

Filed on behalf of: Yangtze Memory Technologies Company, Ltd.

Entered: November 26, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY, INC.,
Petitioner,

v.

YANGTZE MEMORY TECHNOLOGIES COMPANY, LTD.,
Patent Owner.

PGR2025-00021
Patent 12,010,838

PATENT OWNER'S RESPONSE

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Exhibit List

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2001	Defendants' Preliminary Invalidity Contentions and Document Production Accompanying Invalidity Contentions re YMTC II Asserted Patents (Patent Local Rules 3-3 and 3-4), <i>Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc.</i> , No. 3:23-cv- 05792-RFL (N.D. Cal. Nov. 25, 2024) (excerpts)
2002	Civil Minutes, <i>Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc.</i> , No. 3:23-cv-05792-RFL (N.D. Cal. Sept. 18, 2024), ECF No. 141
2003	Order Granting Stipulation to Extend Certain Deadlines Pursuant to Patent L.R. 4-2 and the Scheduling Order (ECF No. 141) Pursuant to Civil Local Rule 6-1(b), <i>Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc.</i> , No. 3:23-cv-05792-RFL (N.D. Cal. Jan. 8, 2025), ECF No. 194
2004	Order Granting Motion to Stay Case Pending <i>Inter Partes</i> Review, <i>Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc.</i> , No. 3:23-cv-05792-RFL (N.D. Cal. Mar. 14, 2025), ECF No. 243
2005	Plaintiff/Counterclaim Defendant Yangtze Memory Technologies Company, Ltd.'s and Counterclaim Defendant Yangtze Memory Technologies, Inc.'s Opposition to Micron's Motion to Stay Case Pending <i>Inter Partes</i> Review and Post-Grant Proceedings, <i>Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc.</i> , No. 3:23-cv-05792-RFL (N.D. Cal. Feb. 3, 2025), ECF No. 221
2006	Declaration of Konstantinos Giapis ("Giapis")
2007	<i>Curriculum Vitae</i> of Konstantinos Giapis
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2018	Order Granting Motion to Consolidate, <i>Yangtze Memory Technologies Company, Ltd. v. Micron Technology, Inc.</i> , No. 3:23-cv-05792-RFL (N.D. Cal. Aug. 21, 2024), ECF No. 106
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2023	Counterpoint Tech. Mkt. Rsch., <i>Scaling to 1,000-Layer 3D NAND in the AI Era</i> (July 2024), https://filecache.mediaroom.com/mr5mr_lamresearch/182770/Counterpoint_Research_Paper_Scaling_to_1000-Layer_3D_NAND_in_the_AI_Era.pdf ("Counterpoint")
2024	3D FLASH MEMORIES (Rino Micheloni ed. 2016) ("Micheloni") (excerpt)
2025	EFY Bureau, <i>At 20nm, Chips Have Features Sized Ten Times Smaller Than the Wavelength of Laser Used in Lithography</i> , electronicsforu.com (Dec. 4, 2014), https://www.electronicsforu.com/technology-trends/interviews/20nm-chips-features-sized-ten-times-smaller-wavelength-laser-used-lithography
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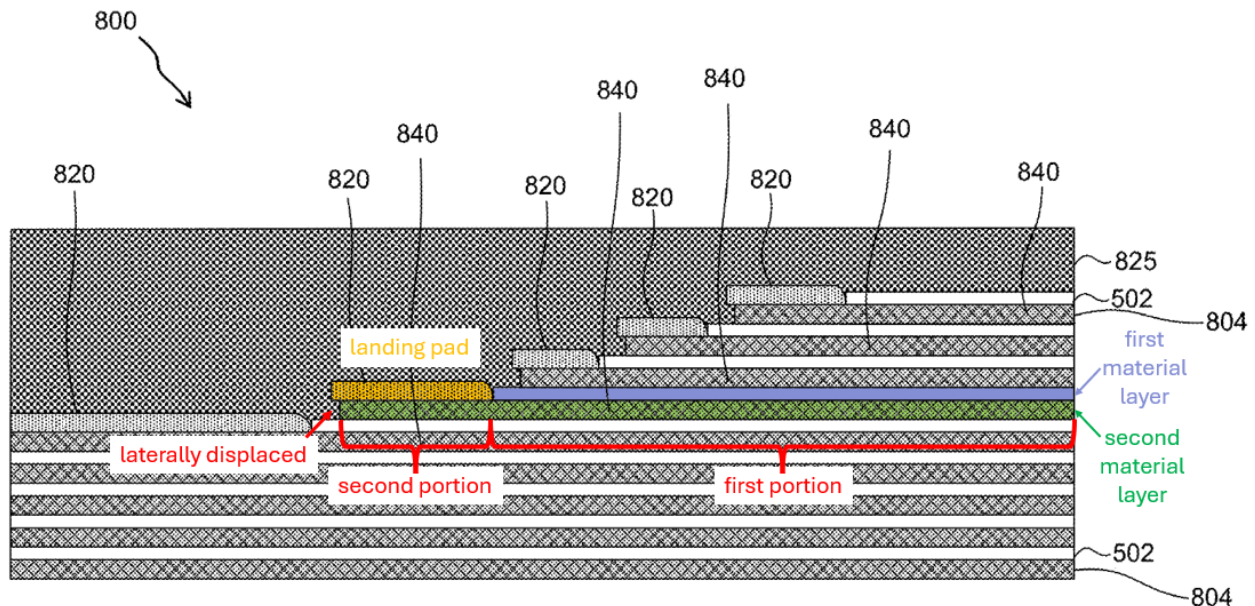
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2030	Transcript of the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , PGR2025-00021 (P.T.A.B. Oct. 30, 2025) (“Lee ’838 Dep.”)
2031	Transcript of the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (“Lee ’666 Dep.”)
2032	Exhibit 1 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 1”)
2033	Exhibit 2 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 2”)
2034	Exhibit 3 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 3”)
2035	Exhibit 4 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 4”)

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2036	Exhibit 5 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 5”)
2037	Exhibit 6 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 6”)
2038	Exhibit 7 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 7”)
2039	Exhibit 8 entered in the Deposition of Jack C. Lee, Ph.D., <i>Micron Technology, Inc. v. Yangtze Memory Technologies Company, Ltd.</i> , IPR2025-00189 (P.T.A.B. Aug. 13, 2025) (Ex. 2031) (“Lee ’666 Dep. Ex. 8”)
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Exhibit	Description
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2045	A. Barranco et al., <i>Electronic State Characterization of SiO_x Thin Films Prepared by Evaporation</i> , 97 J. APPLIED PHYSICS 113714 (2005) (“Barranco”)

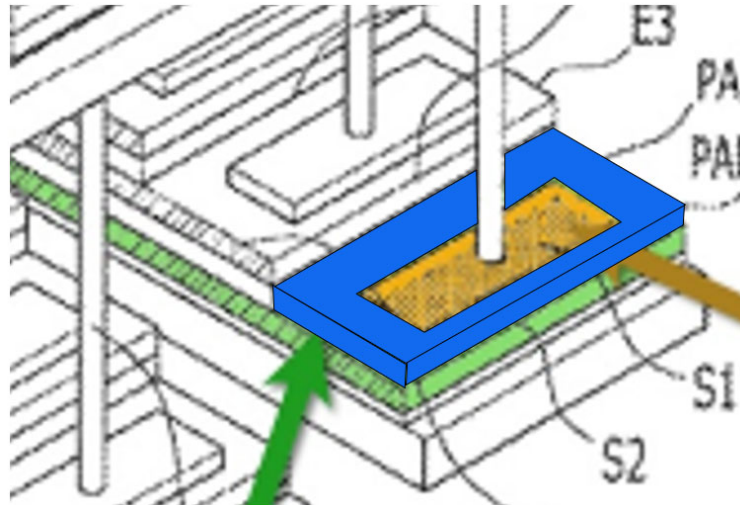
I. Introduction

The '838 patent discloses a novel staircase structure for 3D memory devices defined by specific physical relationships among a first material layer, a second material layer, and a landing pad as shown below.

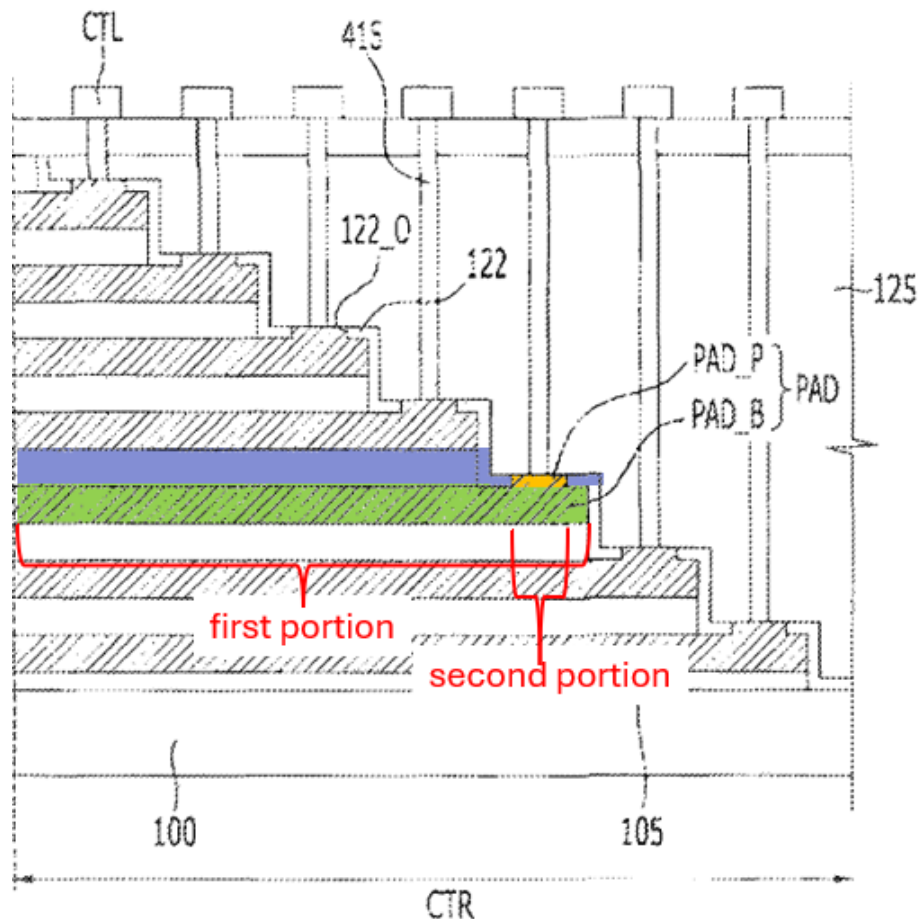


'838 patent (Ex.1001) Fig. 8 (annotated). Specifically, the first material layer (blue) and the landing pad (orange) are disposed over different portions of the second material layer (green)—the “first” and “second” portions—such that the landing pad contacts the first material layer on one side surface and is laterally displaced from the end of the second material layer on the other. Claim 13’s arrangement requires the landing pad having a “curved side surface,” while claims 3 and 18 require a lateral displacement between 10 nm and 300 nm. None of Petitioner’s five Grounds render obvious these claimed arrangements.

Ground 1 — Kim (Ex.1005): Properly understood, Kim does not disclose the claimed lateral displacement. In Kim, the first material layer (blue) surrounds the landing pad (orange) and extends to the end of the second material layer (green), following the staircase as shown below.



As a result, Kim's landing pad (orange) is coextensive (and not laterally displaced) with the second portion of the second material layer as shown in the below annotated Kim Fig. 4B. This is because the claims define the first portion of the second material layer (green) as what the first material layer (blue) is over.



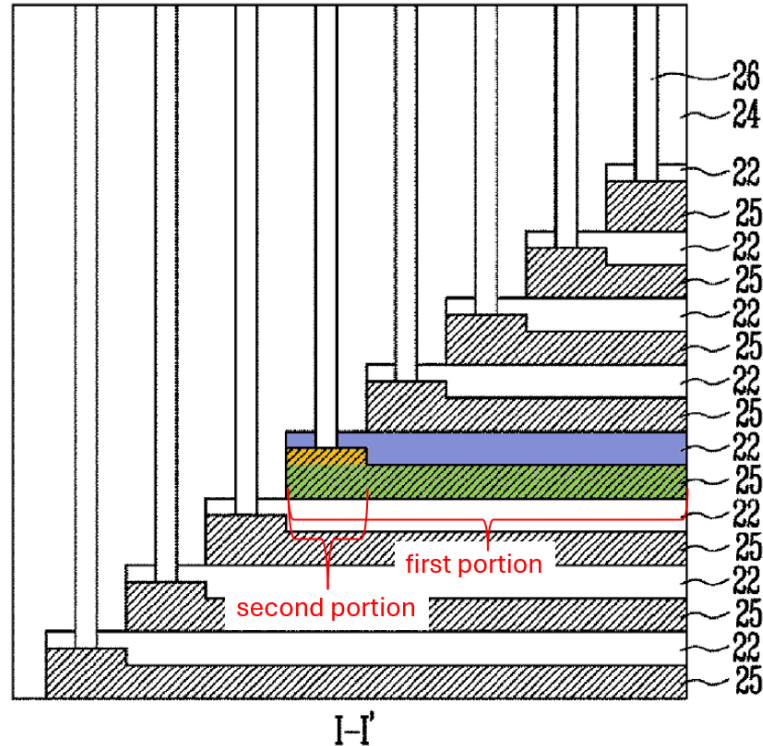
Kim Fig. 4B (annotated).

Kim also does not disclose a landing pad with the claimed “curved side surface,” as required by claims 13-15. Kim mentions a conductive layer with “a rectangular parallele shape,” or having “a curved surface based on a virtual rectangular parallele shape, a cylindrical shape, or any shape.” But these shapes are curved only in the x-y plane and not along the vertical z-axis as claimed in the '838 patent. Ground 1 fails.

Ground 2— Kim with Yang (Ex.1007): Petitioner concedes Kim is silent on the amount of lateral displacement and instead imports dimensions from Yang, based on unfounded assumptions about the contact pad's width and its location relative to the second material layer. Even if Yang disclosed such dimensions (it does not), Petitioner fails to show why a person of ordinary skill in the art ("POSITA") would apply Yang's dimensions to Kim's. Ground 2 fails.

Ground 3—Lee (Ex.1006): Petitioner relies solely on Lee disclosures already considered during prosecution. During prosecution, the Examiner considered Lee's issued patent (U.S. 9,006,984), but issued no rejection based on Lee. In any event, Lee shows no distinct first and second portions of the second material layer; they overlap, and the supposed "first portion" extends over the entirety of the second material layer, as shown below.

FIG. 7B



Lee Fig. 7B (annotated). Ground 3 fails.

Ground 4—Lee with Haller (Ex.1008): Petitioner seeks to import Haller’s spacer dimensions into Lee’s barrier layer. But a POSITA would recognize that Haller’s spacer is not analogous to Lee’s barrier layer; their manufacturing processes, designs, and purposes differ, leaving no motivation to apply Haller’s dimensions to Lee. Ground 4 fails.

Ground 5—Lee with Park (Ex.1009): Petitioner concedes Lee lacks a “curved side surface” and proposes using Park’s oxidation process to supply it. That combination is technically infeasible. Ground 5 fails.

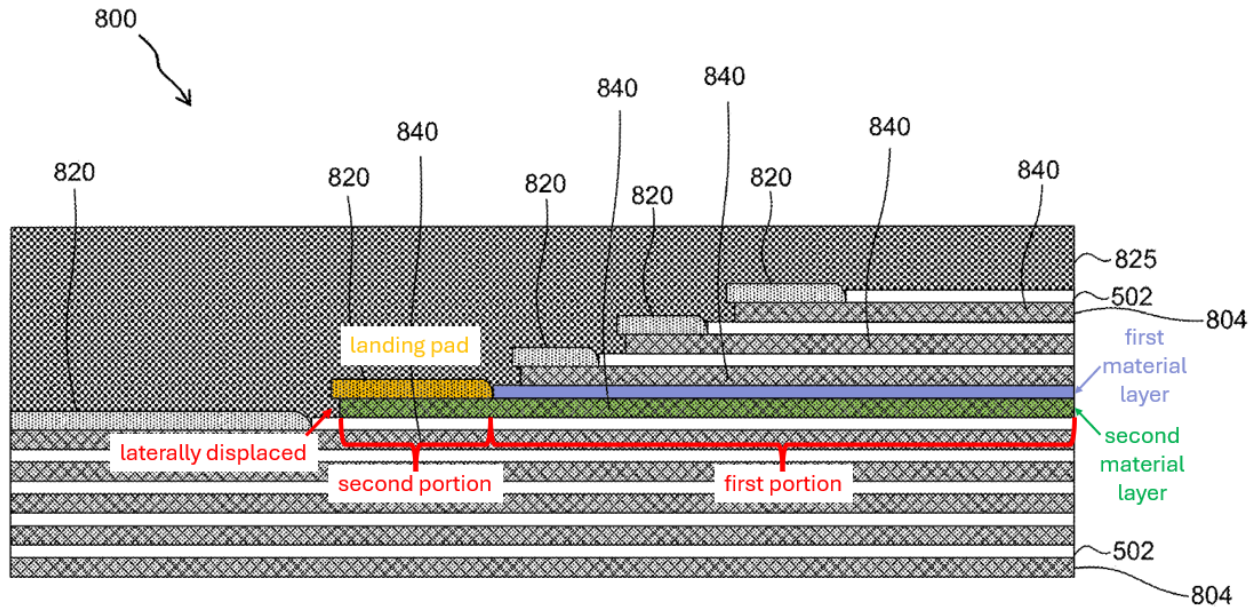
The Board should find the challenged claims of the '838 patent nonobvious.

II. Background

A. The '838 Patent (Ex.1001)

The '838 patent teaches “a staircase structure for a memory device.” '838 patent 1:41-46. The “staircase structure” includes “a set of surfaces that include at least two horizontal surfaces (e.g., along an x-y plane) and at least two vertical surfaces (e.g., along a z-axis).” *Id.* 5:49-52. “Each of the horizontal surfaces is referred as a ‘step’ or ‘stair’ of the staircase structure.” *Id.* 5:56-57. The staircase structure includes a first material layer, made of insulating material, disposed over a first portion of a second material layer, which includes conductive material. *Id.* 1:47-67, Fig. 8, cls. 1, 12. It also includes a landing pad that is “disposed over a second portion of the second material layer” and “adjacent to a respective side of the first material layer.” *Id.* 1:50-57. The landing pad has two side surfaces: a “first side surface” that is “in contact with the first material layer” and can comprise a “curved side surface” (*Id.* cls. 1, 12, 13, 8:46-65, 9:61-65, Figs. 6, 8), and a “second side surface” that “is laterally displaced from a side surface of the second portion of the second material layer” “between 10 nm and 300 nm.” *Id.* cls. 1, 3, 12, 18.

The '838 patent describes a manufacturing process and Figure 8 (as annotated below) shows the resulting claimed structure. *See id.* 6:4-13:13, Figs. 1-9.

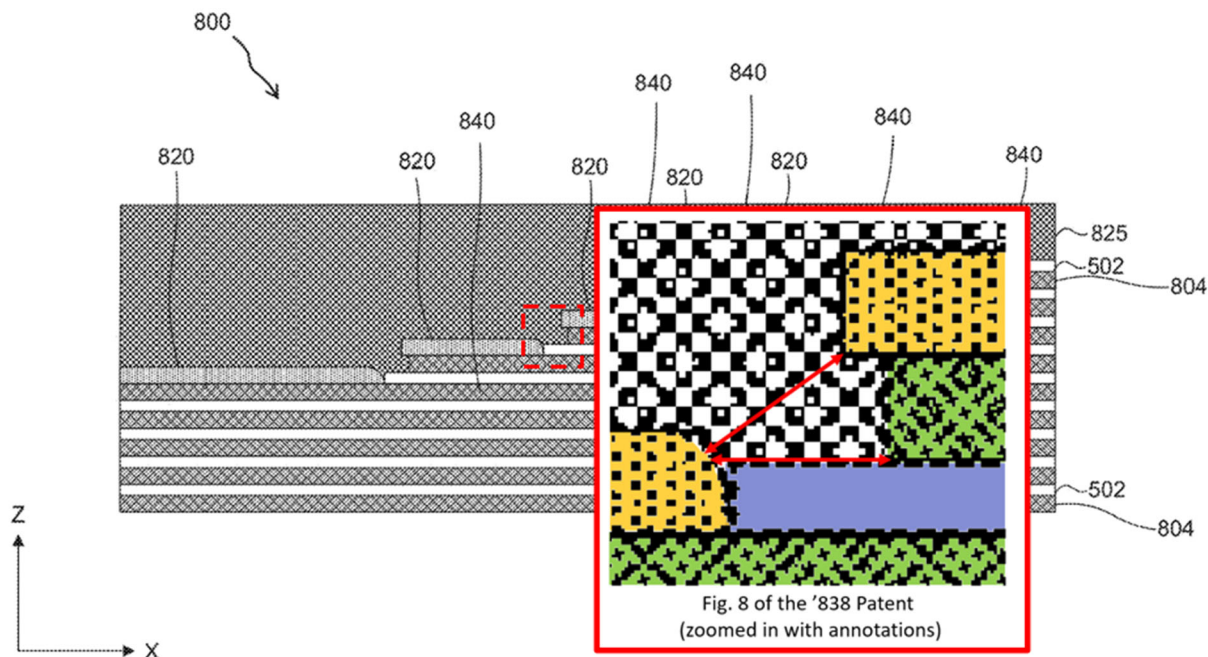


'838 patent Fig. 8 (annotated).

As shown, a first material layer (blue) is disposed over a first portion of a second material layer (green), while a landing pad (orange) is disposed over a second portion of the second material layer (green). *See* '838 patent 1:46-54, 13:47-51, 14:41-45; *Giapis2* (Ex.2019) ¶31. Additionally, the left side surface of the landing pad (orange) is laterally displaced from the left side surface of the second portion of the second material layer (green). *See* '838 patent 1:54-57, 13:50-56, 14:44-50; *Giapis2* ¶32; Ex.2030 (Lee '838 Dep.) 141:19-143:10. Furthermore, the first portion of the second material layer (beneath the first material layer) is shown as a distinct and separate portion, without any overlap, from the second portion of the second material layer (beneath the landing pad). *See* *Giapis2* ¶¶31-41; '838 patent 1:47-54. The claims also recite that the right side surface of the landing pad (orange) is in

contact with the first material layer (blue)—that interface defines the boundary between the “first portion” and the “second portion” of the second material layer below. *See* '838 patent 1:54-57, 13:50-56, 14:44-50; Giapis2 ¶¶31-41, 47.

