

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO. LTD.,
SAMSUNG ELECTRONICS AMERICA, INC.,
SAMSUNG SEMICONDUCTOR, INC., and
SAMSUNG AUSTIN SEMICONDUCTOR, LLC,
Petitioner

v.

CHIEN-MIN SUNG,
Patent Owner

Case: IPR2024-00534

U.S. Patent No. 9,138,862

PATENT OWNER'S RESPONSE UNDER 37 C.F.R. § 42.120

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- Ex. 2002 – M. Y. Tsai & Y. S. Liao (2009) Dressing Characteristics of Oriented Single Diamond on CMP Polyurethane Pad, *Machining Science and Technology*, 13:1, 92-105
- Ex. 2003 – M. Y. Tsai et al., Novel Diamond Conditioner Dressing Characteristics of CMP Polishing Pad, *International Journal of Machine Tools & Manufacture* 49 (2009) 722–729
- Ex. 2004 – Kuen-Ren Chen & Hong-Tsu Young, Estimation of Dressing Effects in Chemical Mechanical Polishing with Sorts of Diamond Dressers, *Advanced Materials Research Online*: 2009-06-24 ISSN: 1662-8985, Vols. 76-78, pp 175-180
- Ex. 2005 – Hsiu-Ming Yeh & Kuo-Shen Chen, Development of a pad conditioning simulation module with a diamond dresser for CMP applications, *Int J Adv Manuf Technol* (2010) 50:1–12
- [[OTHERS INTENTIONALLY OMITTED]]
- Ex. 2011 – Second Declaration of Dr. Ming-Yi Tsai

Pursuant to 37 C.F.R. § 42.120, Patent Owner Chien-Min Sung (“Patent Owner,” “PO,” or “Dr. Sung”) submits his Patent Owner’s Response to the Petition for *Inter Partes* Review (“Petition”) by Petitioners Samsung Electronics Co. Ltd., Samsung Electronics America, Inc., Samsung Semiconductor, Inc., and Samsung Austin Semiconductor, LLC (collectively, “Petitioners” or “Samsung”).

I. INTRODUCTION

Petitioners contend that the challenged claims of U.S. Patent No. 9,138,862 (the “’862 patent”) are anticipated and/or rendered obvious. Petitioner must therefore establish, by a preponderance of the evidence, that each challenged claim is unpatentable based on the invalidity theories and supporting evidence identified with particularity in the Petition. But for each Ground in this Proceeding, Petitioner has failed to carry that burden. Simply put, both the anticipation and obviousness arguments set forth in the Petition fall short of what is required to establish invalidity.

Ground 1A¹ should be rejected because Sung ’026 fails to disclose every limitation of independent claim 1 “arranged or combined in the same way as recited in the claim” as required for an anticipating reference. Sung ’026 facially fails to disclose the specific recitation of Claim Limitation [1A] and fails to provide an

¹ The Board split the Petition’s Ground 1 (anticipation and/or obviousness) into Grounds 1A (Anticipation) and 1B (Obviousness). Paper 14 at 33.

enabling disclosure of Claim Limitation [1D] as recited. And the purported disclosure of Claim Limitation [1C], improperly blends multiple different aspects of Sung '026's distinct embodiments that are not "arranged or combined the same way as recited in the claim."

Ground 1B should be rejected because Petitioners only asserted obviousness for Claim Limitation [1C], and only on an "obvious-to-try" theory. Even if Petitioners were able to carry that burden (and they are not), Petitioners raised no such obviousness arguments for the missing Claim Limitations [1A] and [1D], which were only asserted to have been disclosed by Sung '026—not obvious to a POSITA *in view of such disclosure*. Without the gaps in the corresponding disclosure identified in the Petition, and without explanation of how and why a POSITA would have modified Sung '026 to arrive at what those elements recite, the deficiencies in Claim Limitations [1A] and [1B] for Ground 1A are likewise fatal to Ground 1B.

