use in various combinations is sufficient to establish a motivation to combine these embodiments by a preponderance of the evidence. Thus, we need not further address Petitioner's proposed motivations (e.g., faster engagement of actuator and distal wedge member/central ramp, use of shorter actuator, enhanced robustness of implant).

As noted by Petitioner's declarant Mr. Drewry in his supporting testimony, Olmos expressly suggests combining its various embodiments: "Olmos itself expressly teaches that 'all features discussed in connection with any one embodiment herein can be readily adapted for use in other

embodiments herein to form various combinations and sub-combinations.””
In addition, Olmos expressly suggests using Figure 8’s extension with the Figure 16 embodiment. Ex. 1002 (Drewry Decl.) ¶ 339 (citing Ex. 1006 (Olmos) ¶ 188); *see also* Ex. 1030 (Drewry Reply Decl.) ¶¶ 119–123 (citing Ex. 1006 (Olmos) ¶ 174¹²). Olmos teaches that an extension like that in Olmos’s Figure 8 could be substituted in place of a threaded actuator that lacks such an extension. *See* Ex. 1006 (Olmos) ¶ 174.

We find that Olmos’s express teaching that a POSITA should consider combining features from embodiments is a sufficient basis on which to credit Petitioner’s motivation to combine argument. In addition, we agree with Petitioner that its proposed combination is no more than “the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417. We credit the testimony of Mr. Drewry that “[s]uch a modification of the embodiment(s) of Figs. 16-24 would have involved just a simple combination of the extension from Fig. 8 into the central ramp/distal wedge member from Figs. 16-24.” Ex. 1002 (Drewry Decl.) ¶ 336; *see also Bos. Sci. Scimed, Inc. v. Cordis Corp.*, 554 F.3d 982, 991 (Fed. Cir. 2009) (“Combining two embodiments disclosed adjacent to

¹² Although Olmos’s paragraph 174 refers to Figures 5 and 6 instead of Figure 8, the record reflects that “the actuator assembly structure in Figure 8 is interchangeable with that described in Figures 5-6.” The embodiments differ primarily in that in Figures 5 and 6, proximal wedge member 68 is formed separately from outer sleeve member 34, whereas in Figure 8, these members are integrally formed. *See* Ex. 1006 (Olmos) ¶¶ 106–07; Pet. 28 (“Because Olmos describes Fig. 8 as being a structure that is interchangeable with Figs. 5-6, a POSITA would understand Olmos teaches that the actuator assembly of Fig. 8 is designed to be used with the Figs. 16-26 embodiment.”)(citing Ex. 1006 (Olmos) ¶ 174; Ex. ¶¶ 119–123.

each other in a prior art patent does not require a leap of inventiveness.”). That the combination is a predictable use of prior art elements further demonstrates that a POSITA would have been motivated to make that combination with a reasonable expectation of success. *See KSR*, 550 U.S. at 417.

Patent Owner’s arguments in opposition focus on Petitioner’s alleged motivation to create a more robust implant and an integrally formed extension, and do not address Olmos’s express teaching as described above. *See Response 32–35*. Accordingly, we conclude that Petitioner has shown by a preponderance of the evidence that claim 4 is unpatentable as obvious over Olmos in view of Varela ’774.

4. Summary for Ground 3

In sum, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–7 and 9–20 are unpatentable as obvious over Olmos in view of Varela ’774.

F. Obviousness of Claim 8 Based on Varela ’774, Olmos, and Oglaza

Petitioner asserts that claim 8 is unpatentable as obvious over the combined teachings of Olmos, Varela ’774, and Oglaza. Pet 113–116; Reply 34–35; Ex. 1002 (Drewry Decl.) ¶¶ 428–437. Claim 8 depends directly from claim 1, and therefore includes all the limitations of claim 1. Ex. 1001, 33:55–58. It further recites that “the driving ramp includes an opening configured and dimensioned as a graft delivery opening to allow for graft to be introduced into the expandable implant.” *Id.*

Petitioner alleges that a POSITA would have had a reason to look to locations other than the endplates for providing bone-graft delivery openings, because “introducing bone-graft material through holes in the

endplates after implantation would be unnecessarily difficult given the orientation of the endplates.” Pet. 114. Petitioner notes that Varela ’774 describes including holes or fenestrations in the endplates to promote bone graft growth and discloses that its actuator screw can be cannulated or hollow. *Id.* (citing Ex. 1008 (Varela ’774) ¶¶ 38, 77).

Petitioner alleges that the proximal end of the actuator assembly is accessible after implantation to permit tightening using the actuator. *Id.* Petitioner alleges that a hollow actuator would have been an obvious choice for introducing bone graft material, and that a POSITA would have turned to Oglaza for this teaching. *Id.* at 114–116 (citing Ex. 1002 (Drewry Decl.) ¶¶ 433–434).

Petitioner alleges that Oglaza teaches “configuring and dimensioning an opening in an end member to be a graft delivery opening to allow graft to be introduced into the expandable implant.” *Id.* at 116. Mr. Drewry opines that it would have been straightforward for a POSITA to have modified “Olmos’s actuator shaft 210 to incorporate the apertures of Oglaza’s retaining element,” and that a POSITA would have reasonably expected to succeed in doing so. *Id.* at 114 (citing Ex. 1002 (Drewry Decl.) ¶¶ 429–430, 432).

Patent Owner disputes whether a POSITA would have had a reason to combine Olmos, Varela ’774, and Oglaza. Response 35–37.