Figure 8 also shows that the right side surface of the landing pads 820 is curved in the x-z plane (as indicated by the axes in Figure 8) and in contact with the side surface of the first material layer. Such “curved side surfaces” help “improve[]” “yield and manufacturing costs,” such as by avoiding short-circuits between adjacent layers (by increasing the distance between adjacent layers labeled by the red arrows below) while maintaining landing pad thickness. *See* '838 patent 1:40-46, Fig. 8; Giapis2 ¶¶42-46.



'838 patent Fig. 8 (annotated; concentrated).

B. Prosecution History

As discussed below, the prosecution history suggests neither an expansion nor disavowal of claim scope beyond what a POSITA would have understood the claim terms to mean in view of the '838 patent itself. *Infra* Section II.D. Patent Owner's decision to not otherwise address the prosecution history here should not be understood as agreement or acquiescence with the statements made by Petitioner regarding the prosecution history. *See* Pet. 18-19.

C. Person of Ordinary Skill in the Art

Patent Owner does not dispute Petitioner's proposed level of a POSITA for purposes of this PGR. Pet. 21. Regardless of the precise definition of a POSITA, Petitioner's Grounds do not render any challenged claims unpatentable.

D. Claim Construction

Petitioner's arguments ignore the correct understanding that a POSITA would attribute to the below terms, making claim construction necessary.

1. Terms involving "first" and "second portion" "of the second material layer"

A claim term is given the meaning a POSITA would ascribe to the term when read in the context of the claims, specification, and prosecution history. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313-14 (Fed. Cir. 2005) (en banc). With this context, a POSITA would have understood the term "first portion of the second material layer" should be construed as "a portion of the second material layer beneath the

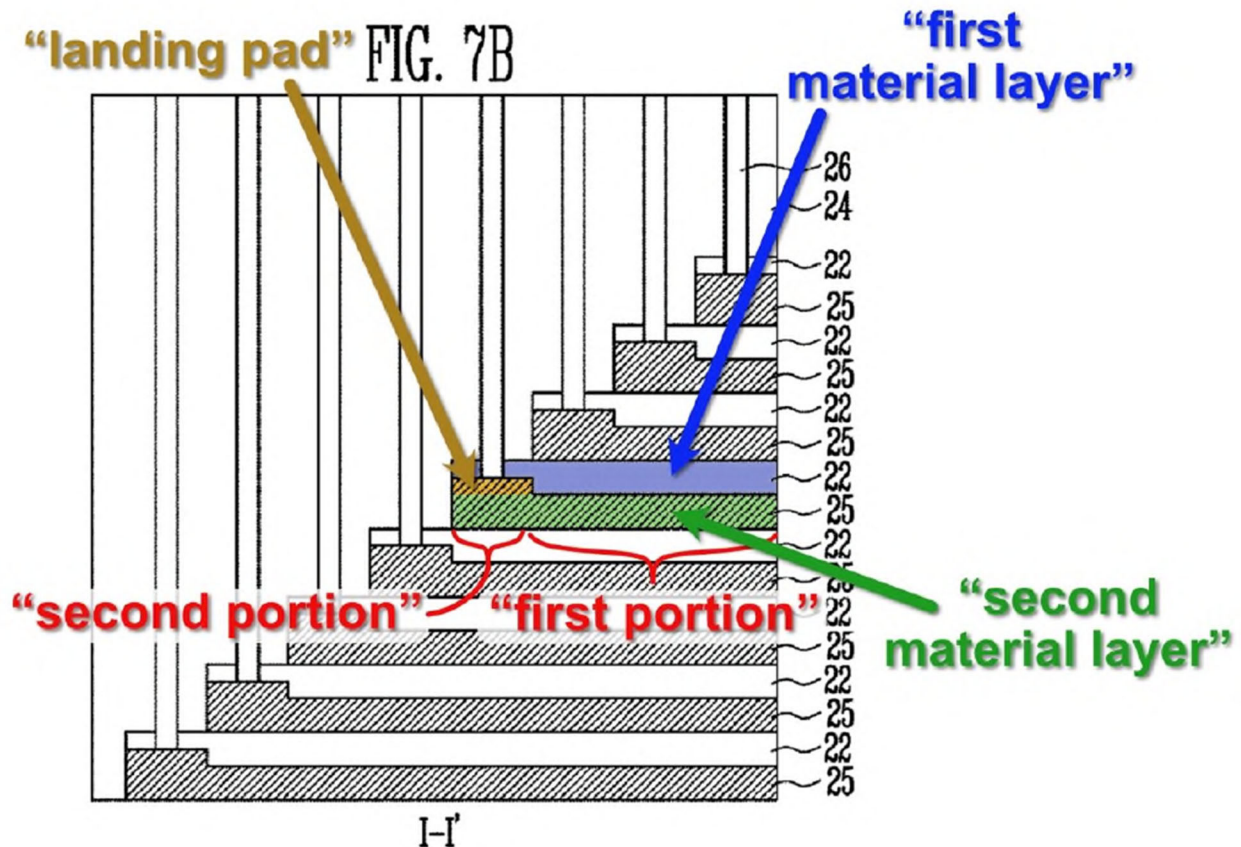
first material layer that is separate and distinct from the second portion of the second material layer.” Alternatively, the phrase “wherein the first material layer is disposed over a first portion of the second material layer” should be construed as “wherein the first material layer is disposed over a first portion of the second material layer but not a second portion of the second material layer” and the phrase “a landing pad disposed over a second portion of the second material layer” should be construed as “a landing pad disposed over the second portion of the second material layer but not the first portion of the second material layer.”

“[C]laim construction must begin with the words of the claims themselves.” *Endo Pharms., Inc. v. Actavis LLC*, 922 F.3d 1365, 1370 (Fed. Cir. 2019).¹ Claims 1 and 12 recite that “the first material layer is disposed over a first portion of the second material layer” and “a landing pad [is] disposed over a second portion of the second material layer.” The claims thus define the “first portion” as including the region of the second material layer beneath the first material layer and the “second portion” as including the region of the second material layer beneath the landing pad. Listed separately in the claims, the claims assign the “first portion” and “second portion” distinct structural locations relative to each other. *See Engel Indus., Inc. v.*

¹ All emphases are added and internal quotation marks and citations are omitted unless noted otherwise.

Lockformer Co., 96 F.3d 1398, 1405 (Fed. Cir. 1996) (concluding that where a patent provides for two separate elements, a “second portion” and a “return portion,” these two elements “logically cannot be one and the same”); *Gaus v. Conair Corp.*, 363 F.3d 1284, 1288 (Fed. Cir. 2004) (holding that where “claim lists” elements “separately,” it provides “clear implication” they are “separate” and “distinct” elements); *Becton, Dickinson & Co. v. Tyco Healthcare Grp., LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) (“[w]here a claim lists elements separately, the clear implication of the claim language is that those elements are distinct components of the patented invention.”).

If the first portion and second portion were not distinct or could overlap, then the terms “first portion” and “second portion” would become meaningless. This is clear from, for example, Petitioner's read of Lee, as shown below. Pet. 63.



In Petitioner's mapping, Lee's first material layer is merely “over ... the second material layer” as Lee's first material layer being over *the entirety* of the second material layer—the claim term “a first portion” is read out entirely. Notably, under Petitioner's theories, it could arbitrarily change the extent of both the “first portion” and the “second portion” in its figure above and its invalidity theory would be the same. In other words, Petitioner's mappings read the claims to merely require a landing pad and first material layer disposed over the second material layer in any arrangement rather than the claimed one that requires two recited portions. See *Giapis2* ¶¶50-52, 170-175. But that approach is “highly disfavored.” See *Intel Corp.*

v. Qualcomm Inc., 21 F.4th 801, 809-10 (Fed. Cir. 2021) (“[i]t is highly disfavored to construe terms in a way that renders them void, meaningless, or superfluous.”); *SSI Techs., LLC v. Dongguan Zhengyang Elec. Mech. LTD.*, 59 F.4th 1328, 1335 (Fed. Cir. 2023) (“A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.”); *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1305 (Fed. Cir. 2014) (“In construing claims, however, we must give each claim term the respect that it is due.”).

Nowhere did the Institution Decision address that Petitioner's mappings read the “portions” out of the claims entirely. Moreover, Patent Owner is not reading embodiments from the specification into the claims. ID 29. Instead, Patent Owner only reads the claims “with an eye toward giving effect to all terms in the claim” as the Federal Circuit mandates. *Bicon, Inc. v. Straumann Co.*, 441 F.3d 945, 950-51 (Fed. Cir. 2006) (collecting cases).

Liberty Ammunition, Inc. v. United States is instructive. 835 F.3d 1388 (Fed. Cir. 2016). There, the claim recited “a body including a nose portion and tail portion, said body further including an interface portion disposed intermediate opposite ends of said body.” *Id.* at 1399 (emphases omitted). When construing the term “intermediate opposite ends” to mean that “the interface is positioned between or in the middle of the opposite ends of the forward end of the nose portion and the trailing end of the tail portion,” the trial court declined to add that the interface “does not

extend all of the way to the front or to the end of the projectile.” *Id.* “[T]he trial court concluded that so long as the interface was positioned, in part, between the forward end and the trailing end of the projectile, ***it did not matter if the interface was also positioned outside of that prescribed area.***” *Id.* The Federal Circuit rejected this construction, noting that the additional language not adopted by the trial court was “fully supported by the plain claim language and specification.” *Id.* The Federal Circuit also noted that by not adhering to the plain claim language, the trial court’s construction “significantly diminishes the ‘intermediate opposite ends’ limitation, almost to the point of rendering it a nullity.” *Id.*

Here, Petitioner’s invalidity theories are based on the same argument rejected in *Liberty*. Petitioner argues “[t]he claims require only that an insulating layer be ‘disposed over a first portion’ of an underlying conductive layer. They do not prohibit the insulating layer from also covering other portions of the same conductive layer.” Pet. 62. But just as in *Liberty*, the “very essence” of the “first portion” and “second portion” limitations “is to define a precise position for the” “first material layer” and the “landing pad” over the “second material layer.” *Liberty*, 835 F.3d at 1399; *Giapis2* ¶¶50-62, 174-176. Ignoring that specific arrangement improperly treats the claims the same as if the patentee omitted the “first portion” and “second portion” language from the claims entirely. *See Giapis2* ¶¶52-59, 174-175. To render those limitations “optional or potentially nonexistent,” as the Petition

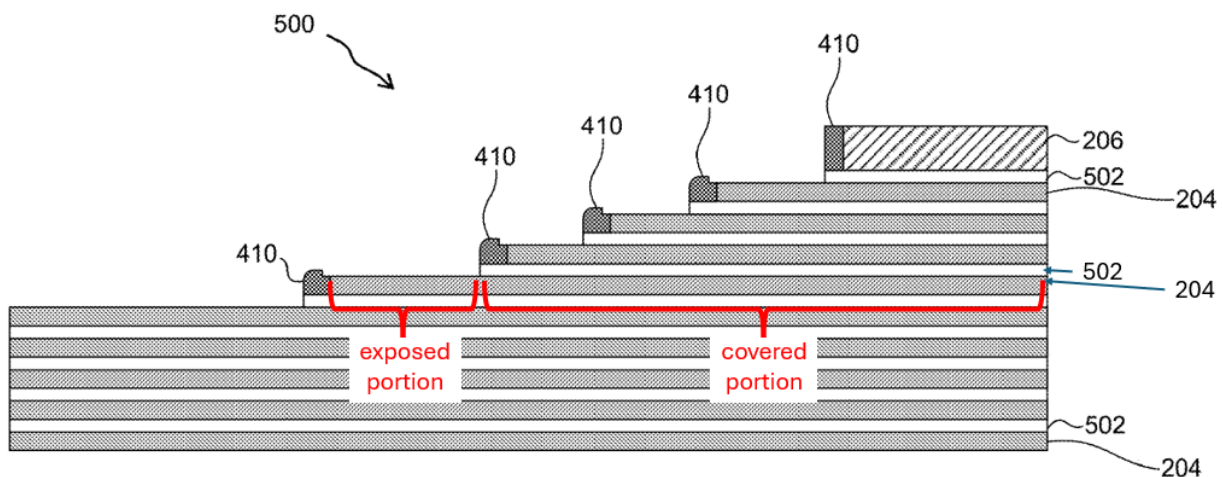
does, is incorrect. *Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.*, 853 F.3d 1272, 1288 n.10 (Fed. Cir. 2017). The Institution Decision did not engage with the fact that Petitioner's theory reads "portion" out of the claim entirely and contradicts *Liberty*.

Nor did the Institution Decision engage with the fact that Petitioner's theory contradicts the Federal Circuit precedent in *Engel*, which is instructive. There, the patent described a "second portion" and a "return portion" of a sheet metal duct. *Engel*, 96 F.3d at 1404-05. The specification described "[a] second portion 24" and then that "[a] return portion 26 is also provided." *Id.* at 1405. The Federal Circuit found that "[s]ince a return portion is '**also provided**,' they logically cannot be one and the same." *Id.* On that basis, the court concluded that "the claimed second portion 24 is **separate and distinct** from the return portion 26" as it would otherwise "contradict[] the plain language of the ... patent." *Id.*

The same reasoning applies here. Because the claims provide both a "first portion" and a "second portion" of the second material layer, those portions are "separate and distinct" and "logically cannot be one and the same." *Id.* Further, just as the specification in *Engel* described a "return portion" that was "**also provided**," the specification here describes a staircase structure that includes "a first material layer disposed over a first portion" and "**further includes** a plurality of landing pads respectively disposed on the plurality of layer stacks, where each landing pad is disposed over a second portion of [the] respective second layer stack." '838 patent

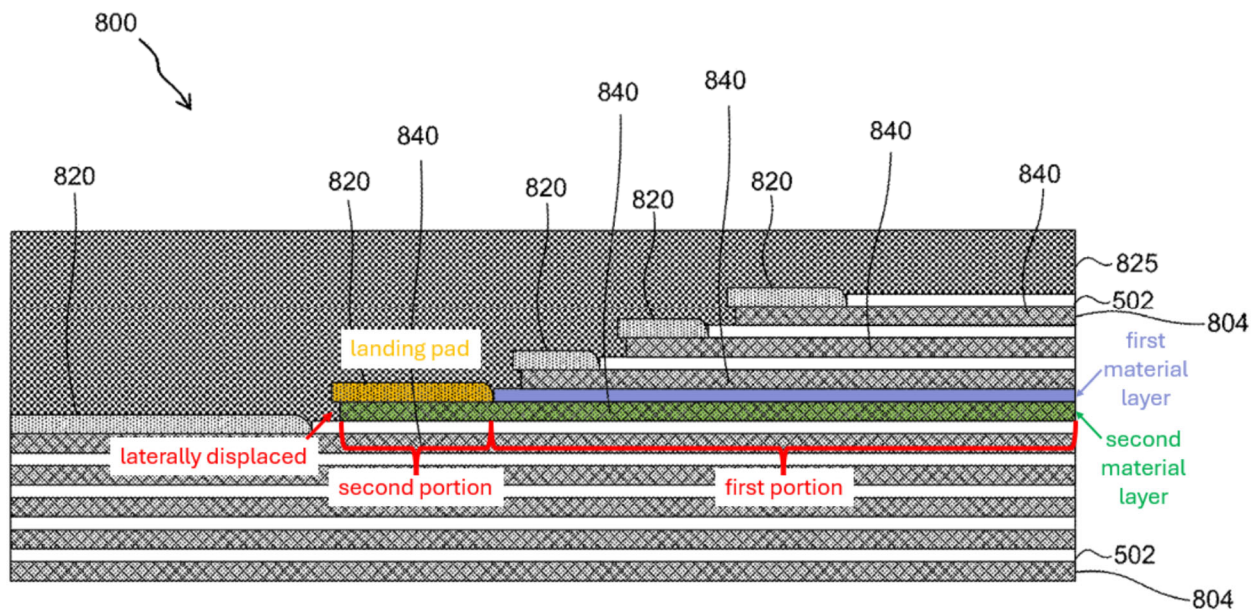
1:47-54. Thus, the first and second portions of the second material layer must be separate and distinct (and thus cannot overlap) per *Engel*.

As the “single best guide to the meaning of a disputed term,” the specification also confirms that the “first” and “second” portions of the “second material layer” are separate and distinct. *Trs. of Columbia Univ. v. Symantec Corp.*, 811 F.3d 1359, 1362 (Fed. Cir. 2016). In particular, the manufacturing process described in the specification can only form “a first portion of a second material layer” that is separate and distinct from the “second portion.” *Giapis2* ¶¶53-59. It describes removing a part of the first material layer, thus “expos[ing] a portion of a top surface of sacrificial layer 204” while the rest of sacrificial layer 204 remains entirely under the first material layer. ’838 patent 8:41-44; Ex.2030 149:8-22.



’838 patent Fig. 5 (annotated); *Giapis2* ¶¶53-56. The specification describes forming a landing pad 720 on the exposed, but not unexposed, portion of sacrificial layer 204. ’838 patent 8:52-56, 9:13-31, Figs. 6-7; Ex.2030 150:9-151:10, 152:8-153:2;

Giapis2 ¶¶53-56. As explained by Petitioner’s expert, after replacing the landing pad 720 and sacrificial layer 204 with conductive materials, the resulting first and second portions described in the ’838 patent are “divided by the intersection of the insulating layer and landing pad above them,” (Ex.2030 141:11-15), and cannot be overlapping, as annotated below. ’838 patent 9:44-53.



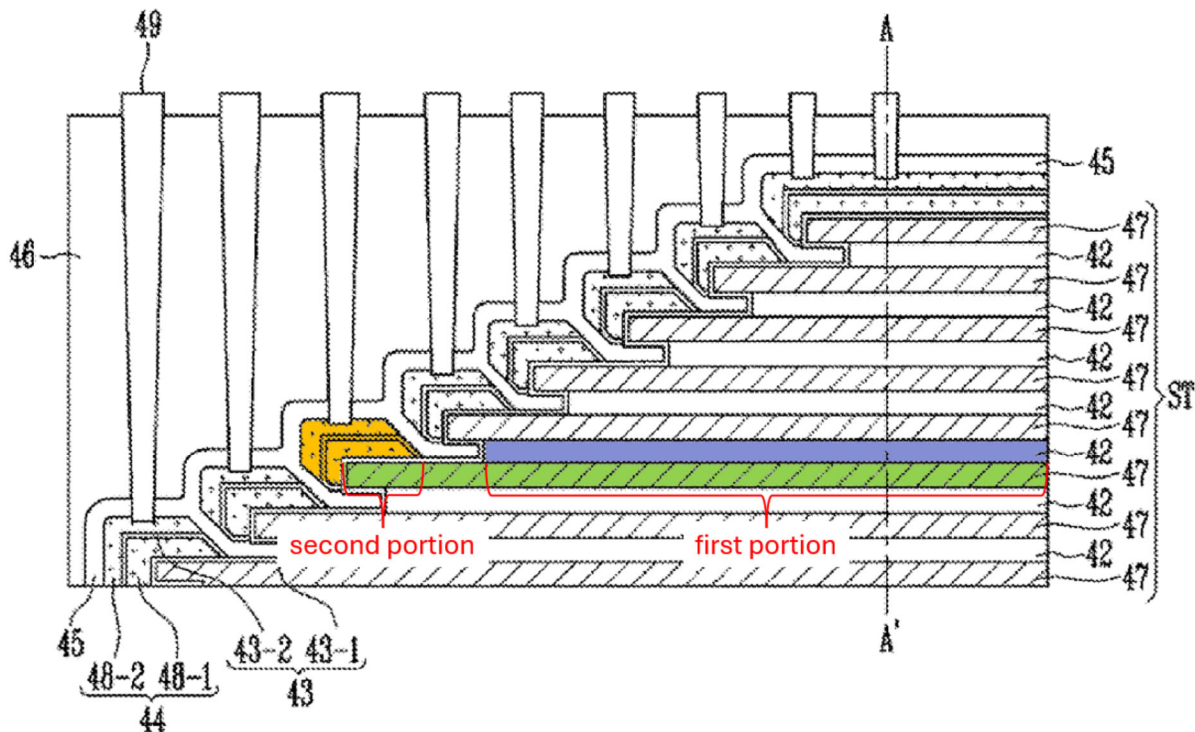
'838 patent Fig. 8 (annotated); *Giapis2* ¶¶53-59. As the “only description” from the specification that both “casts light” on what the “first portion” and “second portion” are and that “enables one of ordinary skill in the art to achieve the objects of the claimed invention,” Figure 8 confirms that the “first” and “second” portions must be distinct and separate. *Medicines Co. v. Mylan, Inc.*, 853 F.3d 1296, 1309 (Fed. Cir. 2017) (“[C]onstruing ‘efficiently mixing’ to incorporate the efficient mixing conditions of Example 5 is necessary to ‘tether the claims to what the specification[]

indicate[s] the inventor actually invented.”); *World Class Tech. Corp. v. Ormco Corp.*, 769 F.3d 1120, 1123-25 (Fed. Cir. 2014) (construing support surface as distinct from ledge surface based on specification embodiments and rejecting contrary construction where there was nothing “in the written description or drawings that discloses an arrangement of the sort”). In fact, reading out “portion” from the claims by allowing the “first” and “second” portion to overlap would lead to no written description, contradicting “the canon that courts should attempt to construe claims to preserve their validity.” *Omega Eng’g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1335 n.6 (Fed. Cir. 2003); *Medicines*, 853 F.3d at 1309 (limiting “efficiently mixing” to embodiment—despite the specification’s identifying that embodiment as “non-limiting”—because it was “the only description of efficient mixing”).