Grounds 2–6, which argue various obviousness combinations for certain dependent claims based on Sung '026 as a primary reference, should be rejected for the same reasons as Grounds 1A/1B. Each Ground assumes the invalidity of independent claim 1 based on the disclosure of Sung '026, but fails to plug any of the holes of that disclosure (which doom Ground 1A/1B) by identifying supplemental disclosure(s) elsewhere. Ground 2 should further be rejected because Petitioners draw an unsupported inference from the absence of evidence and thus

have failed to establish that its secondary reference discloses what the additional recitation of the dependent claims recite.

In sum, Petitioners have failed to show the unpatentability of any of the claims challenged in the Petition by a preponderance of the evidence and each of the seven grounds in the Petition should be rejected in its entirety.

II. CLAIM CONSTRUCTION

Patent Owner contends that no construction is necessary for the '862 patent's claim terms.

III. PERSON OF ORDINARY SKILL IN THE ART

A POSITA for purposes of the '862 patent would have at least two years of experience in developing CMP technology including some specific experience with the design and development of CMP pad dressers. (Ex. 2011 at ¶ 21.) PO contends that Dr. Shanfield's lack of that specialized experience (*see* Ex. 1002, App'x A.) disqualifies him as a POSITA. At most, Dr. Shanfield states that he has generally worked with CMP systems at facilities where he worked (*id.* ¶¶ 3-5), but he does not profess any experience related to the design and development of pad dressers.

IV. LEGAL STANDARDS

“In an *inter partes* review, the burden of persuasion is on the petitioner to prove ‘unpatentability by a preponderance of the evidence,’ 35 U.S.C. §316(e), and that burden never shifts to the patentee.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016). Specifically, the Petition must “identif[y] in

writing **and with particularity**, each claim challenged, the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge to each claim.”² 35 U.S.C. § 312(a)(3); *see also Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016) (“[i]t is of the utmost importance that petitioners . . . adhere to the requirement that the initial petition identify ‘with particularity’ the ‘evidence that supports the grounds for the challenge to each claim.’”).

The Board must assess what the Petition **actually presents**; it is **not** “free to adopt arguments on behalf of petitioners that could have been, but were not, raised by the petitioner.” *See Magnum Oil*, 829 F.3d at 1381. The Board cannot “deviate from the grounds in the petition and raise its own” theories of invalidity. *Sirona Dental Sys. GmbH v. Institut Straumann AG*, 892 F.3d 1349, 1356 (Fed. Cir. 2018).

Review has been instituted based on Grounds raising 35 U.S.C. §§ 102 (1A) and 103 (1B-6). For anticipation under 35 U.S.C. § 102, a reference must “disclose[] within the four corners of the document . . . all of the limitations claimed,” and that disclosure must be “arranged or combined in the same way as recited in the claim.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008). Nor may Petitioner combine different embodiments in a single prior art or supplement missing

² Emphases added in this Response unless otherwise indicated.

limitations—no matter how minor—in proving anticipation. *See id.* Moreover, to be anticipating, the reference must also enable “a [POSITA] [to] make or use the invention without undue experimentation based on the disclosure *of that particular document.*” *In re Morsa*, 713 F.3d 104, 110 (Fed. Cir. 2013) (emphasis in original). Anticipation can also be established via inherency, which requires showing that the allegedly anticipatory feature is consistent, **necessary**, and inevitable, not simply possible or probable—and it should be clear that it would be so recognized by persons of ordinary skill. *Atofina v. Great Lakes Chemical Corp.*, 441 F.3d 991, 1000 (Fed. Cir. 2006); *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). Inherency “may not be established by probabilities or possibilities,” and “the mere fact that a certain thing **may** result from a given set of circumstances is not sufficient” to show inherency. *Id.* at 745.