After considering the arguments and evidence, we find that Petitioner demonstrates by a preponderance of the evidence that Olmos with Varela ’774 and Oglaza renders claim 8 unpatentable as obvious. We agree with and adopt Petitioner’s arguments and rationale that a POSITA would have found the process of introducing bone-graft material through holes in the

endplates after implantation to be difficult, and have considered alternate methods of doing so. Pet. 114; see also Ex. 1002 (Drewry Decl.) ¶¶ 429–434); 1008 (Varela ’774) ¶¶ 38, 77; Ex. 1007 (Oglaza Figure 2A). We further adopt Mr. Drewry’s opinion that a POSITA seeking to make the proposed implementation would have had a reasonable expectation of success. Ex. 1002 (Drewry Decl.) ¶ 431). We address Patent Owner’s arguments below.

Patent Owner argues against a POSITA’s motivation to make the proposed combination in two regards. First, Patent Owner argues that a POSITA would not have been “motivated to both modify Olmos’[s] device to be smaller than 5 mm and modify its resulting tiny actuator to include a passage.” *Id.* at 35 (emphasis omitted). Patent Owner argues that, because Olmos’s unexpanded device is already 5 mm, a POSITA would not have been motivated to add a passageway to the actuator “because it would affect the structural integrity of the actuator.” *Id.* at 35–36 (citing Ex. 2024 (Culbert Second Decl.) ¶¶ 218–220).

Patent Owner’s argument is unavailing. We agree with Petitioner (*see, e.g.*, Reply 34) that Olmos is not limited to a 5 mm implant, and a POSITA would have found motivation to modify the actuator to add a passageway for bone-graft material for implants of varying sizes. In addition, we credit Mr. Drewry’s testimony that a bone-graft material could be delivered through an actuator of 1.25 mm or less without causing structural integrity issues because Varela ’774 demonstrated use of a cannulated or hollow actuator, and because Oglaza discloses that its bone-graft material retaining element for delivering the material can be as small as 1 mm. *See* Ex. 1030 (Drewry Reply Decl.) ¶¶ 141–142 (citing Ex. 1002

(Drewry Decl.) ¶ 432); *see also In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc) (“Etter’s assertions that Azure cannot be incorporated in Ambrosio are basically irrelevant, the criterion being not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.”).

Second, Patent Owner argues that a POSITA would not have been motivated to make the proposed modifications because the POSITA would have “understood that Olmos’ expandable implant is already configured so that bone-graft material can be inserted into the implant’s interior chamber prior to and after implantation.” Response 35.

Patent Owner’s argument is unavailing. “If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *KSR*, 550 U.S. at 417. The evidence shows that, to the extent a POSITA desired to introduce bone-graft material into an implant, the art suggested a method for providing an additional route for introducing bone-graft material. A POSITA would have understood that modifying Olmos’s actuator shaft 210 to incorporate the apertures of Oglaza’s retaining element would have provided such a route, and the POSITA would have had a reasonable expectation of success in doing so. Pet. 114–116 (citing Ex. 1002 (Drewry Decl.) ¶¶ 433–434). On balance, the weight of evidence supports that the POSITA would have been motivated to make the modification. Accordingly, we conclude that Petitioner has shown by a preponderance of the evidence that claim 8 is unpatentable as obvious over Olmos in view of Varela ’774 and Oglaza.

*G. Petitioner’s Additional Grounds of Alleged Unpatentability
(Grounds 1 and 2)*

Petitioner argues that claims 1–7 and 9–20 of the ’649 patent are unpatentable as anticipated¹³ by Varela ’357 (Ground 1). Pet. 21–61. Petitioner argues that claim 8 is unpatentable as obvious over Varela ’357 and Oglaza (Ground 2). Pet. 61–67. As we have found all of the challenged claims unpatentable on other grounds as described above, we need not reach Grounds 1 and 2. *See Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the “Board need not address issues that are not necessary to the resolution of the proceeding” and, thus, agreeing that the Board has “discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

III. CONCLUSION¹⁴

Based on the information presented, we conclude that Petitioner has demonstrated by a preponderance of the evidence that claims 1–20 of U.S. Patent No. 10,973,649 B2 are unpatentable.

¹³ Petitioner lists the basis of Ground 1 in its “Identification of Challenge” chart as “§§102, 103.” Pet. 3. As we do not reach Ground 1, we need not further consider the basis of Ground 1.

¹⁴ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this Decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–7, 9– 20	102/103	Varela '357 ¹⁵		
8	103	Varela '357, Oglaza ¹⁶		
1–7, 9– 20	103	Olmos, Varela '774	1–7, 9–20	
8	103	Olmos, Varela '774, Oglaza	8	
Overall Outcome			1–20	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has demonstrated by a preponderance of the evidence that claims 1–20 of U.S. Patent No. 10,973,649 B2 are unpatentable.

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

¹⁵ As explained above, we do not reach this ground. *See supra* § II.G.

¹⁶ As explained above, we do not reach this ground. *See supra* § II.G.

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For PETITIONER:

George Beck
Scott Anderson
Jeffrey Costakos
Michael Houston
Roberto Fernandez
Bradley Roush
FOLEY & LARDNER LLP
gbeck@foley.com
sanderson@foley.com
jcostakos@foley.com
mhouston@foley.com
rfernandez@foley.com
broush@foley.com

For PATENT OWNER:

Heath Briggs
Elana Araj
Andrew Sommer
Vivian Kuo
Joshua Rudawitz
GREENBERG TRAURIG, LLP
briggsh@gtlaw.com
araje@gtlaw.com
sommera@gtlaw.com
kuov@gtlaw.com
rudawitzj@gtlaw.com

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