“The prosecution history, like the specification, provides evidence of how the U.S. Patent and Trademark Office and the inventor understood the patent,” and, here, is also consistent with Patent Owner’s proposed construction. *Iridescent Networks, Inc. v. AT&T Mobility, LLC*, 933 F.3d 1345, 1350 (Fed. Cir. 2019). During prosecution of the application that led to the ’838 patent, the Examiner rejected the claims over Exhibit 1014 (Lee 107), stating that it disclosed “a first material layer (42) and a second material layer (47), wherein the first material layer (42) ... is disposed over a first portion of the second material layer” and a “landing pad (48-2,

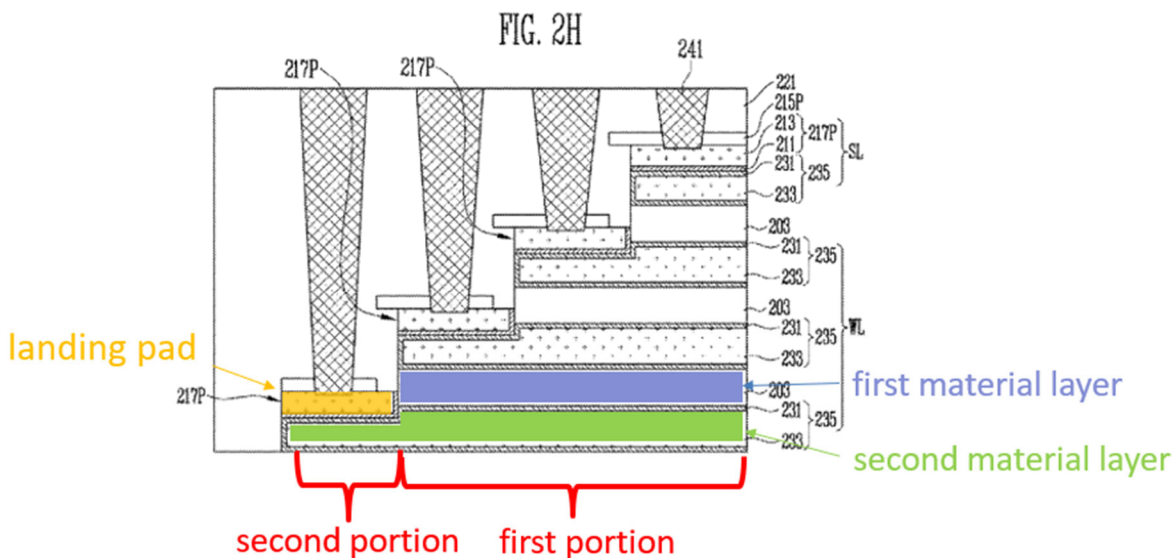
43-2, 48-1) disposed over a second portion of the second material layer.” Ex.1002 154; Giapis2 ¶60. In other words, the Examiner relied on prior art with the claimed first and second portions being separate and distinct as shown below.

FIG. 4C



In contrast, the Applicant cited U.S. Patent 9,006,884 to Lee—the patent that issued from the application underlying the Lee reference Petitioner relies on. Ex.1002 61; *compare* Lee, with Ex.2020 ('884 Patent). The Examiner did not issue any rejection based on Lee, reflecting that the claimed first and second “portions” of the “second material layer” must be separate and distinct. The Examiner’s correct understanding of the claim language is in stark contrast to Petitioner’s, which applies Lee in a way that renders the portions superfluous.

The prosecution history of a related application reinforces this point. In Application No. 16/126,956, a parent to which the '838 patent claims priority, the claims recited analogous limitations: “a first material layer disposed over a first portion of a second material layer” and “each landing pad disposed over a second portion of the second material layer.” Ex.2022 ('16/126,956 FH) 4. The Examiner rejected the claims based on Hyun (Ex.1016) (US 9,373,540 B2), finding that Hyun taught “a first material layer (203) [(below in blue)] disposed over a first portion of a second material layer (235, which is 231+233) [(green)]; and a plurality of landing pads (217P) [(yellow)] respectively disposed on the plurality of layer stacks, each landing pad disposed over a second portion of the second material layer (235),” as shown below. Ex.2022 4. The Examiner's rejection further confirms that a POSITA would have understood the claimed “first” and “second” portions are separate and distinct.



Ex.1016 Fig. 2H (annotated); Giapis2 ¶61.

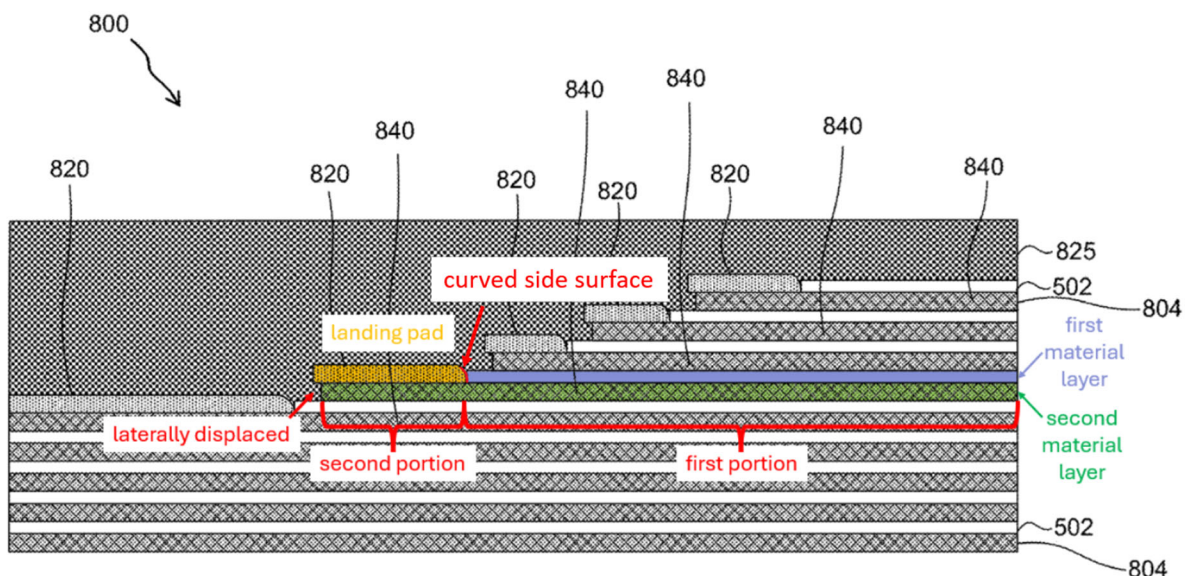
A POSITA would have thus understood that the term “first portion of the second material layer” is “a portion of the second material layer beneath the first material layer that is separate and distinct from the second portion of the second material layer.” Alternatively, the phrase “wherein the first material layer is disposed over a first portion of the second material layer” should be construed as “wherein the first material layer is disposed over a first portion of the second material layer but not a second portion of the second material layer” and the phrase “a landing pad disposed over a second portion of the second material layer” should be construed as “a landing pad disposed over the second portion of the second material layer but not the first portion of the second material layer.” To find otherwise would read the “portion[s]” out of the claims and would be inconsistent with Federal Circuit law, the embodiments in the '838 patent, and the prosecution history.

2. “curved side surface”

When viewed in the context of the intrinsic record, a POSITA would have understood the term “curved side surface” to be a “vertical surface curved along a direction (e.g., the z-axis) perpendicular to the top surface of the structure.”

As discussed, “claim construction must begin with the words of the claims themselves.” *Endo Pharms.*, 922 F.3d at 1370. Here the claim language supports that the “curved side surface” is vertical and perpendicular to the top surface of the

structure. Claim 12 (from which claim 13 depends) recites a landing pad with a “**first side surface**” “in contact with the first material layer.” In claim 13, that “first side surface” comprises a “curved side surface.” But claim 12 also requires the first material layer contact the landing pad’s “first **side surface**,” and that both the landing pad and first material layer are “disposed over ... the second material layer.” A POSITA would have understood this claimed structure requires the “landing pad” contact the “first material layer” at a vertical surface because it is a side surface. Giapis2 ¶65. Figure 8 of the '838 patent depicts this arrangement as annotated below.



The other claims of the '838 patent contrast vertical “side surface[s]” with a horizontal “bottom surface,” further supporting that the claimed “curved side surface” is not a horizontal surface. *See Phillips*, 415 F.3d at 1314. Claim 2, which depends on claim 1, and claim 11, which depends on claim 8, both recite that the

landing pads include “**a bottom surface**” and a “**side surface.**” Giapis2 ¶66; Ex.2030 157:1-5. Thus, the claims themselves distinguish the vertical side surfaces from horizontal bottom surfaces.

The specification confirms that the term “curved side surface” is a “vertical surface curved along a direction (e.g., the z-axis) perpendicular to the top surface of the structure.” Claim 13 recites a “memory device,” which the specification describes includes a staircase structure. ’838 patent 1:41-43, 2:48-50, 3:34-46. As the specification explains:

In the present disclosure, a staircase structure refers to a set of surfaces that include at least **two horizontal surfaces (e.g., along an x-y plane)** and at least **two vertical surfaces (e.g., along a z-axis)**. Each horizontal surface is adjoined to a first vertical surface that extends upward from a first edge of the horizontal surface, and is also adjoined to a second vertical surface that extends downward from a second edge of the horizontal surface. Each of the horizontal surfaces is referred to as a ‘step’ or ‘stair’ of the staircase structure. A horizontal direction can refer to a direction (e.g., the x-axis or the y-axis) **parallel with a top surface** of the substrate (e.g., the substrate that provides the fabrication platform for formation of structures over it). A vertical direction can refer to a direction (e.g., the z-axis) **perpendicular to the top surface** of the structure.

Id. 5:47-61. Indeed, the specification defines “vertical” as “nominally perpendicular to the lateral surface of a substrate” and “horizontal” as “nominally parallel to a

lateral surface of a substrate.” *Id.* 5:6-8, 5:14-16. When the specification refers to one of the horizontal surfaces (e.g., along an x-y plane), it consistently refers to that surface as a “top,” or “bottom” surface. *Id.* 5:55-61, 5:66-6:1, 7:5-12, 8:1-7, 8:16-25, 8:41-44, 8:46-65, 11:60-64, 12:21-25, 12:37-44, 12:63-66, cls. 2, 11; Giapis2 ¶¶67-83. When the specification refers to one of the vertical surfaces (e.g., along a z-axis), it consistently refers to that surface as a “side” or “side surface.”² ’838 patent 7:9-11, 8:1-7, 8:16-32, 8:44-65, 9:66-10:3, 11:57-62, 12:9-10, 12:18-20, 12:38-44, 12:55-60, cls. 1-3, 6, 8, 11-16, 18, 20; Giapis2 ¶¶67-83.

For example, the horizontal surfaces of the substrate are described as the “top surface” and “bottom surface.” Ex.2031 (Lee ’666 Dep.) 47:16-50:1;³ ’838 patent

² In only column 4 does the specification use “side” to refer to a horizontal surface, but those usages are unambiguously associated with the term “top” or “bottom” in discussing a “top side” (i.e., top surface) or a “bottom side” (i.e., bottom surface). ’838 patent 4:45-31; Giapis2 ¶68. “Side surface” always refers to a vertical surface.

³ Dr. Lee’s statements regarding the specification and figures of U.S. Patent No. 11,145,666 (“the ’666 patent”) (Ex.2021) apply equally to the ’838 patent because the ’838 patent is a continuation of the ’666 patent. *Compare generally* ’838 patent, *with* Ex.2021; Ex.2030 131:12-132:8.

4:26-33; Giapis2 ¶¶67-83. In Figure 1 (below), the “top surface” of substrate 101 is shown to be a horizontal surface along the x-y plane. Giapis2 ¶70.

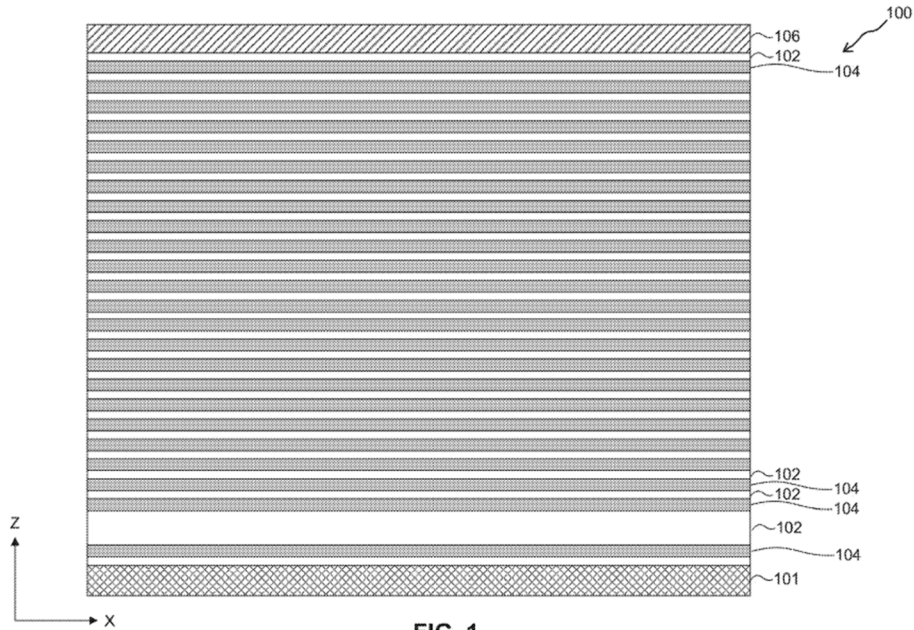
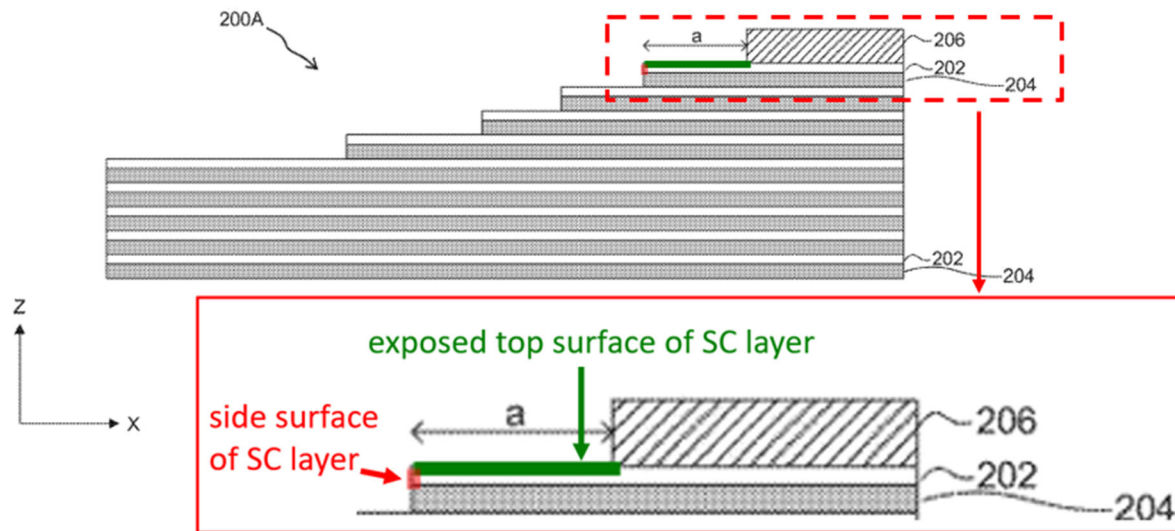


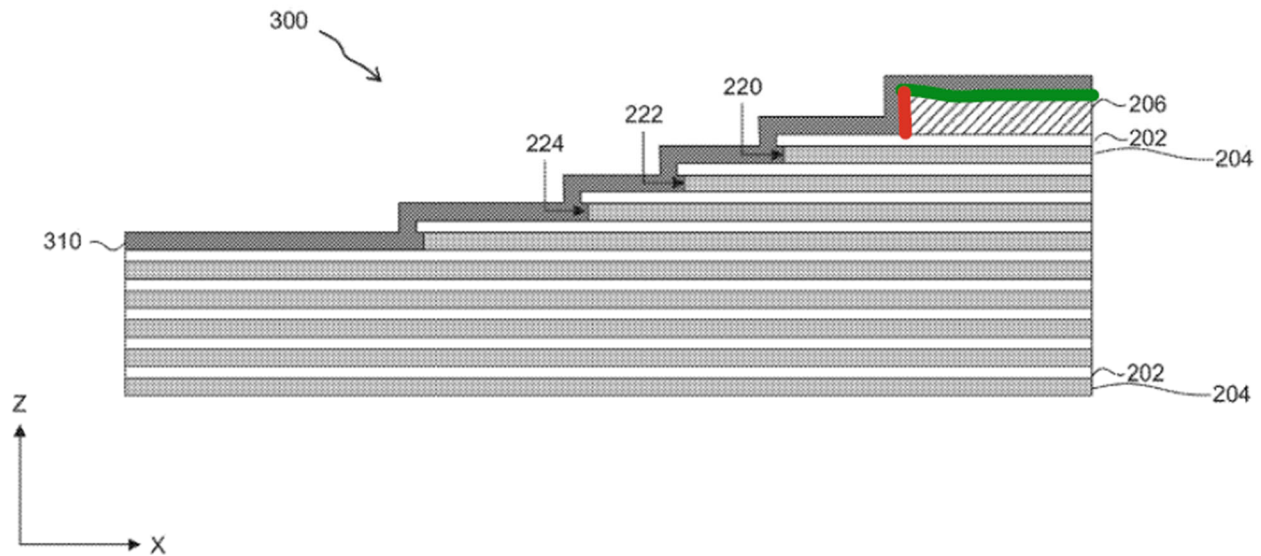
FIG. 1

'838 patent Fig. 1. Meanwhile, Figure 2A depicts the exposed “**top surface**” of the SC layer as a horizontal surface (shown in green), while the “**side**” is along the z-axis (in red). *Id.* 7:4-11; Giapis2 ¶71.



'838 patent Fig. 2A (annotated; concentrated).

As confirmed by Petitioner's expert, Figure 3 depicts a "**top surface** of hard mask layer 206" (green below) while what is "shown in red is a **side surface** of hard mask layer 206." Ex.2031 60:8-61:21; '838 patent 8:3-9; Giapis2 ¶72. That "side surface of the hard mask layer 206 is parallel to the y-z-axis - y-z plane," as shown below. Ex.2031 62:10-63:7; Giapis2 ¶72.

**FIG. 3**

Ex.2032 (Lee '666 Dep. Ex. 1) (annotated).

The '838 patent describes and depicts in Figure 4 the “top surface of hard mask layer 206” (in green) as a horizontal surface along the horizontal direction, while the “side of hard mask layer 206” (in red) is a vertical surface along the vertical direction. '838 patent 8:15-28; Giapis2 ¶73.

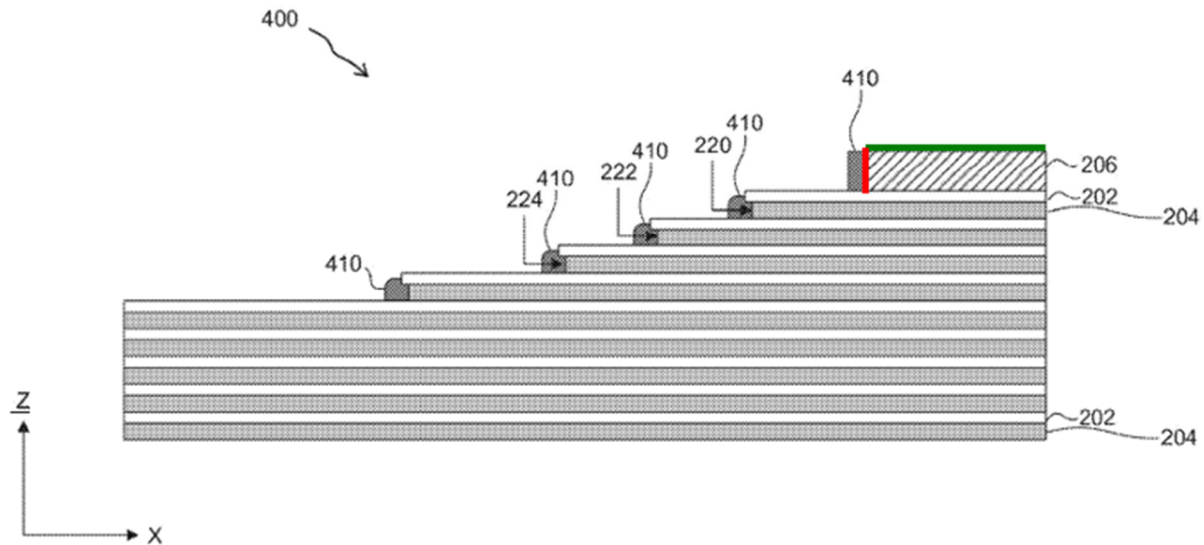


FIG. 4

'838 patent Fig. 4 (annotated).

Figure 5 “illustrates” the “**top surface**” of the sacrificial layer 204 and the spacer 410 of each SC layer as horizontal surfaces running in the x–y plane (depicted in green). *Id.* 8:41-45; *see also* Ex.2031 68:5-69:9 (agreeing that these top surfaces “run along the x–y plane”). Figure 5 also depicts “exposed” “**side**” surfaces (depicted in red) of insulating layer 502 as vertical surfaces along the vertical direction. '838 patent 8:44-45, Fig. 5; Giapis2 ¶74.