To prevail on obviousness under 35 U.S.C. § 103, Petitioner must use “record evidence” to demonstrate that the claimed “features . . . were known prior art elements.” *K/S Himpp v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1365 (Fed. Cir. 2014). “[W]hile ‘common sense’ can be invoked, even potentially to supply a limitation missing from the prior art, it must still be supported by evidence and a reasoned explanation.” *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1363 (Fed. Cir. 2016). “Obviousness requires more than a mere showing that the prior art includes separate references covering each separate limitation in a claim.” *Unigene Labs.*,

Inc. v. Apotex, Inc., 655 F.3d 1352, 1360 (Fed. Cir. 2011). “Rather, obviousness requires the additional showing that a [POSITA] at the time of the invention would have selected and combined those prior art elements in the normal courses of research and development to yield the claimed invention.” *Id.* Petitioner must also demonstrate “that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.” *Intelligent Bio-Sys.*, 821 F.3d at 1367-68. These additional requirements cannot be met by “conclusory statements”—“there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006); *see KSR Int’l. Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).

V. BACKGROUND OF CMP PAD DRESSER DEVELOPMENT

A. Conventional CMP Pad Dressers Circa 2007

Circa 2007, conventional diamond pad conditioners were unable to produce micron-sized asperities at high density because the tips of the diamond grits could not be leveled to the same height. Ex. 1005 at 1:4-6. The variation in tip height distribution was “intrinsically large (50-100 microns),” which made “the cutting depth of the pad var[y] significantly.” *Id.* at 1:23-24.

At this time, it was thought that controlling the tip heights of the diamond grits **during manufacturing** of the CMP pad dresser would result in none of the diamond grits being overly stressed and “all diamond grits . . . sharing the dressing work” during use. *See id.* at 1:11-13. While this assumption would later turn out to be incomplete, if not inaccurate, it was the understanding at the time of how CMP pad dressers operated in practice. Ex. 2001 at ¶¶ 19-21.

B. Sung '026 and Sung ICPT

Reflecting that then-prevailing understanding of the ability to control the heights of the diamond grit to a certain degree and its effect, *see id.*, Sung '026 published on March 15, 2007, but never issued as a patent. Ex. 1004 at 1. It addressed “issues with properly holding very small superabrasive particles” in the CMP pad dresser. *Id.* [0007]; *see also* [0006] (“the superabrasive particles are so small that a traditional metal matrix is often unsuitable for holding and retaining them”), [0007] (known polymeric resins “typically [we]re not able to retain superabrasive particles to a degree that [wa]s sufficient for CMP pad dressing”).

To improve “the retention of a superabrasive particle in an organic material layer,” Sung '026 taught “rearranging the superabrasive particles in the organic material layer such that mechanical stress impinging on any individual superabrasive particle is minimized.” Ex. 1004 at [0050]; *see id.* at [0051] (providing “a method of improving retention of superabrasive particles . . . in an arrangement that minimizes

mechanical stress”). Sung ’026 explained that “[b]y reducing the stress impinging on each individual superabrasive particle they can be more readily retained in a solidified organic material layer, particularly for delicate tasks.” *Id.* at [0050].

In short, Sung ’026 disclosed CMP pad dressers with certain features formed in certain ways that were thought to minimize mechanical stress on the superabrasive particles based on the assumption that the bulk of the superabrasive particles performed cutting and thus substantially equally shared substantially all of the mechanical stresses during actual use. Ex. 2001 at ¶¶ 19-21. It provided “[v]arious configurations or arrangements . . . for minimizing the mechanical stress impinging on the superabrasive particles held in the abrading tool. One potentially useful parameter may include the height that the superabrasive particles protrude above the organic material layer.” Ex. 1004 at [0052].

Sung ’026 expressly recognized that “there may be some height deviation between superabrasive particles that occur due to limitations inherent in the manufacturing process.” *Id.* at [0053]. Even if “it is intended that the plurality of superabrasive particles be arranged according to the designated profile, a small amount of deviation therefrom may be likely,” in an unquantified amount. *See id.* at [0011]. Thus, “some level of deviation may occur” from the intended alignment of the tips of the superabrasive particles with the designated profile.” *Id.* at [0056].