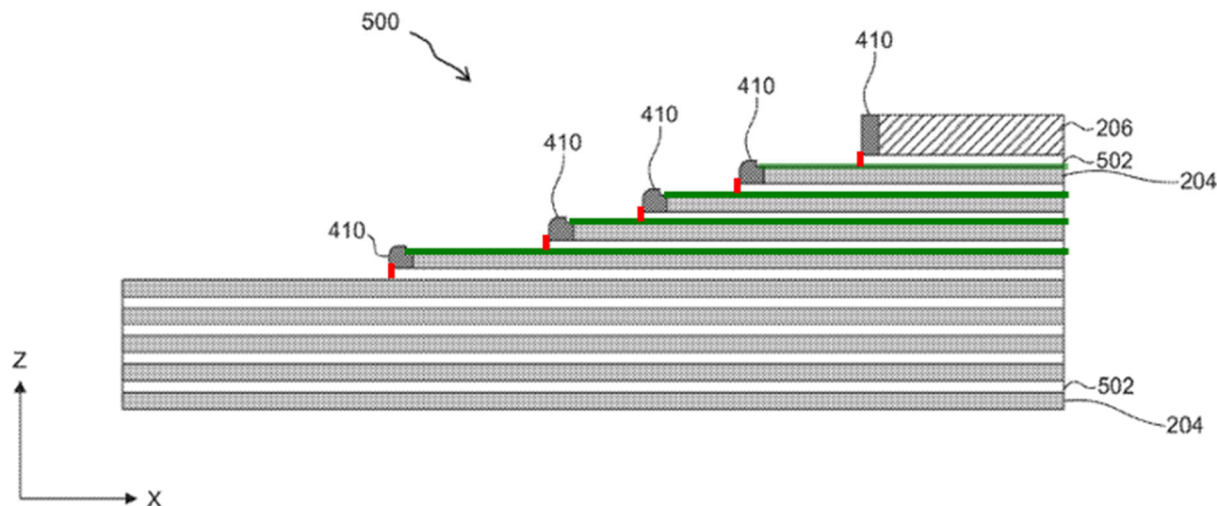
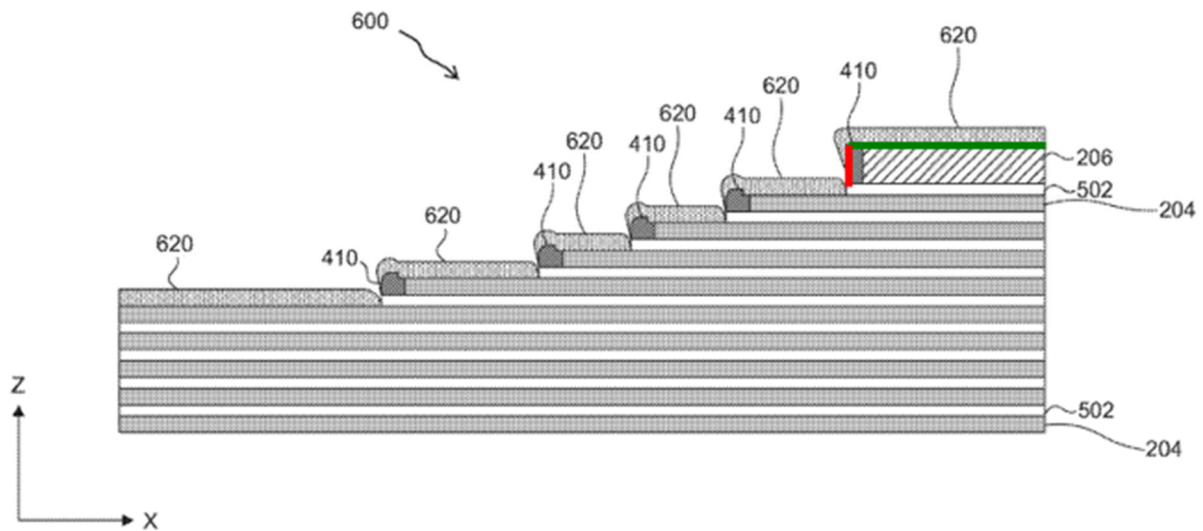


FIG. 5

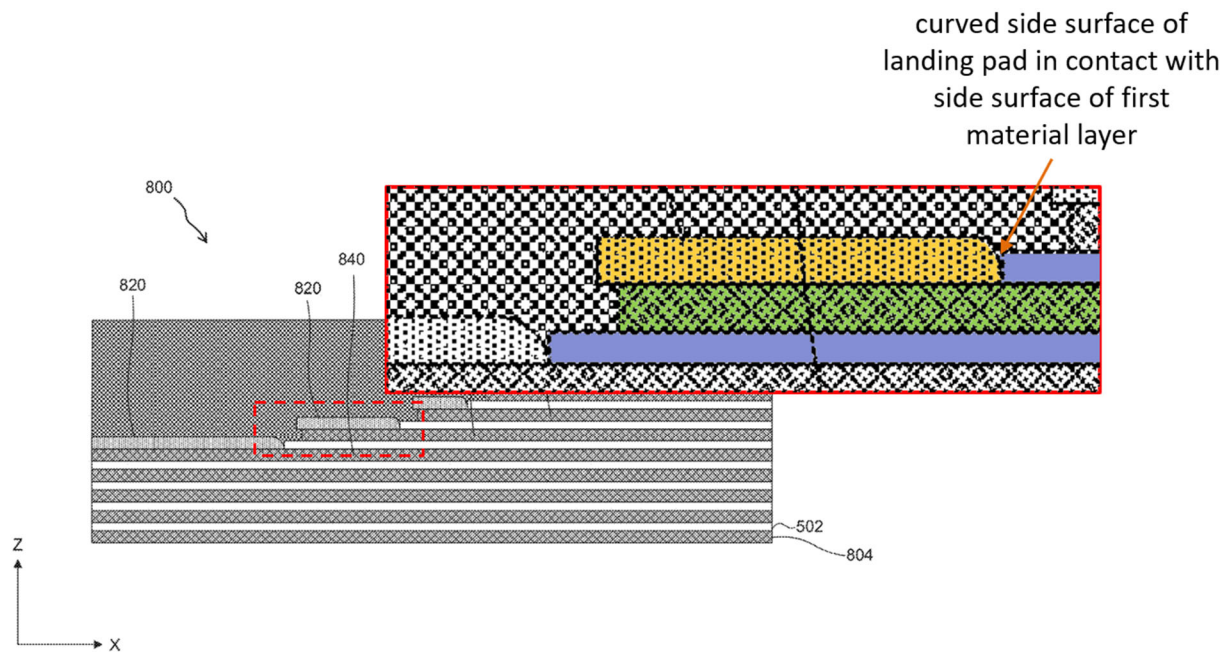
'838 patent Fig. 5 (annotated).

Figure 6 and its description also distinguish “top” surfaces from “side” surfaces, such that the “side” surfaces are vertical surfaces along the vertical direction. Ex.2031 78:8-79:13 (“the side surface of the staircase structure 500 is parallel to the y-z axis and perpendicular to the x-y plane.”). In Figure 6, “[d]ielectric layer 620 covers a **top surface** of staircase structure 500 and a **portion of a side** of staircase structure 500.” ’838 patent 8:48-50; *see also id.* 8:52-57 (labeling horizontal surfaces as “top surface[s]” and vertical surfaces as a “side”). As shown below, the “thinner” portion of dielectric layer 620 (which is described as being “at a **side** of staircase structure 600”) is at the vertical surface of the staircase structure, while the thicker portion is at the horizontal surface (described as “a **top surface** of staircase structure 600.”). *Id.* 8:57-60; Giapis2 ¶75.

**FIG. 6**

'838 patent Fig. 6 (annotated).

As shown in Figure 8 below, the only embodiment of the “curved side surface” of the “landing pad” (labeled as 820 in orange) is shown to be curved only along the vertical direction. Giapis2 ¶¶76-77; Ex.2030 135:3-36:14.



'838 patent Fig. 8 (annotated; concentrated). Indeed, consistent with claim 13, the '838 patent describes that “landing pad 820 contacts a portion of a **side** of insulating layer 502,” as identified in the above figure. *Id.* 9:66-10:3; Giapis2 ¶77. Thus, as the “only embodiment” of a “curved side surface,” it is “highly indicative of the scope of the claims.” *Medicines*, 853 F.3d at 1309.

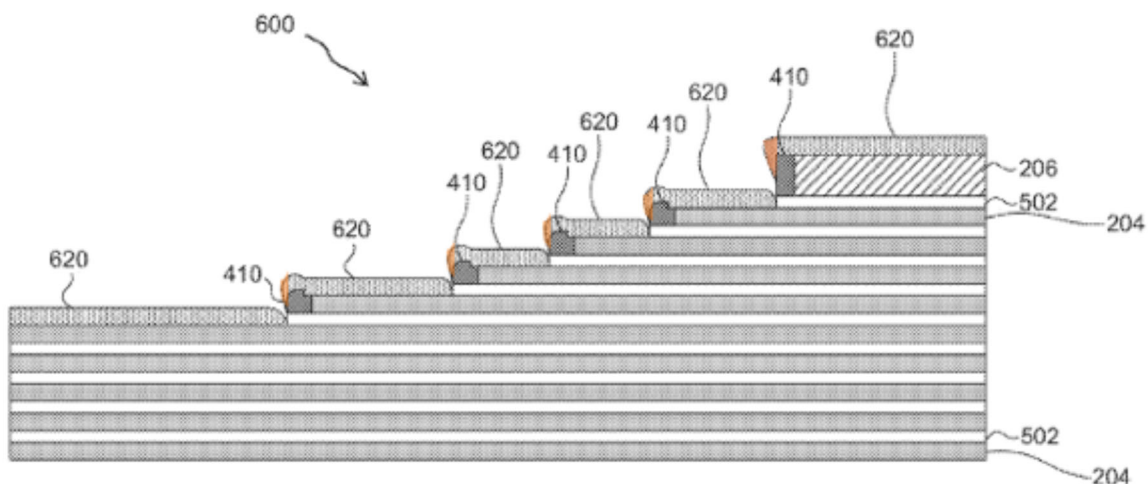
The specification also uses the terms “top surface” as a horizontal surface and “side” “surface” as a vertical surface when describing Figure 9—a Figure that reflects the descriptions and depictions already described above for Figures 1-8. Giapis2 ¶78; '838 patent 10:49-53, 11:60-62, 12:9-10, 12:37-44, 12:55-56, 12:63-66.

In sum, all 28 references to a “top surface” or “bottom surface” in the ’838 patent refer to a horizontal surface parallel to the x-y plane. *Giapis*2 ¶¶67-83. Meanwhile, each of the 60 references to a “side” or “side surface” in the ’838 patent is shown or understood to be vertical surfaces in a vertical direction. *Id.* Such consistent use of the term “side” or “side surface” to refer to a vertical surface in a vertical direction supports Patent Owner’s construction. *See, e.g., AstraZeneca LP v. Apotex, Inc.*, 633 F.3d 1042, 1051-52 (Fed. Cir. 2010) (“When a patentee uses a claim term throughout the entire patent specification, in a manner consistent with only a single meaning, he has defined that term ‘by implication.’”); *Nystrom v. Trex Co.*, 424 F.3d 1136, 1145 (Fed. Cir. 2005) (“Nystrom consistently used the term ‘board’ to refer to wood cut from a log. Although there was no clear disavowal of claim scope, there was nothing in the intrinsic record to support the conclusion that a skilled artisan would have construed the term ‘board’ more broadly than a piece of construction material made from wood cut from a log.”).

Further confirming Patent Owner’s construction, a curved side surface that is a “vertical surface curved along a direction (e.g., the z-axis) perpendicular to the top surface of the structure” is the only kind of curved side surface that can be formed from the only process disclosed in the ’838 patent. *Giapis*2 ¶¶36, 79-81. A POSITA would understand that the ’838 patent relies on a (gas-phase) vapor deposition technique with both directional and isotropic flux components, which will form

curved surfaces along the sidewalls in the vertical direction. '838 patent 8:46-9:12, 12:37-49; Giapis2 ¶¶36, 79-81.

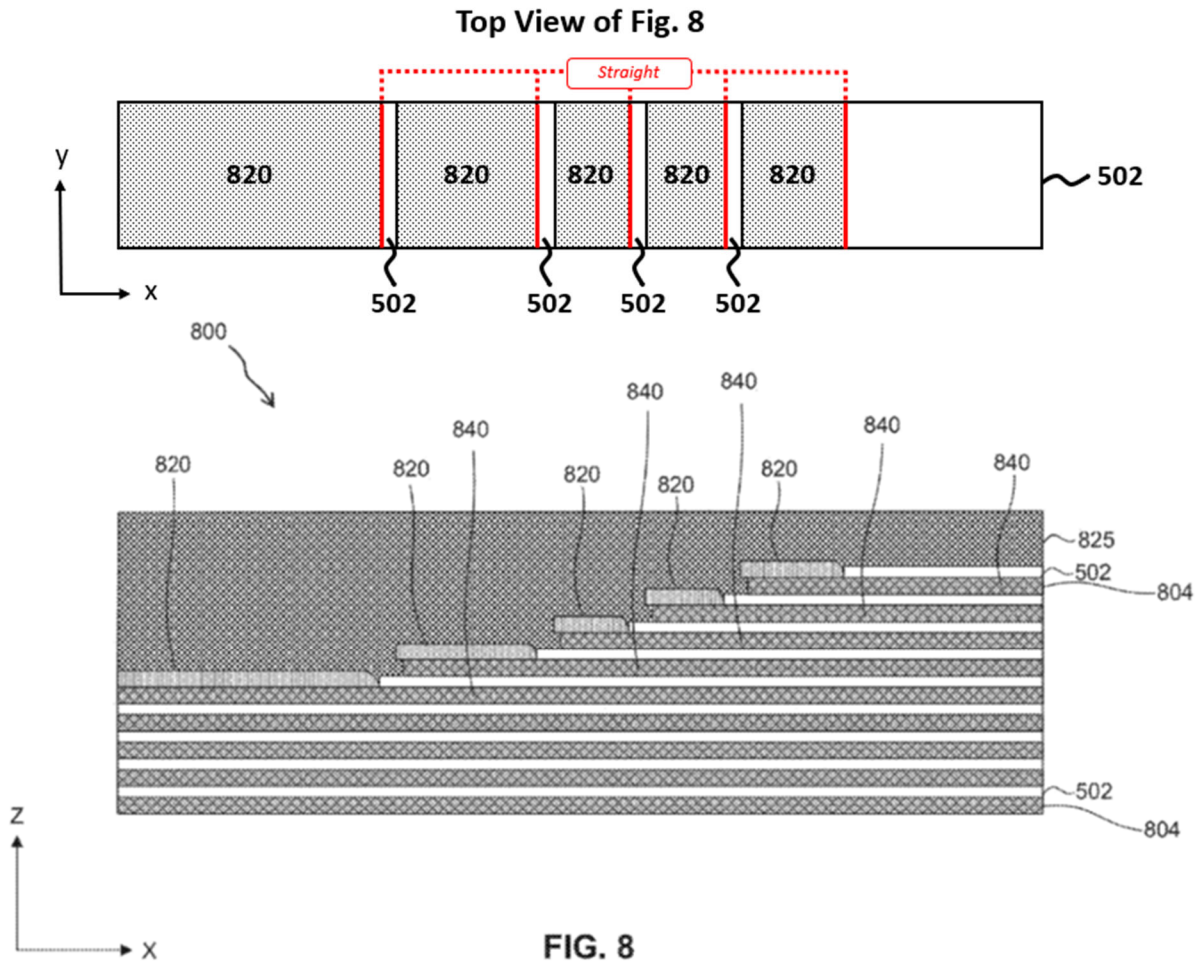
The '838 patent discloses no processes for forming a curved x-y, horizontal surface, nor does the '838 patent disclose any landing pad with a curved x-y, horizontal surface. Giapis2 ¶¶79-83. As explained in the '838 patent and depicted in Figure 6 below, a dielectric material is deposited onto the staircase structure so that the ensuing dielectric layer 620 has poor step-coverage on staircase structure 500,” where the thickness of layer 620 on the top surface of the stair step is thicker than the thickness of layer 620 on the side wall. '838 patent 8:56-60; Ex.2031 85:3-16; Giapis2 ¶¶34-43, 75-83. The thickness of the dielectric layer “is substantially thinner at the side of staircase structure 600 than that at a top surface of staircase structure 600,” resulting in a layer (620) with a surface that curves into the corner by the step sidewall, as shown below. '838 patent 8:46-9:12.



'838 patent Fig. 6 (annotated). This curved side surface remains when layer 204 and the remaining dielectric 620/720 are replaced to form a word line layer 804.

Id.; Giapis2 ¶¶34-43, 75-83.

The results of the process taught in the '838 patent is shown in the figure below, which is a depiction of a view of the staircase structure shown in Figure 8 from above (in the x-y plane). In this view, the landing pads 820 have no visible curvature. Giapis2 ¶80. Instead, the curved side surface described is along the z-axis, as shown in Figure 8. By contrast, nothing described in the '838 patent could result in a curvature in the x-y plane at that interface. *Id.* ¶80.



'838 patent Fig. 8 (annotated). Thus a “curved side surface” must be a vertical surface because the embodiments and the processes discussed in the specification do not support any contrary construction. *See World Class*, 769 F.3d at 1123-25 (construing support surface as distinct from ledge surface based on specification embodiments and rejecting contrary construction where there was nothing “in the written description or drawings that discloses an arrangement of the sort”).

The “express purpose of the invention ‘informs the proper construction of claim terms,’” and further supports that the “curved side surface” must be a vertical

surface curved along a direction (e.g., the z-axis) perpendicular to the top surface of the structure. *Sequoia Tech., LLC v. Dell, Inc.*, 66 F.4th 1317, 1326 (Fed. Cir. 2023). The stated purpose of the '838 patent's invention is to provide "a staircase structure for a memory device" that "provide[s] numerous benefits including, but not limiting to, yield and manufacturing cost improvements." '838 patent 1:42-47. A POSITA would have understood that one of these yield and manufacturing cost improvements is to have a "curved side surface," which limits the risk of short-circuits while also making it easy to manufacture. *Giapis*2 ¶¶43-46, 82-83. The effect of this novel "curved side surface" is shown below, where the arrows representing the separations (increased minimum distance) between adjacent conductive layers with the curved side surface are longer than those with a right-angle side surface, thereby reducing the risk of electrical shorting. *Id.* ¶43.

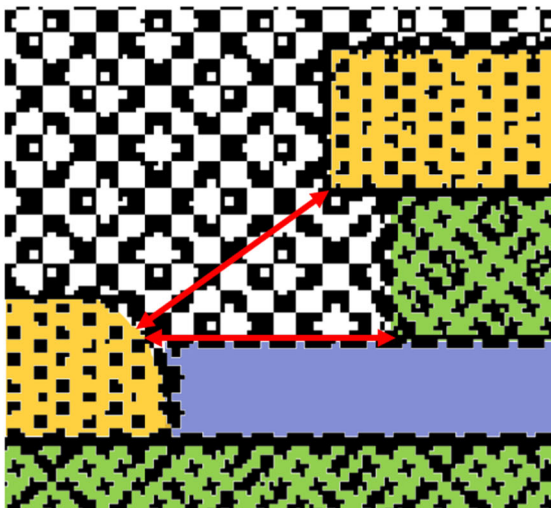
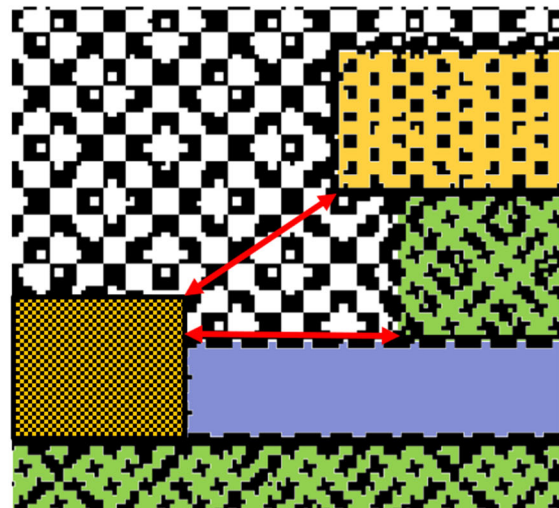


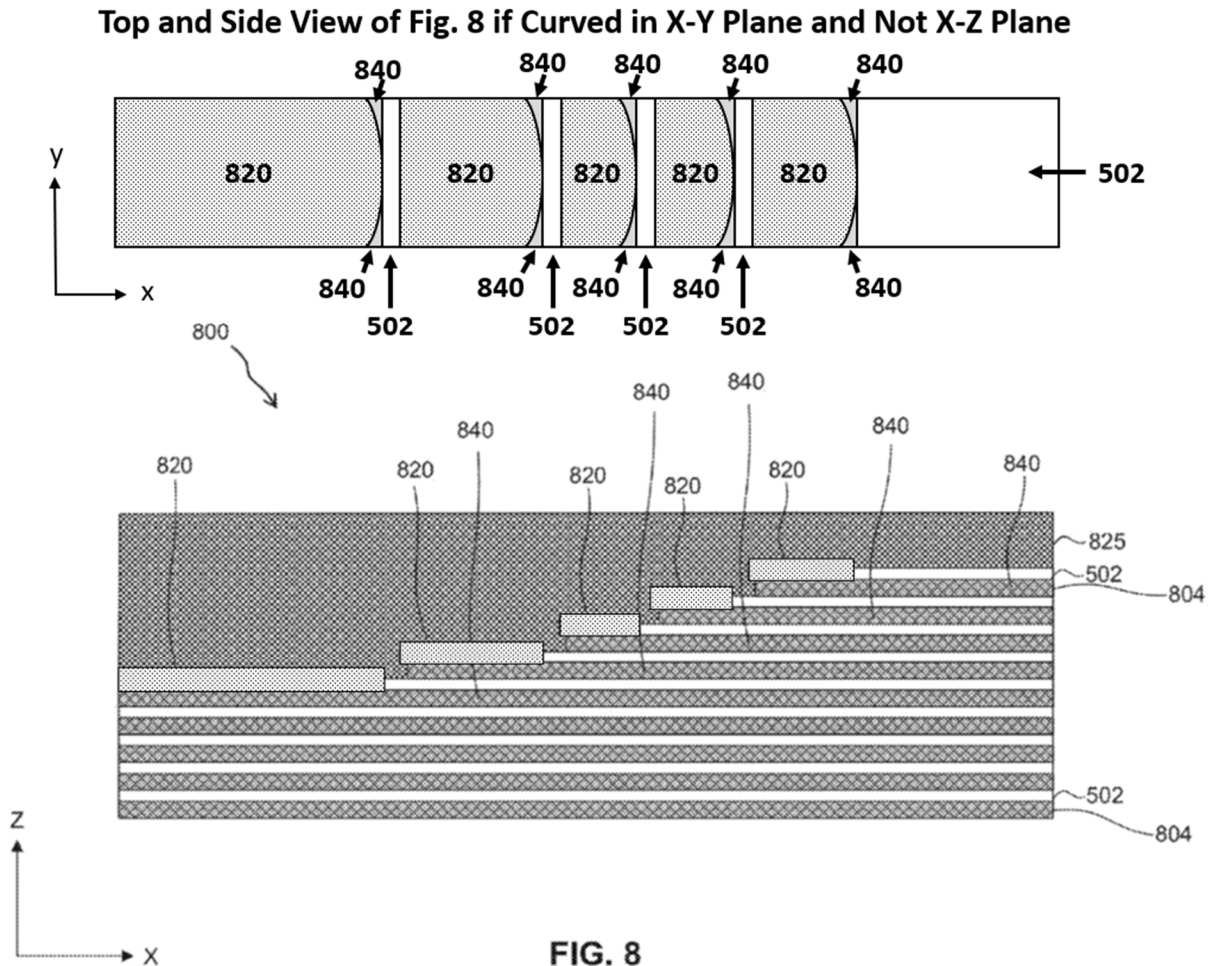
Fig. 8 of the '838 Patent
(zoomed in with annotations)



Other Structures

Petitioner's expert agrees with Patent Owner's expert, explaining that a "curved side surface" "reduce[s] the risk of short circuit" "by increasing the minimum distance between the pad and adjacent conductive layer[]." Ex.1003 (Lee Decl.) ¶245. Further, a "curved side surface" makes the memory device easier to manufacture because it maintains a thicker landing pad, limiting the risk of punch-through. Giapis2 ¶¶44-46, 82-83.

These purposes of the '838 patent would not be achieved if the surface were curved in the horizontal direction. If the landing pad portion were curved in the horizontal direction instead of the vertical, as shown in the top figure below—and ignoring that the '838 patent does not describe a way to do that—it would not increase the minimum distance to the immediately adjacent conductive layer at all. *Id.* ¶¶43-46, 82-83. Instead, at the minimum distance in the x-z plane, the resulting structure would be like the right figure above ("Other Structures") and the bottom modified Figure 8 below. *Id.*



'838 patent Fig. 8 (annotated and modified).

Patent Owner's construction of "curved side surface" does not improperly import any limitations. To the contrary every embodiment and description of a "side" surface in the specification is vertical, while all "top" and "bottom" surfaces are horizontal. And a POSITA would have understood the importance of the "curved side surface" being curved in a vertical, and not horizontal, direction for purposes of "yield and manufacturing cost improvements," such as short-circuit protection. *Id.* 1:42-46; Giapis2 ¶¶82-83; Ex.1003 ¶¶247, 482. Petitioner's expert agrees that there

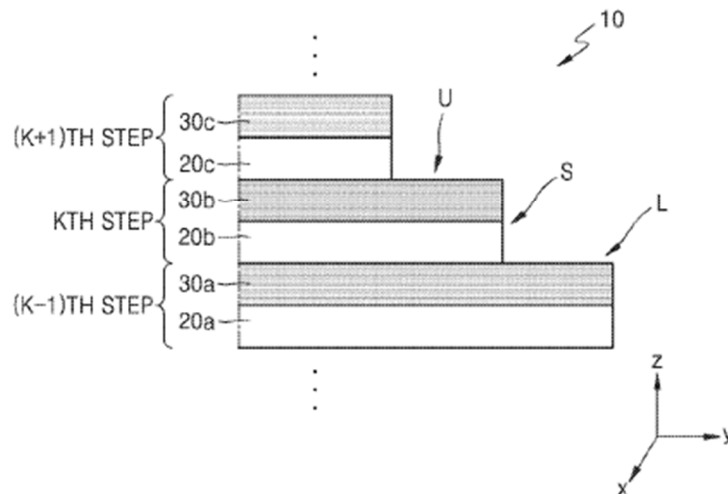
is “[a] decreased risk of short circuit resulting from the use of rounded pads.” Ex.1003 ¶247 “These two facts provide together a proper reason to limit the claims in this way.” *See, e.g., Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1137 (Fed. Cir. 2016) (“The district court’s analysis does not involve importing limitations from embodiments described in the specification. Every embodiment described in the specification has inwardly extended short seals and every section of the specification indicates the importance of inwardly extended short seals.”).

“The prosecution history, like the specification, provides evidence of how the U.S. Patent and Trademark Office and the inventor understood the patent,” and, here, is also consistent with Patent Owner’s proposed construction. *Iridescent Networks*, 933 F.3d at 1350. Petitioner’s expert admitted that he did “not recall any discussion” of “how the surfaces of the staircase structure should be curved.” Ex.2030 24:6-25:17. The only discussion about “curved side surfaces” was that the Examiner “agreed that cited prior art (Lee et al., US 2016/0218107) would not read on language regarding ‘curved’ structural feature.” Ex.1002 109, 177, 195. Thus, the prosecution history does not suggest a construction for “curved side surface” different from Patent Owner’s proposed construction. *Giapis2* ¶84.

In fact, the cited prior art also describes a “side surface” as being along the vertical direction. *See, e.g., V-Formation, Inc. v. Benetton Grp. SpA*, 401 F.3d 1307, 1311 (Fed. Cir. 2005) (“This court has established that prior art cited in a patent or

cited in the prosecution history of the patent constitutes intrinsic evidence.”). During prosecution, Applicant identified U.S. Patent Application Publication 2018/0301460 (“Yoo”) as prior art. Ex.1002 61, 172. As shown below, Yoo identifies the “side surface” as being along the vertical direction and uses the terms “upper” and “lower” to describe the surfaces in the horizontal planes. Ex.2041 (Yoo) [0103] (“The stepped structure 10 has an upper surface U, a lower surface L, and a side surface S connecting the upper surface U and the lower surface L.”).

FIG. 6A



Id. Fig. 6A. Thus, the cited prior art, like the '838 patent, describes “side surfaces” as being vertical surfaces, as opposed to horizontal surfaces, which are described as either “top”/“bottom”/“upper”/“lower” “surfaces.” *See, e.g., Id.* [0103], Fig. 6A; '838 patent 7:6-12, 8:1-7, 8:16-65, cls. 1-3, 6, 8, 11-15, 18, 20.

As the Federal Circuit has repeatedly held, “[t]he construction that stays true to the claim language and most naturally aligns with the patent’s description of the

invention will be, in the end, the correct construction.” *Phillips*, 415 F.3d at 1316. Indeed, “[t]he only meaning that matters in claim construction is the meaning in the context of the patent.” *Trs. of Columbia Univ.*, 811 F.3d at 1363. The evidence confirms that Patent Owner’s construction of “curved side surface” most naturally aligns with the described invention and thus the Board should adopt it.

III. Ground 1: Petitioner failed to demonstrate that Kim renders claims 1, 4-7, 12-17, and 19-20 obvious

A. Ground 1 does not rely on Kim Figure 5

While the Institution Decision relied on Kim Figure 5, Petitioner did not. Petitioner included only a single stray citation to Figure 5; Petitioner never claims it or any other non-island embodiments render obvious any challenged claim limitation. Pet. 34-36. Thus, the Board cannot find claims unpatentable based on Kim Figure 5. *See In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) (The Board cannot “adopt arguments on behalf of petitioners that could have been, but were not, raised by the petitioner during an IPR.”); *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (burden on Petitioner to show “with particularity” that claims are unpatentable).

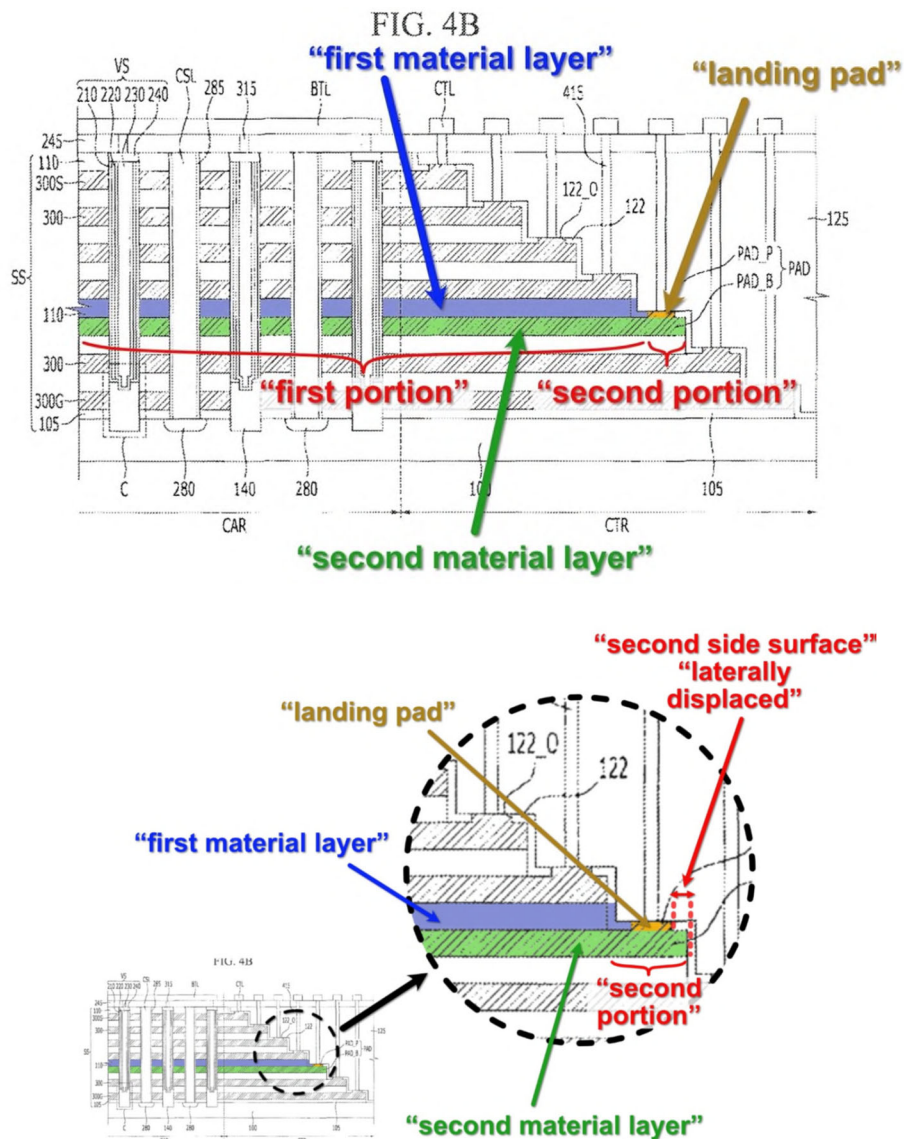
Further, even if Petitioner meant to assert that Figure 5 invalidates the challenged claims, Petitioner offers no supporting evidence. Petitioner’s expert admits he did not cite Figure 5 when forming his opinions. Ex.2030 59:9-11, 59:21-60:5. Without expert support, Petitioner’s cite is at best attorney argument (although

Petitioner made no such argument), which “is not evidence.” *Elbit Sys. of Am., LLC v. Thales Visionix, Inc.*, 881 F.3d 1354, 1359 (Fed. Cir. 2018); *Wasica*, 853 F.3d at 1284-85 (“attorney argument is no substitute for evidence.”)

Petitioner's citations to Kim in the Petition (34-36) do not suggest otherwise. Petitioner itself notes that an example of these disclosures “is shown in the three-dimensional view provided **in Figure 6.**” Pet. 35. At most, Petitioner relies on these citations to discuss the landing pad, not lateral displacement or the first and second material layers. This is evident from the Petition's pages 36-38, which discusses purported lateral displacement yet never discusses Kim Figure 5 or descriptions about it.

B. Kim does not render obvious the claimed arrangement

Claims 1 and 12 require a specific arrangement: (1) a “first material layer” “disposed over a first portion of the second material layer,” (2) a “landing pad disposed over a second portion of the second material layer,” and (3) a “second side surface” of the “landing pad” that is “laterally displaced from a side surface of the second portion of the second material layer.” Petitioner and its expert argue Kim alone meets these limitations, relying on Kim Figures 4B and 6 and its island shaped PAD_P structures as shown below. Pet. 27-38; Ex.1003 ¶¶144-202 (using annotated versions of only Kim Figures 4B and 6).

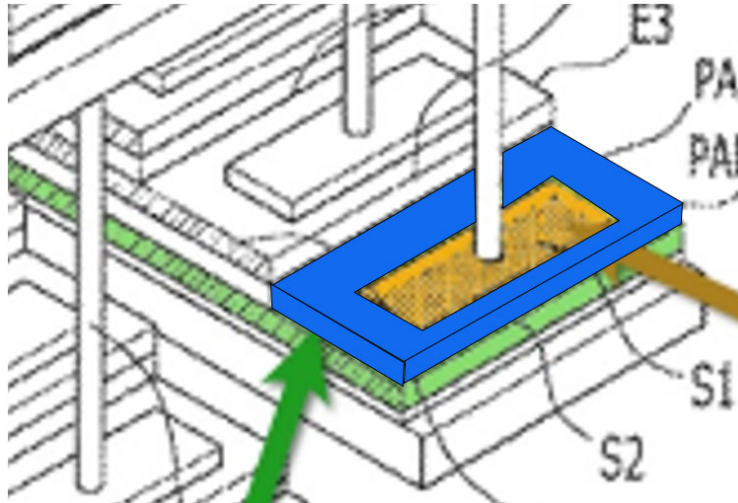


Pet. 31, 37.

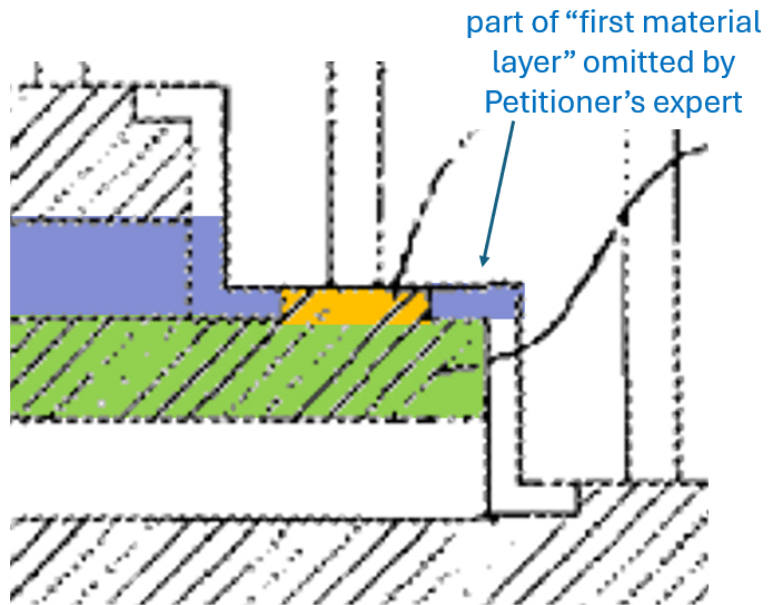
That reading misapprehends Kim. Petitioner and its expert map the '838 claim limitations solely to Figures 4B and 6 and treat layers 110 and 122—stated to “form one structure”—as the “first material layer.” Ex.1003 ¶¶144-202, 196; Pet. 27-38; Giapis2 ¶¶98-99; Ex.2030 38:8-39:16. Yet the Petition counts auxiliary layer 122 as part of the first material layer on only one side of PAD_P while excluding it on the

other—an impermissible, hindsight-driven cherry-pick. *See, e.g., Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1331-32 (Fed. Cir. 2019) (noting “the longstanding principle that the prior art must be considered for all its teachings, not selectively”); *Zoltek Corp. v. United States*, 815 F.3d 1302, 1313 (Fed. Cir. 2016) (noting expert’s reconstruction of patent figure was arbitrary and stating “[h]indsight reconstruction for litigation ends is not of probative value”).

Petitioner’s exclusion of portions of layer 122 from the first material layer contradicts Kim. Petitioner’s expert acknowledges that auxiliary layer 122 is deposited after the stepwise insulating layers 110 and before pad formation—i.e., “formed thereon”—and that “the auxiliary insulating layer 122 is used to form the contact pads” by creating “‘opening 122_O’ that will correspond to the pads.” Ex.1003 ¶¶157-158 (citing Kim 12:34-37, 12:61-13:11, 13:51-14:17, Fig. 11); *see also* Giapis2 ¶¶85-90, 99-108. The resulting structure includes auxiliary layer 122 (blue) surrounding the island-shaped PAD_P, as shown below. Kim 10:49-51; Ex.2030 56:7-11, 58:1-7; Giapis2 ¶¶100-108.

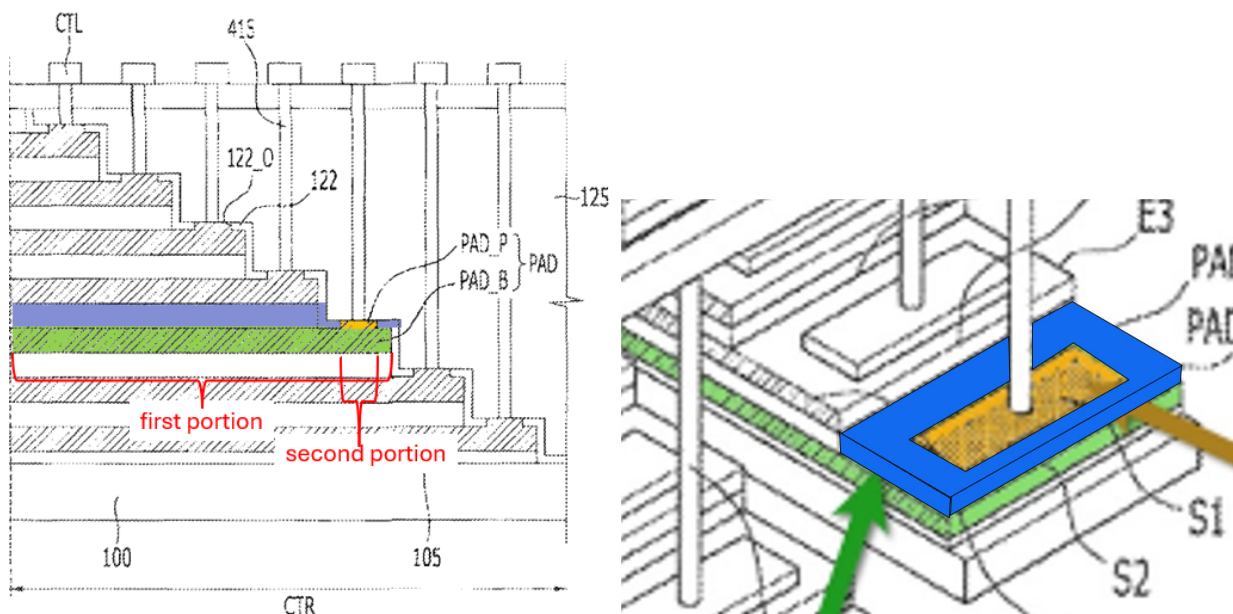


Yet Petitioner and its expert just ignore that layer 122 surrounds PAD_P in their mapping of Kim to the claims. Ex.1003 ¶¶157-162, 251-255; Giapis2 ¶¶99-108. Petitioner and its expert both arbitrarily define the “first portion” to either (1) terminate where the annotated blue color stops at the PAD_P (as shown on Pet. 31) or (2) terminate where the annotated blue color stops at the layer 122 (as shown on Pet. 37). But these arbitrary labels of the “first portion” ignore that the first material layer 110 and 122 extends all the way past the end of the second material layer below it, as shown below.



Kim Fig. 4B (annotated); *see* Giapis2 ¶106.

A POSITA reading Kim would understand that the first material layer (below in blue) extends beyond the edge of the second material layer (green) below it and encircles PAD_P. Giapis2 ¶¶103-107.



Kim Fig. 4B, 6 (cropped and annotated). As a result, Kim does not teach the claimed lateral displacement. Notably, Petitioner's expert "did not opine that Kim teaches [the lateral displacement] limitation." Ex.2030 52:14-21. Instead, *all* sides of the landing pad contact the first material layer. As a result, the PAD_P and the second portion are coterminous when viewed from above, and thus there is no lateral displacement. *See* Giapis2 ¶¶107-108.

Thus, when accounting for Kim's teachings, Kim fails to show the claimed arrangement required by claims 1 and 12. Indeed, Petitioner's expert admitted that none of the references he reviewed, including Kim, "disclose every element of a claimed invention arranged or stated in the claim." Ex.2030 33:7-35:20. Ground 1 fails.

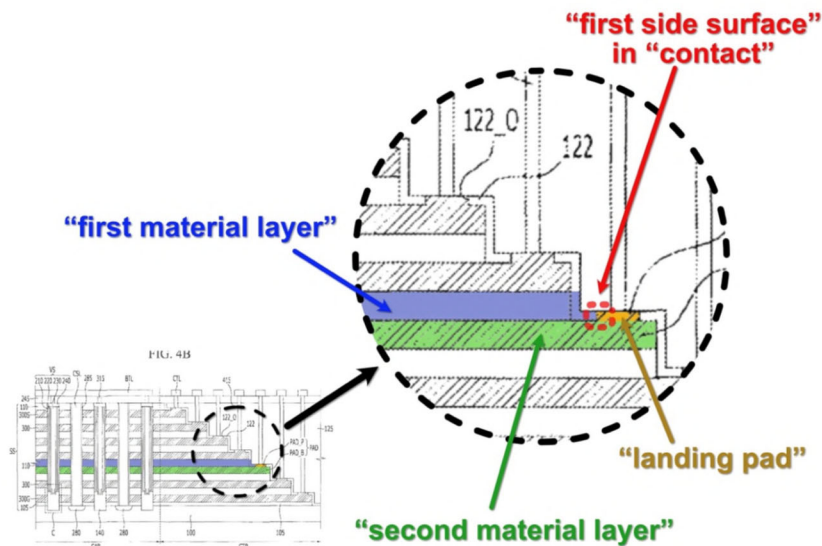
C. Petitioner fails to establish claims 13-15 are obvious in view of Kim's non-island embodiments

In the Institution Decision, the Board signaled its view that only the Figure 5 embodiment showed claims 1 and 12. As explained above, Kim's Figure 5 is not properly before the Board for consideration. But if Petitioner must rely on Kim's non-island Figure 5 embodiment to show all the limitations of claims 1 and 12 are obvious, then Petitioner fails to establish that claims 13-15 are invalid. For claims 13-15, Petitioner relies exclusively on the hypothetical island embodiments depicted in Kim Figures 4B and 6 without explaining of how the non-island embodiments

render claims 13-15 invalid. Pet. 41-51. Because the island embodiments do not render obvious the limitations of the independent claims, they cannot render obvious the dependent claims either. Regardless, Kim does not disclose the “claimed side surface” either.

D. Kim does not render obvious a “curved side surface” as in claims 13-15

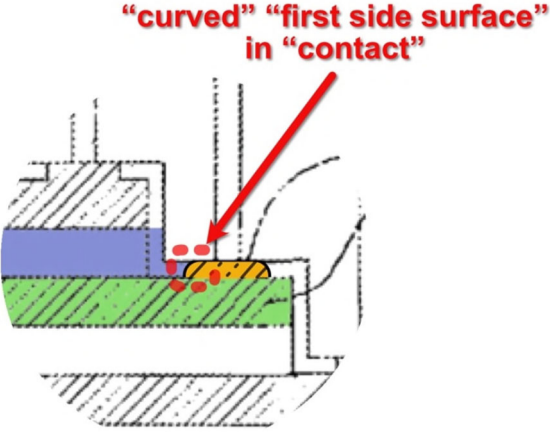
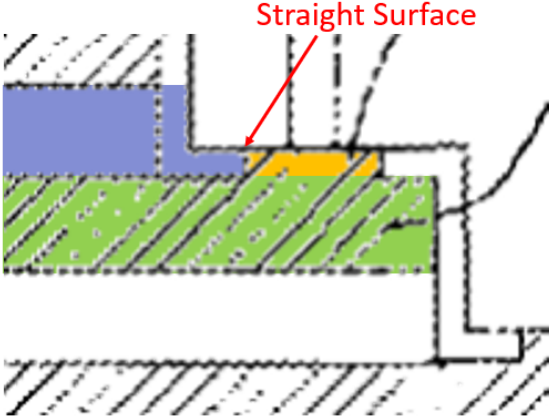
Petitioner cites Kim’s Figure 4B to argue it shows a “landing pad” where the “first side surface comprises a curved side surface” Pet. 41-49. Petitioner is wrong. Figure 4B depicts a “landing pad” with a **straight** side surface.