But Sung '026 neither identified the level of deviation that was likely to occur, nor taught anything about how any of its various disclosed dresser designs would operate in practice. It likewise did not explain how reducing particle tip height variation (or any particular range of particle tip heights) in its invention correlated to performance in dressing CMP pads.³ It simply assumed that reducing particle tip variation post-manufacturing would result in superior performance in operation, consistent with the prevailing thinking about how dressers actually functioned. *See* Ex. 2001 at ¶ 19.

To the extent Sung '026 discussed various ranges of cutting depths that could be produced from the superabrasive particles protruding to a predetermined height (or ranges of heights) above the organic matrix (Ex. 1004 at [0010], [0052]), it did not disclose the sets of heights or profiles that would, without undue experimentation, have produce those disclosed results in use. Ex. 1004 at, *e.g.*, [0010], [0076]; *see* Ex. 2001 at ¶¶ 22, 25-20. Likewise, Sung '026 never provided

³ Sung '026 noted only that the particle tip height variation of over 50µm in ***traditional*** pad dressers was unsuitable to dress a CMP pad and achieve a uniform asperity depth of less than 20µm. Ex. 1004 at [0006]. Such traditional pad dressers utilized a metal matrix to retain the superabrasive particles and thus lacked the organic layer recited in Claim Limitation [1B] of the '862 patent.

any description of the particular superabrasive particles that would actually cut asperities in the CMP pad during conditioning, nor taught any way that such particles would (or could) be identified. Ex. 2001 at ¶ 31.

Around the same time, Dr. Sung discovered that CMP pad dressers using an organic matrix in a “reverse casting” process to hold pre-leveled diamond tips could reduce their height variation to within 20 microns. *See* Ex. 1005 at 1:30-2:3. Consistent with the prevailing (but inaccurate and incomplete) understanding of how CMP pad dressers operated at that time, Dr. Sung concluded that this level of controlling tip height variation manufacturing would result in “all diamond grits sharing the dressing work” and would produce a “number of working grits . . . significantly higher than conventional designs.” Ex. 1005 at 1:12-14, 6:20 (“ODD has much higher count of working crystals”).

C. Subsequent Understanding of CMP Pad Dressers in Usage

But the assumption that the as-manufactured distribution of diamond grits corresponded to performance in usage conditions, when pressed against the CMP pad, turned out to be incomplete, if not inaccurate. Ex. 2001 at ¶¶ 19-21, 25-31.

Even as of 2009, it was recognized that because “the tips of diamond grits are not at the same height” and they “differ in shape and can be oriented differently,” “the dressing behaviors of polishing pads are unpredictable.” Ex. 2002 at 3-4; *see* Ex. 2001 at ¶¶ 19-21, 25-31; Ex. 2003 at 1 (“diamond grits have various shapes and

orientations and so their dressing behaviors are unpredictable”). It was not until that time that the dressing behavior of even a single diamond was characterized under particular conditions. *See generally* Ex. 2002.

Similarly, as of 2009, Sung ’026’s assumptions that the mechanical stress was substantially equally distributed among the bulk of the superabrasive particles remained an “inference [that] still need[s] to be experimentally verified.” Ex. 2004 at 5. It turned out to be incorrect. Ex. 2001 at ¶¶ 19-21, 25-31.

As of 2010, most of the studies on pad dressings were experimental investigations. Ex. 2005 at 2. Even a cutting-edge simulation module for a diamond dresser for CMP conditioning developed in 2010 still took a “bulk view” of the superabrasive particles that only considered the “the effective radius and the distributed density of the diamond grits.” *Id.* It assumed a uniform distribution of superabrasive particles on the dresser based on a study concluding that “the patterns of diamond grits have no significant influence on the final dressing results.” *Id.* at 5. It did not consider parameters like the orientation, protrusion depth, and height variation among the superabrasive particles. *See id.*; Ex. 2001 at ¶¶ 21-22.

Even circa 2011, what was then considered “a conventional diamond pad conditioner” still had “large variation in the height of the tips of the diamond grits on the” dresser. Ex. 1014 at 3, 6. But by then, it was finally beginning to be recognized that as a result of that height variation, “many diamond grits did not

contribute to cutting,” and instead, most diamond grits in contact with the CMP pad merely deformed the dirty pad by pushing debris around. *See id.*; Ex. 2001 at ¶¶ 29-31.