Id. 45 (Petitioner’s annotations); Ex.2031 174:14-175:6 (“In Figure 4B, Figure 4B does not show a curved -- curved region....”). Kim also states that in the embodiments “illustrated,” the conductive “PAD_P” (orange) has “a rectangular parallel[] shape”—i.e., a shape with **straight** surfaces. Ex.1005 (Kim) 7:58-8:31, Fig. 5 (showing PAD_P having a box shape with no curved sides), Fig. 6 (same),

Fig. 7 (same); Giapis2 ¶¶110-114. Petitioner's expert admits that "Kim does not expressly or inherently disclose the curved side surface." Ex.2031 130:8-133:3. Thus, Kim does not disclose the claimed "curved side surface."

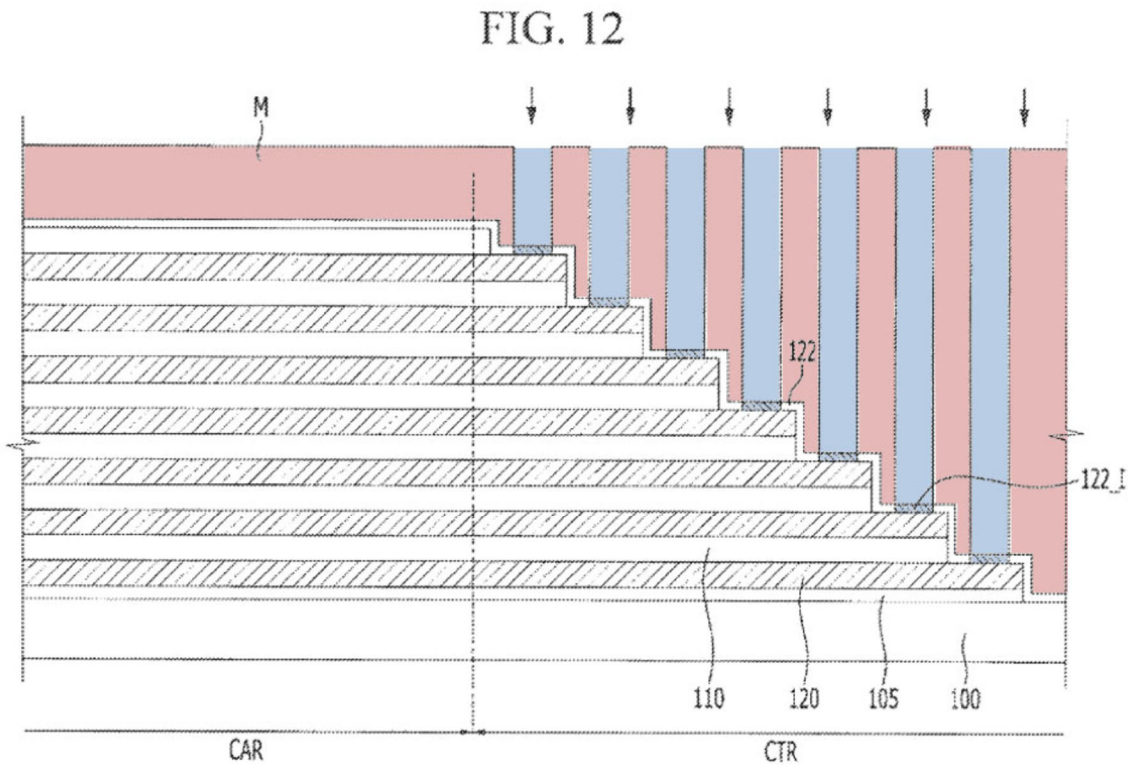
Despite Petitioner's expert's admission to the contrary (Ex.2031 130:8-133:3), Petitioner and its expert argue that "Kim teaches that the 'first side surface' of its 'landing pad' that is in 'contact' with its 'first material layer' is (or at the very least obviously can be) 'curved.'" Pet. 41. Petitioner cites Kim (8:29-34) to allege that "PAD_P would obviously be shaped in the manner shown" in Petitioner's modified figure, in contrast to what Kim discloses. Pet. 41-42. Petitioner is incorrect again and fails to show such a shape would have been obvious as it is infeasible under Kim's process steps.

Petitioner's Modified Figure (Pet. 42)	Actual Figure from Kim
 <p>The diagram shows a cross-section of a device. A blue rectangular layer is on top of a green hatched layer. A red arrow points to the interface between them, with the text "curved" "first side surface" in "contact" in red. The interface is depicted with a curved, wavy line.</p>	 <p>The diagram shows a cross-section of a device. A blue rectangular layer is on top of a green hatched layer. A red arrow points to the interface between them, with the text "Straight Surface" in red. The interface is depicted with a straight horizontal line.</p>

First, Kim does not teach the claimed “curved side surface in contact with a side surface of the insulating layer” because it does not teach a vertical surface curved along the vertical direction. While recognizing Figure 4B does not show a curved side surface, Petitioner argues that any shape is possible with Kim. Pet. 41. Petitioner is wrong, and a POSITA would have understood that none of Kim’s disclosures involve a vertical surface curved along a direction (Kim’s z-axis) perpendicular to the top surface of the structure. Giapis2 ¶¶110-122; Ex.2031 173:9-182:5. In fact, in cross-sectional view, each of Petitioner’s shapes will always look as it does above on the right in Kim’s Figure 4B, i.e., with straight vertical sidewalls. Giapis2 ¶¶92-97, 111-120.

Second, Petitioner argues that “contact pads with curved side surfaces would have been among the available design choices a POSITA would have considered for use” with Kim. Pet. 45. That is also incorrect. Kim’s manufacturing process cannot produce a vertical surface curved along the vertical direction, as required by the claimed “curved side surface.” Kim uses “a photosensitive resin pattern M” that precisely defines “the region 122_I for forming the protrusion pad.” Kim 12:61-67. This pattern exposes predetermined regions of auxiliary insulating layer 122 during the ion injection process. *Id.* 12:61-67, Fig. 12; Giapis2 ¶¶87-88. The masks are horizontally shaped, allowing vertical ion injection (as shown in Kim Figure 12) into only the exposed regions. Kim 12:61-13:11; Ex.2031 149:9-11, 154:12-20; Giapis2

¶¶87-90. The ion injection process alters the exposed regions 122_I to “have a different etching ratio” from the rest of auxiliary insulating layer 122. Kim 13:5-11; Giapis2 ¶¶87-90. Figure 12 of Kim shows this ion injection process, with the annotated areas in pink protected from injection by the mask M, while the annotated blue areas denote areas through which ions are injected into auxiliary layer 122 to form doped regions 122_I. Giapis2 ¶87.

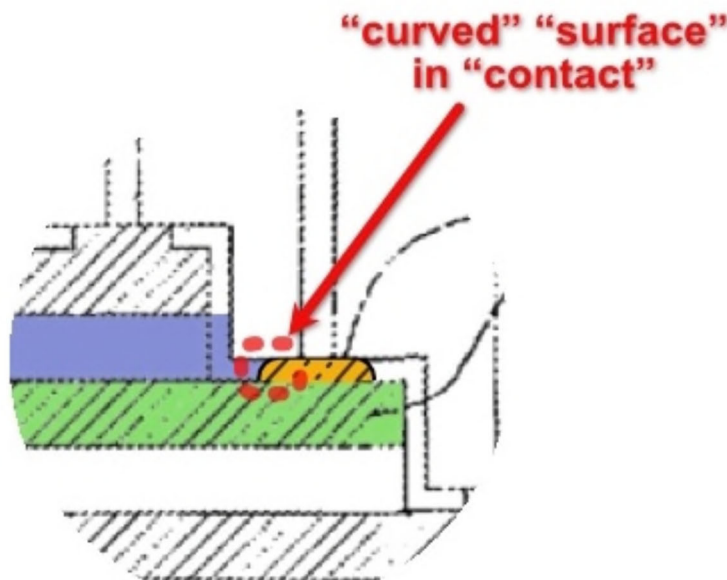


Kim Fig. 12 (annotated).

The doped regions 122_I, now with “a different etching ratio,” are etched away to form “opening[s] 122_O” where “conductive layer PAD_Ps are formed.” *Id.* 13:55-67, 14:6-17, Figs. 16-17; Giapis2 ¶¶87-93. Regardless of the mask hole

shape, the structure resulting from Kim's ion injection process will have straight vertical sidewalls in the x-z and y-z planes. *Giapis2* ¶¶86-97, 114. Kim only describes changing the etching ratio of the entirety of 122_I. *Id.* ¶89. Kim does not describe any other process for injecting ions, let alone one that could result in a curved side surface in the vertical direction. *Id.* ¶¶86-97, 114. Indeed, an ion injection process like Kim's cannot result in Petitioner's made-up figure. *Id.* ¶¶86-97, 114-115, 136. And Petitioner provides no explanation for how a POSITA would form such a surface from Kim's teachings. *Id.* ¶114.

The Petition says nothing about how Kim's process will form a vertical surface curved along the vertical direction. Instead, the Petition concludes, without explanation how, that "PAD_P would obviously be shaped in the manner shown."

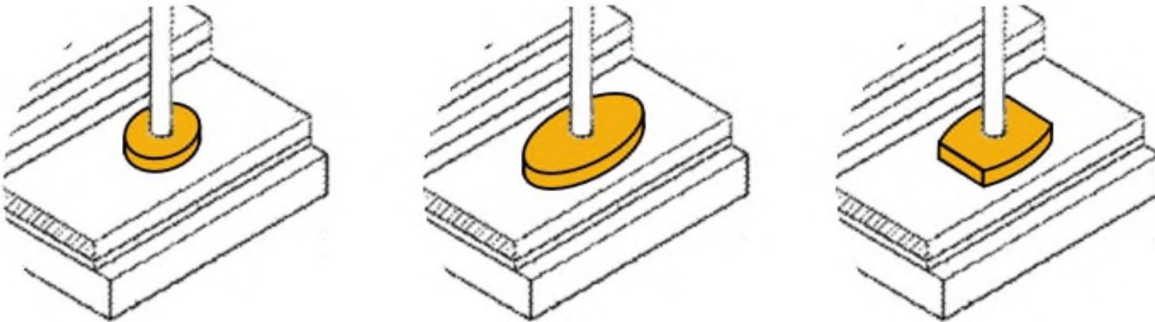


Pet. 41-42. Petitioner's expert does not fill this void either, as he merely parrots the same statement. Ex.1003 ¶225. Such parroted expert testimony is both incorrect (as explained above) and insufficient to support obviousness. *See, e.g., Harmonic*, 815 F.3d at 1363 (“[Petitioner's] expert testimony in support of this theory is equally unavailing, adding nothing beyond the conclusory statements in [the] petition.”); *Smartmatic USA Corp. v. Election Sys. & Software LLC*, IPR2019-00527, Paper 32 at 34 (P.T.A.B. Aug. 5, 2020) (giving no weight to an expert declaration that “merely parrots the language in the Petition”).

Third, Kim teaches embodiments “in which the protrusion pad PAD_P has a rectangular parallele shape is illustrated.” Kim 8:29-34. But as Petitioner's expert confirmed, “none of the figures in Kim” “show a curved sidewall side surface.” Ex.2031 175:20-176:17. Given that Kim states that a “rectangular parallele shape is illustrated,” a rectangular parallele shape protrusion pad PAD_P does not have a curved sidewall surface at all. Kim 8:29-34, Figs. 4B, 5; Giapis2 ¶¶93-97, 112.

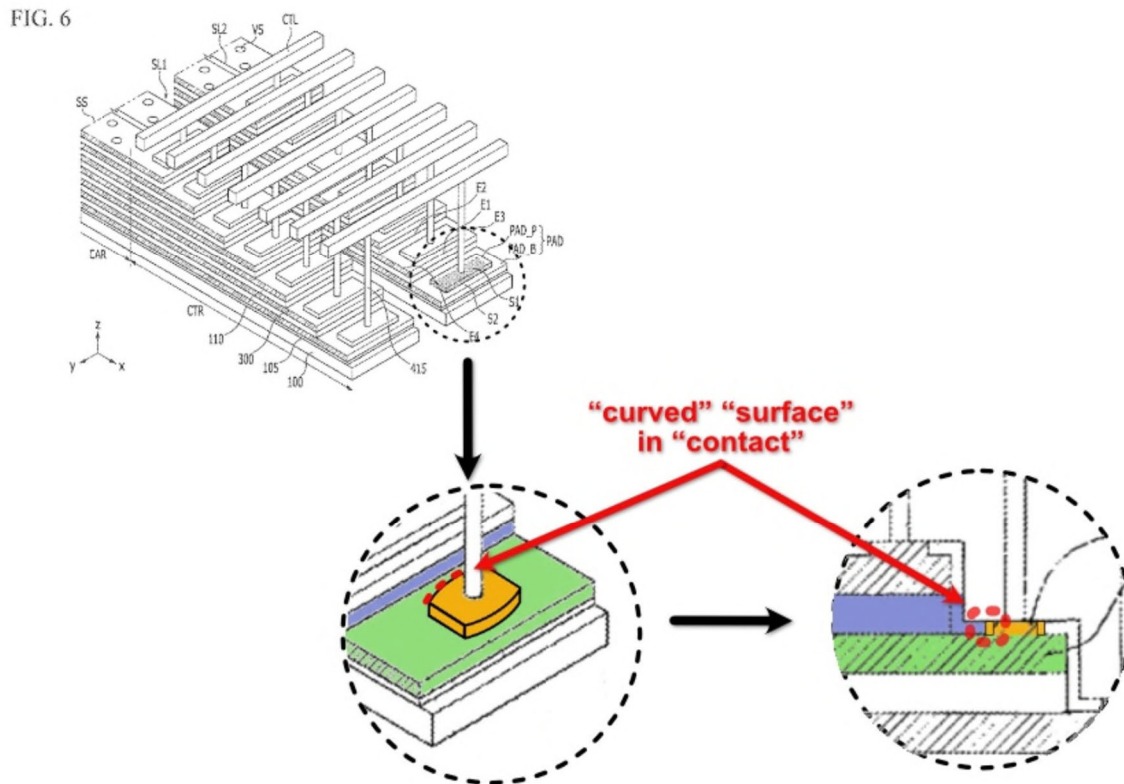
Fourth, Petitioner's expert agrees that “Kim does not expressly or inherently disclose [the curved side surface].” Ex.2031 130:8-133:3. Thus, his testimony contracts Petitioner's argument that “a POSITA would have understood that Kim's ‘cylindrical[ly]’shaped protrusion pads PAD_P also include the type of ‘curved’ surface that claim 13 requires.” Pet. 47-49. Regardless of whether “a right cylinder, an elliptical cylinder, or even a generally rectangular pad with two sides that follow

a cylindrical pattern” is formed, as argued, none of these shapes curve vertically, and thus they do not form the claimed “curved side surface.” *Id.* 47-49; Giapis2 ¶¶117-122. In fact, all shapes Petitioner suggests as examples of “how a POSITA would have understood these pads to be shaped” (reproduced below) are straight vertically and do not meet the “curved side surface” requirement. Giapis2 ¶¶110-122. This is because, as explained above, curvature in the vertical direction is not possible following Kim’s teachings.



Pet. 47. Thus, when viewed along a x-z or y-z cross-section, the surface of the protrusion pad PAD_P in contact with the insulating layer will be straight in the vertical direction, not curved as claimed. As Petitioner’s expert agrees, even with a cylindrical shape, “[w]hen viewed in cross-section, the sides appear straight.” Ex.1003 ¶265. Petitioner acknowledges this with its own drawing of Figure 6 (reproduced below from Pet. 48), showing a straight vertical surface. In other words, any curvature in Kim has no effect on the minimum distance between conductive layers. Giapis2 ¶121. This is in stark contrast to the ’838 patent where the cross-

sectional view shows the curved side surface that results in increased minimum distance, as discussed above. '838 patent Fig. 8; Giapis2 ¶¶43-44.



Kim Fig. 6 (reproduced from Pet. 48).

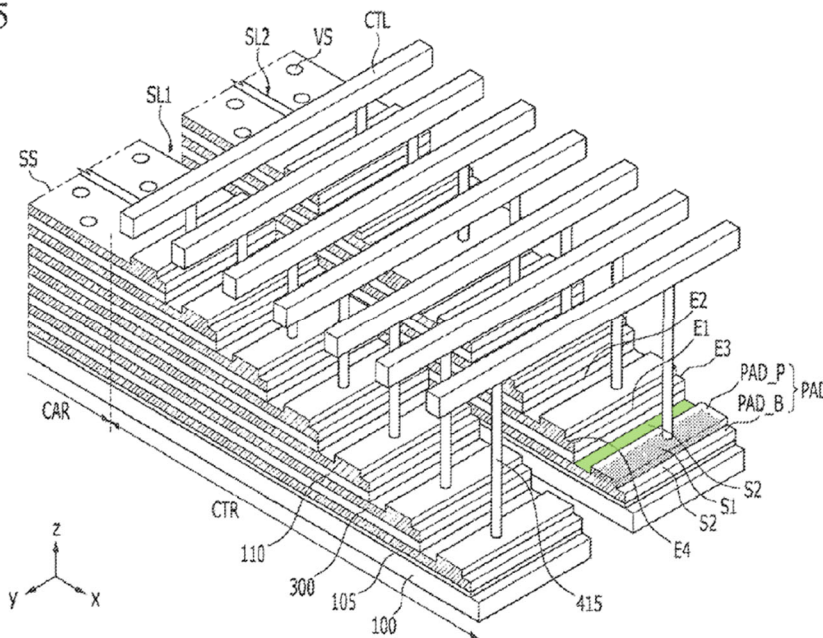
1. Petitioner failed to establish that Kim in view of knowledge of a POSITA renders obvious the claimed “curved side surface.”

Petitioner claims that “contact pads with curved side surfaces would have been among the available design choices a POSITA would have considered for use” with Kim because it would have reduced the risk of short-circuit. Pet. 45-46. That is incorrect. A POSITA would not have been motivated to alter Kim to reduce short-circuit risk, as Kim already addresses this issue with three other methods. Adding a

further method would have been redundant, unnecessary, and as proposed by the Petitioner, counterproductive. *Giapis2* ¶¶123-134.

First, Kim's mask process prevents short-circuits by creating separation between pad units, as shown in green below.

FIG. 5



Kim Fig. 5. As taught by Kim, forming the protrusion pad PAD_P “inside from the edge of a surface of the base pad PAD_B [is] to prevent the short-circuit between the pad units PAD positioned at different rows.” *Id.* 9:46-49, Figs. 5-9; *see also id.* 7:63-67 (“The pad unit PAD and the adjacent pad unit PAD may not overlap with each other.”); *Ex.2031* 171:22-172:16, 183:13-184:8; *Giapis2* ¶¶123-134.

Second, Kim “effectively prevent[s]” short-circuits by maintaining “auxiliary insulating layer 122 positioned between the adjacent protrusion pads PAD_P

positioned at different rows.” Kim 9:50-55, Fig. 4B; Ex.2031 184:16-185:8; Giapis2 ¶132.

Third, Kim “prevent[s] a short circuit” by making the “z-direction thickness of the insulating layer 110 ... in the z-direction between two adjacent pad units PAD.” Kim 9:7-11; Giapis2 ¶133.

The Petition and Petitioner's expert do not mention any of Kim's three methods for preventing short-circuits, nor do they explain why these methods are inadequate. They also fail to identify any advantages of a “curved side surface” over Kim's disclosed methods. Thus, the Petition fails to establish that a POSITA would have been motivated to modify Kim's straight side surface to a “curved side surface.” *See, e.g., In re Anova Hearing Labs, Inc.*, 809 F. App'x 840, 843 (Fed. Cir. 2020) (reversing obviousness finding because “[t]he Board also does not explain why a person of ordinary skill in the art would be motivated to modify Brown, **which already includes vents, to address occlusion effect**”); *South-Tek Sys., LLC v. Engineered Corrosion Sols., LLC*, 748 F. App'x 1003, 1006-07 (Fed. Cir. 2018) (finding claims non-obvious because “South-Tek only argued that a person of ordinary skill would have been motivated to use Wood's drain to allow water to drain from Viking's system. **Viking's system already includes a drum drip drain that serves this purpose.**”); Giapis2 ¶¶123-134.

Beyond its flawed short-circuit rationale, Petitioner's sole motivation for altering Kim is that "[c]ontact pads with this type of 'curved' side surfaces were well-known in the art," and "would have been among the available design choices a POSITA would have considered for use" with Kim. Pet. 42-47. This is insufficient to establish obviousness. *See, e.g., Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886-88 (Fed. Cir. 2024) (reversing Board's obviousness finding and explaining that relying on disclosure in prior art as "therefore 'known'" without "[a] reason for combining" "is an error as a matter of law"); *Forest Laboratories, LLC v. Sigmapharm Laboratories, LLC*, 918 F.3d 928, 934 (Fed. Cir. 2019) ("[A]n invention is not obvious simply because all of the claimed limitations were known in the prior art at the time of the invention.").⁴

⁴ The Acting Director's Memorandum, Enforcement and Non-Waiver of 34 C.F.R. § 42.104(b)(4) and Permissible Uses of General Knowledge in Inter Partes Reviews, dated July 31, 2025 (https://www.uspto.gov/sites/default/files/documents/aapa_memo_final_signed.pdf?utm_campaign=subscriptioncenter&utm_medium=email&utm_source=govdelivery), expressly states that the USPTO will enforce the requirement of 37 C.F.R. § 42.104(b)(4) for Petitions filed after September 1, 2025. While this Petition was filed before that date, it fails to comply with the PTAB's

Additionally, Petitioner failed to establish the necessary basis for using “general knowledge of a POSITA” to demonstrate the claimed “curved side surface.” Common knowledge can “fill in a missing limitation only when the limitation in question was unusually simple and the technology particularly straightforward.” *DSS Tech. Mgmt., Inc. v. Apple Inc.*, 885 F.3d 1367, 1374-76 (Fed. Cir. 2018). Petitioner did not demonstrate this. Nor could it. Forming curved side surfaces involves complex semiconductor processes, such as “a (gas-phase) vapor deposition technique with both directional and isotropic flux components.” *Giapis2* ¶¶36, 80; ’838 patent 8:46-9:12. Further, 3D NAND technology is “complex” and not straightforward. *Giapis2* ¶¶24-25; Ex.2024 (Micheloni) 199 (“3D NAND architectures need to be proven cost effective in terms of process costs and product yield because the process complexity is not trivial if compared to 2D NAND.”); Ex.2023 (Counterpoint) 6 (“NAND is a complex technology that presents some major manufacturing challenges....”). Thus, relying on what was supposedly well-known to a POSITA to provide the missing “curved side surface” is legal error.

Ground 1 also fails because Petitioner has not established that a POSITA would have had a reasonable expectation of success in implementing the proposed

Rules due to its failure to “specify where each element of the claim is found in the prior art patents or printed publications relied upon.” 37 C.F.R. § 42.104(b)(4).

combination. “A finding by the Board that a patent challenger has demonstrated a motivation to combine references does not necessarily imply that the challenger has also met its burden of showing a reasonable expectation of success in achieving a claimed method of treatment.” *Eli Lilly & Co. v. Teva Pharms. Int’l GmbH*, 8 F.4th 1331, 1344 (Fed. Cir. 2021).

The Petition does not explain *how* a POSITA would, or even could, change Kim’s side surfaces to be “curved.” At most, Petitioner’s expert offers a conclusory opinion that Kim “would simply be tailored to form a ‘doped region 122_I’ with curved rather than straight sides.” Ex.1003 ¶256; Pet. 46-47. The Board should give no weight to such testimony. *See, e.g., Harmonic*, 815 F.3d at 1363 (“[Petitioner’s] expert testimony in support of this theory is equally unavailing, adding nothing beyond the conclusory statements in [the] petition.”); *Smartmatic*, Paper 32 at 34 (giving no weight to an expert declaration that “merely parrots the language in the Petition”).

Petitioner asserts that curving side surfaces was a well-known technique, citing three references—Park, Yun, and Nam—not included in Ground 1. Yet, a POSITA would not have a reasonable expectation of success in merging Kim’s manufacturing processes with any of the different techniques of Park, Yun, or Nam to create the claimed “curved side surface.” The Petition establishes no reason for expecting success nor a motivation for making these combinations.

Park. Park's and Kim's manufacturing processes are fundamentally different, preventing their combination to form the claimed "curved side surface." Giapis2 ¶¶135-140. Park achieves a rounded structure through a thermal oxidation process for additional insulating layers 40 or 66. *See, e.g.,* Ex.1009 (Park) 8:28-33, 12:16-20; Ex.2031 247:9-15. Kim, however, does not use thermal oxidation. Giapis2 ¶¶85-97, 136-140. The portions of Kim's auxiliary layer that Petitioner suggests rounding are not exposed and consist of "for example, silicon oxide layers" so oxidizing them would not create rounding. Kim 6:35-36; Giapis2 ¶¶139-140. Thus, no POSITA could or would convert Kim's non-oxidative process into an oxidative one to form curved side surfaces on a conductive layer, and the Petition offers no rationale for doing so. Giapis2 ¶140. To incorporate Park's rounded corners into Kim, a POSITA would need to start with Park and abandon Kim's process entirely. *Id.* ¶¶137-140. But "combinations that change the 'basic principles under which the [prior art] was designed to operate,' or that render the prior art 'inoperable for its intended purpose,' may fail to support a conclusion of obviousness." *Plas-Pak Indus., Inc. v. Sulzer Mixpac AG*, 600 F. App'x 755, 758 (Fed. Cir. 2015); *see also, e.g., Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020) ("Fundamental differences between the references are central to this motivation to combine inquiry.").

Yun. As an initial matter, Yun does not teach the claimed "curved side surface." In all Yun's embodiments, the relevant side of pads 120 is neither rounded

nor curved. Instead, the “inner side surface of the protrusion part 65 may have a *flat surface*.” Ex.1021 (Yun) 8:31-40, Figs. 3, 5A-5F; Giapis2 ¶¶141-143. Additionally, in all of Yun’s embodiments, the inner side surface of pads 120 does not contact the interlayer insulating layer 102 as claimed. Giapis2 ¶142. The surface Petitioner suggests a POSITA would curve in Kim (between the contact pad and staircase structure) differs from the surface in Yun that Petitioner claims is curved (facing outside the staircase structure). *Id.*; Ex.2030 166:12-167:5. Thus, combining Yun with Kim would not yield the claimed “curved side surface,” and Petitioner provides no motivation for a POSITA to make such a modification. *See Adidas*, 963 F.3d at 1359 (“The obviousness inquiry does not merely ask whether a skilled artisan could combine the references, but instead asks whether ‘they would have been motivated to do so.’”).

Kim and Yun use fundamentally different processes to create their structures. Giapis2 ¶143. Yun’s pad structures are thicker on the stepped area to provide “a process margin for forming contact plugs 150 having different vertical heights” (Ex.1021 7:27-33), whereas Kim includes PAD_P for this purpose. Kim 11:48-50. Further, unlike Kim, Yun does not use a mask pattern to create its pad structures, preventing precise location control and margin against short-circuits as Kim does. These manufacturing differences are so significant that a POSITA would need to substantially modify Kim’s process to achieve Yun’s pad structures, even if they met

the claim limitation. Giapis2 ¶143. Neither the Petition nor its expert provides evidence to the contrary. *Id.* ¶¶141-143.

Nam. The “bull nose” or “convex” shape pad regions that Nam allegedly forms result from injecting impurities into a sacrificial layer to create a damaged region. Ex.1022 (Nam) [0066]-[0067]; *see id.* [0099]-[0100]; Ex.2031 220:10-19, 221:13-21; Giapis2 ¶145. After injecting impurities, Nam enlarges the damaged regions by applying heat, increasing the pad region's thickness to prevent contact penetration. Nam [0044]-[0045], [0065], [0099]-[0100], [0107]-[0108], Figs. 7, 8A-8B, 37, 39; Ex.2031 230:20-231:3; Giapis2 ¶145. However, this also reduces the distance between adjacent gate electrode layers, *increasing* the risk of short-circuits. Giapis2 ¶145. Thus, Nam's process for forming what Petitioner claims is a “curved side surface” conflicts with Kim's goal of preventing short-circuits and Petitioner's stated reason for making the modification in the first place. *Id.* ¶¶145-146.

Kim uses a fundamentally different manufacturing process from Nam. *Id.* ¶¶144-147. In Kim, mask pattern M precisely defines the locations of the resulting PAD_Ps by injecting impurities into an insulating layer, and not a sacrificial layer as in Nam. Kim 12:43-56; Giapis2 ¶146. Kim's process increases the pad portion's thickness with PAD_P, already addressing the issue Nam aims to solve regarding contact penetration. Kim 7:58-8:28, 11:48-56; Giapis2 ¶146. Simultaneously, Kim's process prevents short circuits, as detailed above. Petitioner offers no rationale for

why (let alone how) a POSITA would modify Kim using Nam's process, as it would introduce potential short-circuits, contradicting Kim's objective of preventing them. *Giapis2* ¶¶144-146. Indeed, Kim, without any modifications, already solves the short-circuit problem. *Id.* ¶¶123-134. Thus, a POSITA would not have had a reasonable expectation of success in modifying Kim in view of Nam. *Plas-Pak*, 600 F. App'x at 758; *see also, e.g., Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (finding no motivation to modify the prior art where doing so "would destroy the basic objective" of the prior art); *Giapis2* ¶¶144-147.

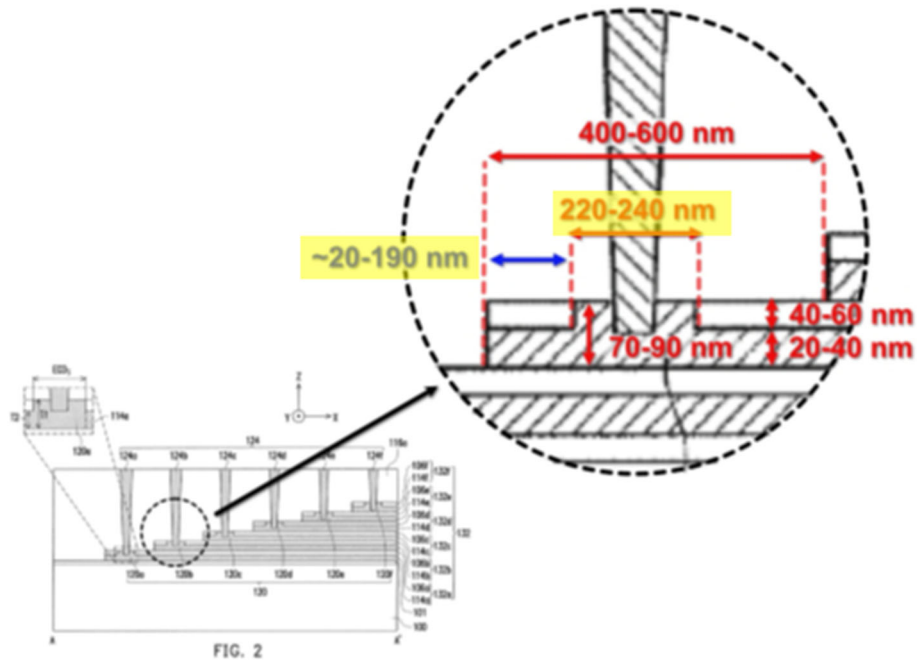
For at least these reasons, the Petition fails to show claims 13-15 would have been obvious over Kim.

IV. Ground 2: Petitioner failed to demonstrate that Kim in view of Yang renders claims 3 and 18 obvious⁵

For Ground 2, Petitioner acknowledges that Kim does not quantify the claimed lateral displacement of "10 nm and 300 nm." Pet. 54; Ex.2030 63:18-64:3. Instead, Petitioner alleges Yang provides "example dimensions" (shown below) that "result[] in the claimed subject matter." Pet. 57. But Yang does not teach the

⁵ Claims 3 and 18 depend on claims 1 and 12 and thus Ground 2 also fails for the same reasons as Ground 1.

dimensions highlighted below. Giapis2 ¶¶148-160. Instead, Petitioner created them from three unfounded assumptions.



Pet. 57 (yellow highlighting added).

First, as Petitioner's expert acknowledges, Yang never provides the pad width or the contact opening width necessary to calculate the pad width. Ex.2030 67:21-68:19, 76:1-11, 77:1-5. Instead, Petitioner estimates pad width (ECDs) as ~220-240 nm by assuming Yang's contact opening width (ECDc) is ~193 nm based on the 193 nm ArF laser used to form the contact opening. Pet. 55-56; Ex.1003 ¶¶307-312; Ex.2030 68:13-69:19. But the 193 nm ArF laser wavelength alone does not set feature size. A POSITA would know ArF tools can print features far smaller or larger using standard techniques. See Ex.2025 1 ("At 20nm, chips have features sized ten

times smaller than the wavelength of laser used in lithography”); Ex.2026 1 (ASML 1450 laser has “a specified resolution of 57-nm); Ex.2027 2 (193 nm ArF excimer laser “enable[ing] features sizes of 38 nm to be printed); Giapis2 ¶¶151-157. So while Petitioner’s expert said the contact width “would be 193 nm” since it is “formed using a 193 nm-ArF excimer laser stepper” in his declaration, in his deposition he admitted that “you could use the excimer laser described in Yang to make contact openings larger than 193 and smaller than 193 nanometers.” Ex.2030 75:13-21. Neither Petitioner nor its expert explains why Yang’s pad contact openings would be approximately the laser wavelength. Pet. 55-57; Ex.1003 ¶¶293-335. Thus, Petitioner fails to show that Yang’s pad width would be ~220-240 nm and that Yang teaches the claimed lateral displacement.

Second, as Petitioner’s expert acknowledges, Yang does not disclose pad location on the step. Giapis2 ¶¶156-159; Ex.2030 80:8-14, 81:3-7. Instead, Petitioner just assumes “the pads are located approximately in the middle of each staircase step.” Pet. 56. But Petitioner identifies no reason for this assumption. *Id.* 57-58. Indeed, the pad placement in ’838 patent, Lee, Yun, and Park are not in the middle of a stair, but rather at or near the end of the step. Ex.2030 133:14-134:5; ’838 patent Fig. 8; Ex.1003 ¶364; Lee Fig. 4B; Yun Fig. 5A; Park Fig. 7; Giapis2 ¶159. And the only support Petitioner cites for its assumption is Yang Figure 2. Ex.1003 ¶306; Ex.2030 79:2-80:14. But unlabeled drawings like Yang Figure 2 cannot supply

dimensions when the specification is silent on the issue. *See Hockerson-Halberstadt, Inc. v. Avia Grp.*, 222 F.3d 951, 956 (Fed. Cir. 2000) (“Under our precedent, however, it is well established that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue.”); *Nystrom v. TREX*, 424 F.3d 1136, 1149 (Fed. Cir. 2005) (“[A]rguments based on drawings not explicitly made to scale in issued patents are unavailing. . . . Under the principles set forth in our prior cases, the speculative modeling premised on unstated assumptions in prior art patent drawings cannot be the basis for challenging the validity of claims reciting specific dimensions not disclosed directly in such prior art.”); *White v. H.J. Heinz Co.*, 640 F. App'x 930, 934-35 (Fed. Cir. 2016).

Third, Petitioner claims “a POSITA would have understood that Yang’s pads would be set back by at least 20 nm, resulting in a total possible pad setback range of 20-190 nm.” Pet. 57. That is incorrect for two reasons. First, as Petitioner’s expert acknowledges, Petitioner’s argument again relies only on the unlabeled drawing in Yang Figure 2, which is improper. Ex.2030 90:17-91:4; *Nystrom*, 424 F.3d at 1149 (“arguments based on drawings not explicitly made to scale in issued patents are unavailing”). Second, Petitioner offers no technical basis or teaching in Yang for equating “the space between the pad edge and the end of the underlying conductive layer” with “at least the minimum thickness of the conductive and insulating layer.”

Pet. 56-57; Ex.2030 93:15-20. A POSITA would see no such correlation and thus would not equate the two dimensions to arrive at the claimed displacement. Giapis2 ¶160.

Because Yang does not disclose the claimed lateral displacement, Petitioner is left with an unsubstantiated assertion that the dimensions are obvious. But if they were, Petitioner should have supplied multiple references showing them. Instead, it relies on Yang, which does not teach the claimed lateral distance, and Petitioner's unsupported assumptions and conclusory expert statements. Such bare assertions cannot "support a finding that there would have been a motivation to combine." *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1359 (Fed. Cir. 2019).

Even if Petitioner had shown that the claimed lateral displacement was known in the prior art as allegedly exemplified by Yang—which it has not—it still fails to establish that a POSITA would have been motivated to combine Kim with Yang to achieve the claimed lateral displacement.

Petitioner's only identified motivation is that Kim and Yang involve similar subject matter, such as they have a purported "similarity in design" and both are structured "to avoid 'electrical failures' resulting from 'over-etching.'" Pet. 59. But the purported fact that prior art falls "within the same alleged field ... without more, is not enough for [Petitioner] to meet its burden of presenting a sufficient rationale to support an obviousness conclusion." *See Securus Techs., Inc. v. Glob. Tel*Link*

Corp., 701 F. App'x 971, 977 (Fed. Cir. 2017); *Microsoft Corp. v. Enfish, LLC*, 662 F. App'x 981, 990 (Fed. Cir. 2016) (finding no motivation to combine when “references were directed to the same art or same techniques”).

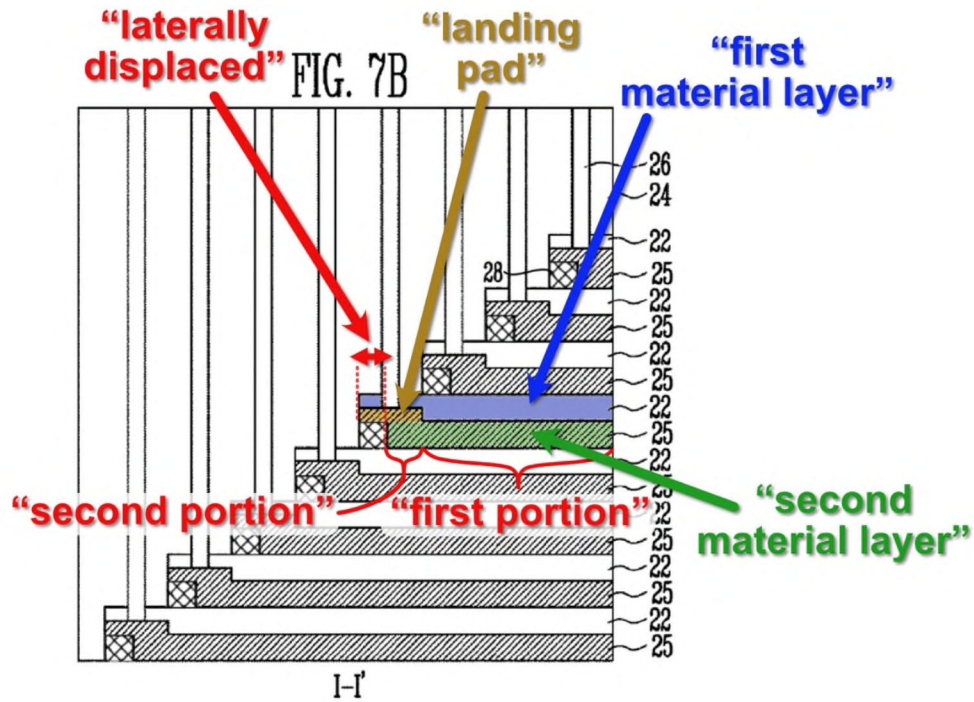
Petitioner next argues that Yang's example dimensions are a routine design choice. Pet. 59. But “[m]erely stating that a particular placement of an element is a design choice does not make it obvious” as there must be a “reason for why a person of ordinary skill would have made the specific design choice” in question. *Cutsforth, Inc. v. MotivePower, Inc.*, 636 F. App'x 575, 578 (Fed. Cir. 2016). Petitioner provides no reasons for adopting Yang's dimensions in Kim.

Even if Yang had the claimed dimensions (which it does not), a POSITA would not have been motivated to import Yang's dimensions into Kim because their processes are incompatible. *Giapis*2 ¶¶161-164. Yang forms openings in both the insulating and sacrificial layers through an etch that occurs alongside step formation. *Id.* ¶163. Kim, by contrast, first forms steps, then deposits auxiliary layer 122, and only afterwards creates openings to form PAD_P structures. *Id.* ¶162. These distinct process flows cannot be combined without a wholesale redesign of Kim. *Id.* ¶¶161-164. Such a combination that “change[s] the ‘basic principles under which the [prior art] was designed to operate,’ or that render the prior art ‘inoperable for its intended purpose,’ may fail to support a conclusion of obviousness.” *Plas-Pak*, 600 F. App'x at 758; *Adidas*, 963 F.3d at 1359.

V. Ground 3: Petitioner failed to demonstrate Lee renders claims 1, 4-7, 12, 16-17, and 19-20 obvious

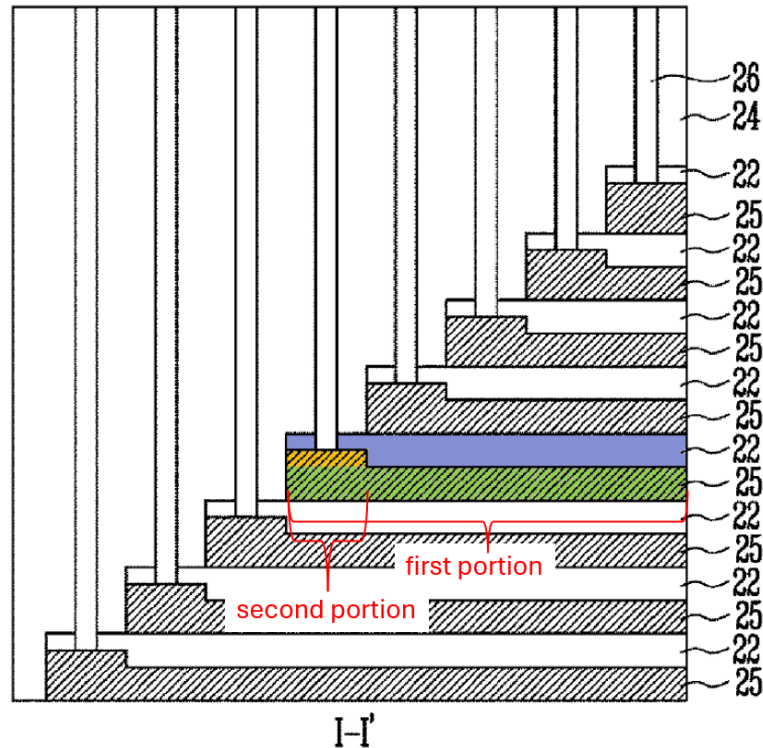
For Ground 3, the Petition relies solely on Lee. Pet. 60-77. But the Examiner already considered U.S. Patent 9,006,884 to Lee—the issued patent from the same Lee application on which Petitioner relies—which contains the same disclosures the Petition invokes. Ex.1002, 61; Ex.2020. Even after considering Lee and conducting prior art searches that expressly cited it, the Examiner correctly issued no rejection based on Lee. Ex.1002 173, 212.

Petitioner provides no explanation for second guessing the examiner's original determination that Lee alone does not disclose or render obvious the claims of the '838 patent. Instead, it attempts to show obviousness by reading “portion” out of the claims by arbitrarily designating the “first portion” of the second material layer as the portions of the second material layer not beneath the landing pad. Pet. 73; Ex.2030 98:13-99:2; *supra* Section II.D.1. That is hindsight, inconsistent with the claim language, and never considered in the Institution Decision.



Pet. 70. But Petitioner ignores that the first material layer, and thus corresponding first portion of the second material layer that the first material layer is disposed on, goes "over the landing pad near the end" of the stair, as shown below. Ex.2030 96:22-99:2; Giapis2¶¶165-176.

FIG. 7B



Lee Fig. 7B (annotated). As a result, Petitioner has not shown that Lee renders obvious such a “first portion of the second material layer” because the “first portion” is not separate and distinct from the second portion of the second material layer beneath the landing pad as required. *See supra* II.D.1. Because Petitioner relies exclusively on Lee for this limitation, it cannot show that the claimed “first portion of the second material layer” would have been obvious in view of Lee.