Actually controlling the height variation of the superabrasive particles to the extent that more than just a handful of them were able to cut the CMP pad during usage remained elusive, and was not practically achievable. Ex. 2001 at ¶¶ 22-26. Only shortly before the invention of the ’862 patent was it recognized that understanding how particular CMP pad dresser designs worked in practice required post-use analysis of the dresser itself. *See* Ex. 1015 at 1 (“Estimation of the depth of penetration of working diamonds, from used disk analyses, allows meaningful topographic assessments of alternative conditioner designs and predictions of relative performance”), 3, 4 (“The fine-finish disk design improvements were validated by polishing experiments” that compared the two designs in actual usage conditions), 7 (concluding that “[p]ost-use examination of conditioners provides information regarding the depth-of-penetration (DOP) of the working diamonds into the pad”); Ex. 2001 at ¶¶ 26-27. In other words, the height variation of the grit as designed, or even as manufactured, did not predictably correlate with how it actually operated. *Id.* at ¶¶ 27-29.

D. The Context of the '862 Patent

It was from this revised understanding of how CMP pad dressers operated in practice that the '862 patent arose:

[T]he present disclosure concerns CMP pad dressers having superabrasive particles with substantially leveled tips. ***Traditional CMP pad dresser manufacturing methods, even many of those describing techniques for leveling superabrasive particle tips prior to fixation, generally contain significant variation in tip height across the surface of the dresser.*** Often, the superabrasive particles are affixed to the CMP pad dresser support in a manner that disrupts any leveling that has occurred. For example, fixation techniques that utilize high heat and/or pressure can cause warping of the dresser support as the dresser cools. Thus, unless steps are taken to avoid such warpage, superabrasive particles are not maintained in their leveled state following cooling of the dresser.

Ex. 1001 at 6:67-7:13. The '862 patent likewise reflected the updated understanding of a POSITA that “only a small percentage of superabrasive particles in a typical CMP pad dresser are positioned so as to penetrate or cut into a CMP pad.” *Id.* at 7:18-23. It elaborated that “a typical CMP pad dresser can have greater than 10,000 superabrasive particles. Of these 10,000 particles, in some cases there may only be a few working superabrasive particles that are actually able to cut the CMP pad. Additionally, out of these few working superabrasive particles, there may be a smaller proportion of overly-aggressive superabrasive particles that cut over 50% of the entire pad that is consumed during conditioning, and in some cases can remove more than 25% of the total pad material.” Ex. 1001 at 8:6-13; see Ex. 2001 at ¶¶

29-30. It was thus the few tallest diamond grits on the diamond disk that determined the overall effectiveness of CMP pad conditioning. *Ibid.*

But rather than try to eliminate the outliers to share the workload, as prior art solutions including Sung '026 taught, the '862 patent focused on bounding and characterizing the protrusion among and variance in the outlying superabrasive particles that actually performed the work. *See* Ex. 2001 at ¶¶ 29-30.

To that end, the '862 patent explains that the extent of the leveling of the tips of the superabrasive particles “allows differing amounts of superabrasive particles to actually cut asperities into the pad.” Ex. 1001 at 10:11-13; *see also id.* at 10:13-21. One disclosed (and claimed) embodiment involves a 60-micron **maximum** cutting depth along with the height variation that produces it: the highest and second-highest protruding tips differing by ~10mm (or less), and the 10 highest protruding tips being within ~20mm (or less) of each other. *Id.* at 12:13-26. This reflects (and results from) the revised understanding that the performance of a CMP dresser is determined primarily by the outliers in protrusion, and not by the evenness of the bulk material. *See* Ex. 2001 at ¶¶ 19-21, 28-30.