VI. Ground 4: Petitioner failed to demonstrate that Lee in view of Haller render claims 3 and 18 obvious⁶

As acknowledged by the Petition and Petitioner's expert, Lee does not disclose the claimed displacement of claims 3 and 18. Pet. 77; Ex.1003 ¶¶436. Instead, Petitioner asserts it would have been obvious to “apply[] Haller's example spacer and etch stop dimensions—30 nm—to Lee,” such that “Lee's layer 28 would have a thickness” (and thus a purported lateral displacement) of approximately 30 nm. Pet. 79. However, Petitioner does not establish why a POSITA would have been motivated to make such a change or have a reasonable expectation of success. Instead, it argues a POSITA would have consulted a reference like Haller for the dimensions to apply in Lee because Haller has a “similarity in purpose and design” to Lee. *Id.* 79-80; Ex.1003 ¶¶450-452. That is incorrect. Lee's barrier layer and Haller's spacer and etch stop incompatibly differ in (1) manufacturing processes, (2) design, and (3) purposes such that a POSITA would not implement Haller's spacer and etch stop dimensions into Lee's barrier layer.

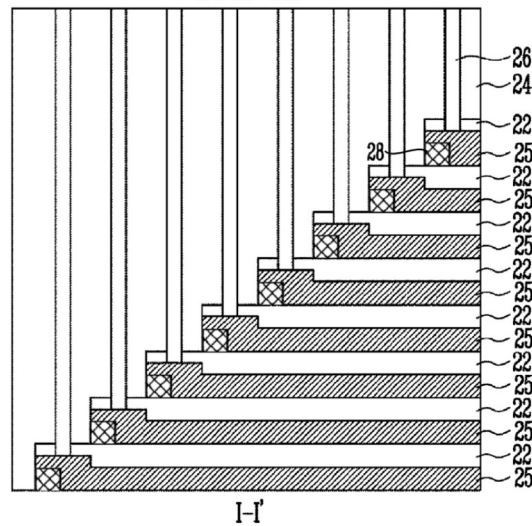
First, a POSITA would not have been motivated to implement Haller's spacer 502 dimensions in Lee's barrier layer 28 because the two references employ incompatible fabrication methods. As Petitioner's expert acknowledges, Haller

⁶ Claims 3 and 18 depend on claims 1 and 12 and thus Ground 4 also fails for the same reasons as Ground 3.

attains the dimensions of spacer 502 by etching under the oxide and then conformally depositing a nitride to fill the etched recess, thereby allowing complete control of spacer size through the etch amount. Giapis2 ¶¶177-181; Ex.2030 116:14-120:14. In contrast, Lee forms barrier layer 28 by oxidizing a sacrificial layer. Lee [0048]-[0050]; Ex.2030 111:14-20. But Lee's process will not allow complete control of oxidation depth at the thickness purportedly taught by Haller because a thin layer of silicon dioxide will form on the nitride surface, thereby slowing the oxidation reaction after 1-2 nanometers of surface oxide, preventing Lee's barrier layer from being as thick as Haller's spacer. Giapis2 ¶¶178-181; Ex.2042 (Kuipers) 758-763; Ex.2043 (Lin) G87-G89. Neither the Petition nor Lee identifies what oxidation depth Lee's process can achieve. Ex.2030 112:14-16. Because Lee's method cannot achieve the dimensions purportedly taught in Haller, a POSITA would not be motivated to combine Lee with Haller. *See Plas-Pak*, 600 F. App'x at 758-59 ("a change in a reference's 'principle of operation' is unlikely to motivate a person of ordinary skill to pursue a combination with that reference.")

Second, a POSITA would not have been motivated to apply Haller's spacer 502 dimensions to Lee's barrier layer 28 because they have incompatible and nonanalogous designs. Lee's landing pad is at the wordline edge while the barrier layer 28 lies beneath. Lee [0048]-[0050]; Giapis2 ¶¶182-184.

FIG. 7B



Pet. 69 (modified Lee Figure 7B). By contrast, Haller's spacer 502 sits at the end of the wordline adjacent to landing pad 902, constraining expansion of silicide layer 802. Ex.1008 (Haller) 6:39-42, 6:53-63, Fig. 9; Giapis2 ¶¶182-184; Ex.2030 122:14-123:16.

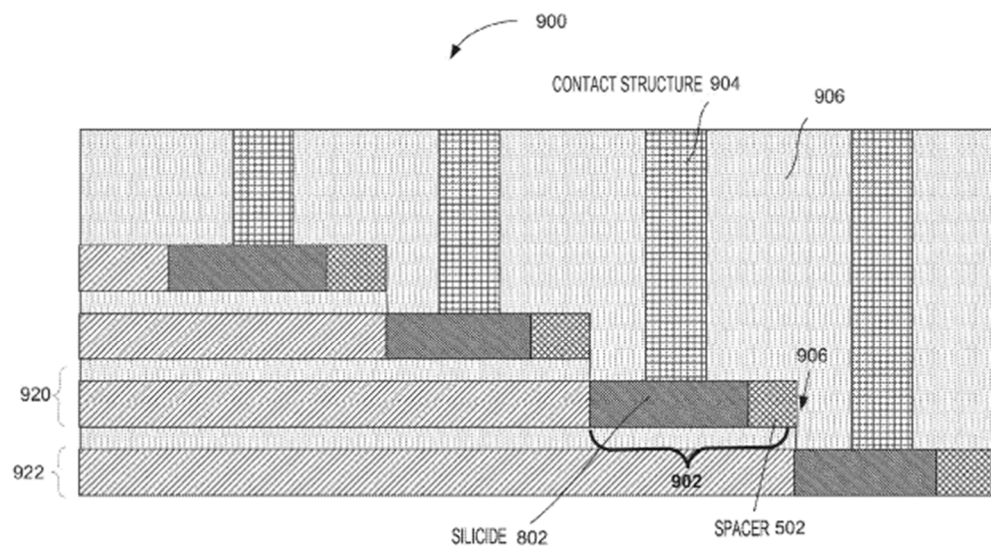


FIG. 9

Petitioner ignores that Haller's spacer and Lee's barrier layer occupy distinct positions relative to the landing pad, such that the Haller's spacer could not be used for Lee's barrier layer. Thus, a POSITA would not have been motivated to use Haller spacer's dimensions for Lee's barrier layer due to these incompatible differences in design. *Giapis* 2 ¶¶182-184.

Third, a POSITA would not have been motivated to implement the dimensions of Haller's spacer 502 into Lee's barrier layer 28 because Haller's spacer and Lee's barrier layer have different purposes. The purpose of Lee's barrier layer is "to ensure an etch margin when the ends of the recessed regions RC are extended" and to ensure "a sufficient distance ... between the stacked conductive layers ... to prevent any deterioration." Lee [0049]; Pet. 78-79; Ex.2030 113:20-114:2. But Haller's spacer has a different purpose: to "prevent the wordline contact structure 902 from leaking over the end 906 of the wordline 920, formed by the spacer 502, to the adjacent wordline 922." Haller 6:59-63; Ex.2030 122:14-123:3. As such, a POSITA would have set the dimensions of Lee's barrier layer based on possible extension of recessed regions RC whereas Haller's spacer length is based on possible misalignment of wordline contact structure. *Giapis* 2 ¶¶185-186. These purposes are inconsistent such that a POSITA would not be motivated to take the spacer and etch stop dimension of 30 nm of Haller and apply with Lee's barrier layer 28. *Id.*

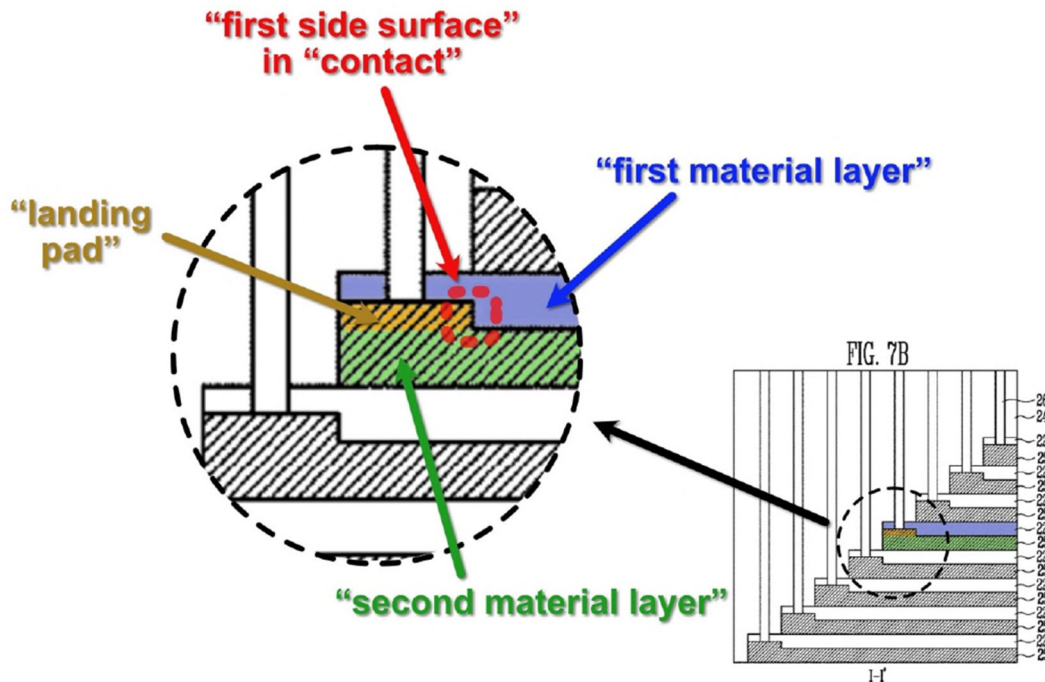
Petitioner also argues that “a POSITA would have recognized that layers in three-dimensional memory devices routinely had thickness in the range of approximately 20-90 nm.” Pet. 80; Ex.1003 ¶¶453-454. Yet, it only cites a single reference purporting to have a thickness in the range of 20-90 nm—Yang. Pet. 80. And as discussed above, Yang does not disclose the claimed lateral displacement. *Supra* Section IV. Thus, Petitioner provides no evidence that this thickness was “routine.” And even if this thickness was routine or common, the mere fact that this thickness was “known in the prior art,” without more, does not render it obvious. *See Forest Laboratories*, 918 F.3d at 934 (“[a]n invention is not obvious simply because all of the claimed limitations were known in the prior art at the time of the invention. Instead, we ask ‘whether there is a reason, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the references, and that would also suggest a reasonable likelihood of success.’”). Thus, Ground 4 fails.

VII. Ground 5: Petitioner failed to demonstrate that Lee in view of Park and knowledge of a POSITA render claims 13-15 obvious⁷

For Ground 5, the Petition combines Lee with Park. Petitioner fails to establish the claimed “curved side surface” recited in claims 13-15. Lee does not disclose a

⁷ Claims 13-15 depend on claim 12 and thus Ground 5 also fails for the same reasons as Ground 3.

“curved side surface,” as shown below. Pet. 80; Ex.2031 243:7-13; Ex.2030 124:5-10; Ex.1003 ¶460.

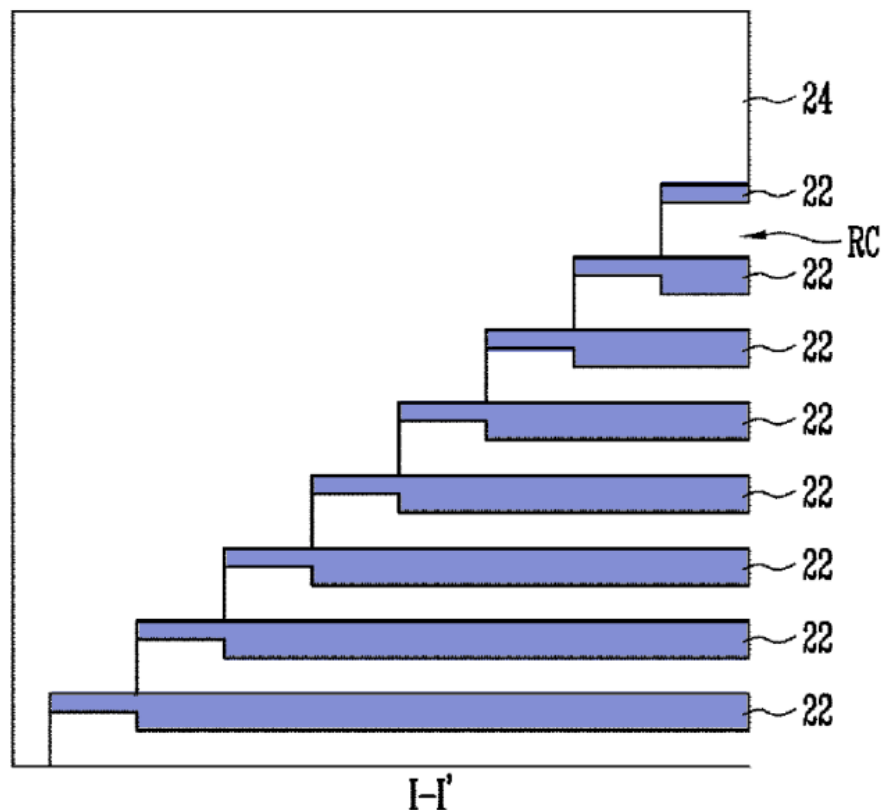


Ex.1006 (Lee) Fig. 7B (annotated; modified; concentrated) (cited at Pet. 65).

Petitioner asserts it would have been obvious to curve the “straight sides” of Lee’s pad portions PAD using Park’s teachings to achieve the claimed invention. Pet. 80-85. However, Petitioner does not establish that a POSITA would have been motivated to make such a change or had a reasonable expectation of success. Instead, it argues that Park with Lee would allow “the process shown in Figures 3B, 4B, and 5B of Lee” to “be followed,” resulting “in the same-shaped openings shown in Figure 5B of Lee.” Ex.1003 ¶472. Figure 5B of Lee, depicted below, shows the

remaining oxide insulating layers 22 in blue and the “openings” in white between them.

FIG. 5B



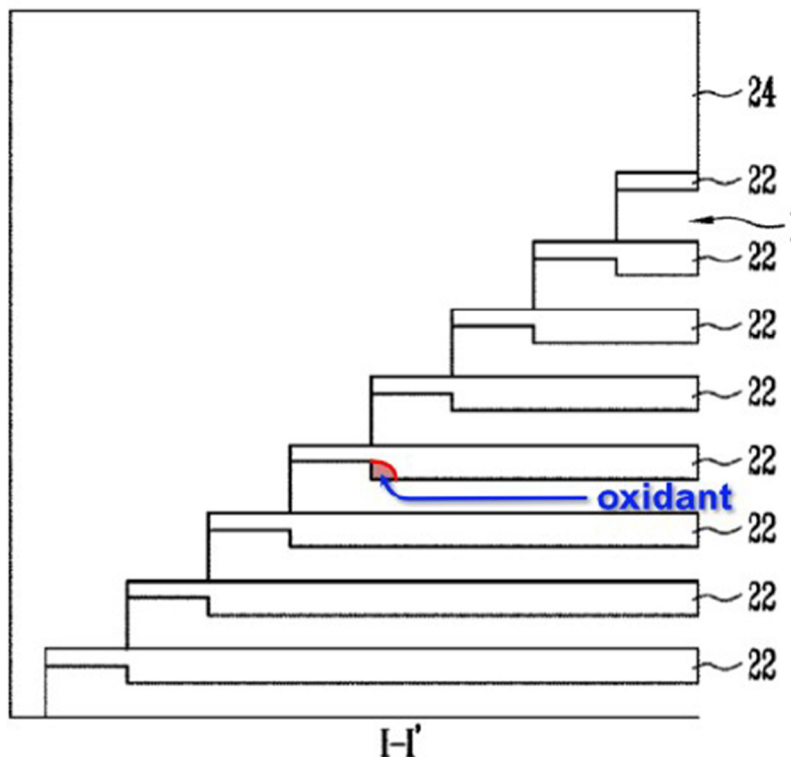
Lee Fig. 5B (annotated); Giapis2 ¶¶187-190. Petitioner's expert asserts “to achieve a rounded rather than straight sided contact pad, *oxidant* would be introduced into the openings.” Ex.1003 ¶472; Ex.2030 125:2-12; Ex.2031 260:7-10. But a POSITA would not have been motivated to make this change to Lee, as it is technically infeasible. Giapis2 ¶¶191-208. A POSITA would have understood that adding

oxidant, as discussed in Park, would not change the shape of the existing oxide 22 in Lee. *Id.* ¶¶191-208.

Further, Petitioner does not establish a motivation for making such changes. Park forms its rounding by oxidizing sacrificial layers made of “silicon nitride” or “polysilicon” to form “an additional insulating layer 66.” Park 11:67-12:23; Ex.2031 248:18-249:9; Giapis2 ¶¶191-192. Park does not attempt to oxidize an oxide layer as the Petition proposes with Lee. Petitioner overlooks this technical infeasibility and does not explain how or why a POSITA would have been motivated to oxidize an oxide layer or have a reasonable expectation of success. Giapis2 ¶¶191-208.

Further, the corner in Lee that Petitioner proposes rounding is *inside* the oxide insulating layer 22. Petitioner's expert refers to this as an “exterior corner” (shown in red below), but it is inside Lee's solid oxide-based insulating layer 22, preventing it from being an “exterior corner.” Ex.1003 ¶¶473-474; Giapis2 ¶¶193-196.

FIG. 5B



Lee Fig. 5B (reproduced from Exhibit 1003 ¶474). Consequently, this corner in Lee could not be oxidized, nor could it produce rounding. Giapis2 ¶¶193-203; Ex.2030 125:13-15. Park thermally oxidizes and rounds the “*exposed surface*” of the sacrificial layer patterns to form the additional insulating layer 66.” Ex.2031 246:12-247:15; Park 8:28-31, 12:6-23. A POSITA would have understood that Lee’s purported “external corner” (as described by Petitioner’s expert) is both unexposed and made of oxide, which prevents it from being rounded using Park’s method. Ex.2031 246:12-247:15; Park 8:28-31, 12:6-23. The Petition does not argue and fails to show otherwise.

During his deposition, Dr. Lee asserted that layer 22 in Lee Figure 5B was not silicon dioxide but rather a “non-stoichiometric silicon oxide layer” that could further react. Ex.2030 129:6-10. That is incorrect. If layer 22 were a “non-stoichiometric silicon oxide layer” as Dr. Lee claims, the still reactive non-stoichiometric silicon oxide would unintentionally react to form a structure different than shown in Lee Figure 5B that would not work in a 3D NAND structure. Giapis2 ¶¶192-208; Ex.2044 (Chen) 1-10; Ex.2045 (Barranco) 1-8. Indeed, non-stoichiometric silicon oxide is chemically and structurally unstable and contains a high density of defects that affect insulating properties, such as oxygen vacancies, sub-oxide species (Si^+ , Si^{2+} , Si^{3+}) and weak Si-O networks. Giapis2 ¶¶203-208; Ex.2044 1-10; Ex.2045 1-8. It also has a lower bandgap than silicon dioxide, which can lead to higher tunneling current leakage, which renders it unsuitable for gate and structural dielectric use. Giapis2 ¶¶203-208; Ex.2045 5-9. In addition, non-stoichiometric silicon oxide is not used in 3D NAND structures due to its lower density, different etch rate and unpredictable etch selectivity verse silicon dioxide. Giapis2 ¶¶205-206; Ex.2044 1-10. For these reasons, a POSITA would never opt for using non-stoichiometric silicon oxide layers between word lines as Dr. Lee argued in his deposition. Giapis2 ¶¶202-208. Moreover, Dr. Lee's post hoc explanation has no basis in Lee. Thus, a POSITA would have understood that when Lee forms layer 22, the solid oxide in layer 22 will enter its most thermodynamically stable state, one

that cannot be further oxidized. Giapis2 ¶¶193-204; Ex.2028 (Plummer) 290-296; Ex.2029 (Zumdahl) 98-139.

Thus, the Petition fails to establish that a POSITA would have been motivated to combine Lee with Park's teachings, as asserted. Moreover, the Petition does not demonstrate that a POSITA could oxidize an oxide that is not externally exposed, leaving a POSITA with no expectation of success in combining the methods as proposed. *See, e.g., Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360-61 (Fed. Cir. 2017) (“[W]here a party argues a skilled artisan would have been motivated to combine references, it *must* show the artisan would have had a reasonable expectation of success from doing so.”)

Petitioner's only identified motivation for “mak[ing] the end of Lee's pad portion PAD facing its conductive layers rounded” is to “prevent a short circuit between the pad and an ‘adjacent’ conductive layer” (Pet. 83), and “enhance the spacing and reduce risks of electrical short circuits and breakdown voltage.” Ex.1003 ¶489. However, Lee already provides a method to achieve this without rounding the pads, by ensuring “a sufficient distance ... between the stacked conductive layers (pad portions) to prevent any deterioration.” Lee [0049]. Thus, even if technically feasible (which it is not), a POSITA would not have been motivated to use Park's teaching to round the pads in Lee to enhance spacing and reduce short-circuit risk, as Lee already addresses spacing and that risk by other

means. *See, e.g., In re Anova*, 809 F. App'x at 843 (reversing obviousness finding because “[t]he Board also does not explain why a person of ordinary skill in the art would be motivated to modify Brown, which already includes vents, to address occlusion effect”).

Petitioner also claims that “[g]iven the prevalence of contact pads with this shape in the prior art, a POSITA would have considered the use of rounded/curved pads with Lee to be nothing more than a routine, obvious design choice.” Pet. 84. But “[a]n invention is not obvious simply because all of the claimed limitations were known in the prior art at the time of the invention.” *Forest Laboratories*, 918 F.3d at 934. Instead, there must be “a reason, suggestion or motivation in the prior art ... to combine the references.” *Id.* Petitioner fails to establish such a reason, suggestion, or motivation to combine Lee and Kim. Ground 5 also fails.

VIII. Conclusion

For the reasons set forth above, the Board should deny the Petition for Post Grant Review.

Respectfully submitted,

Dated: November 26, 2025

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CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Patent Owner's Response complies with the word count limitation of 37 C.F.R. § 42.24(b)(2) because the Patent Owner's Response contains a total of 14,333 words, which is the sum of 14,149 words calculated by Microsoft Word's word-count feature and 184 words hand counted in the figures. This total excludes the cover page, signature block, and the parts of the Patent Owner's Response exempted by 37 C.F.R. § 42.24(b)(2).

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I certify that on this 26th day of November, 2025, a true and correct copy of the foregoing **Patent Owner's Response and all Exhibits** were served by electronic mail on Petitioner's lead and backup counsel at the following email addresses:

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