In other words, the inventions recited in the '862 patent were provided in the context of a POSITA's updated understanding that the manufacturing profile of the diamond tips of a pad dresser did not readily correlate with its performance in actual usage, and that in fact, the overwhelming majority of superabrasive particles did no

work at all in dressing the CMP pad. The assumptions underlying Sung '026 and SungICPT—that relatively low height deviations among the diamond tips in manufacturing would result in shared work across the overwhelming majority of the diamond grit because the bulk of the diamond grits were involved in pad dressing—would not have been applied by a POSITA in contravention of what the '862 patent expressly taught to the contrary. *See* Ex. 2001 at ¶¶ 29-30.

VI. RESPONSE TO PETITIONERS' SPECIFIC GROUNDS FOR CHALLENGE

A. Ground 1A: Sung '026 Does Not Anticipate Claims 1-6, 9-12, and 20

Petitioner has failed to establish that claim 1 is anticipated by Sung '026 because Sung '026 does not disclose “all of the limitations claimed . . . arranged or combined in the same way as recited in the claim.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008).⁴ This applies to least each of Claim Limitations [1A], [1C], and [1D], as explained in detail below.

⁴ Dependent claims 2-6, 9-12, and 20 are likewise not anticipated by Sung '026 at least because they all depend from claim 1, which is not anticipated.

1. Independent Claim 1

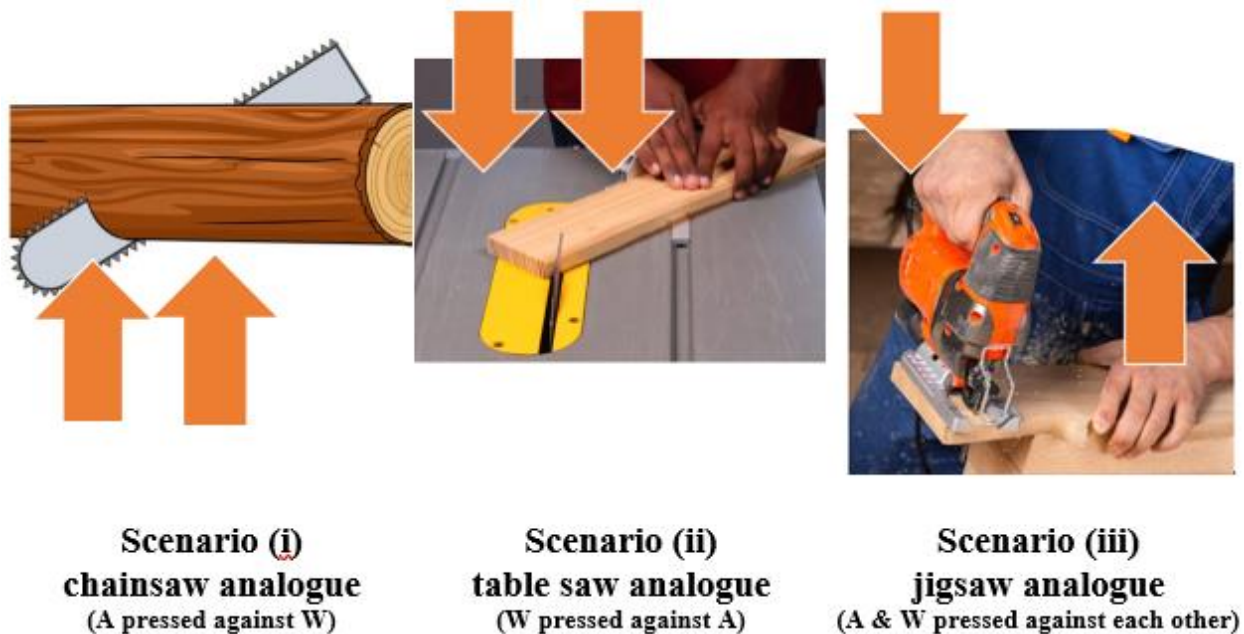
a) Sung '026 does not disclose [1A] (“*pressing a CMP pad dresser against a CMP pad*”)

It bears emphasizing that Petitioners ***did not*** argue that Sung '026 inherently disclosed [1A], or that a POSITA would have “at once envisioned” Claim Limitation [1A] upon reading Sung '026. *See* Pet. at 26-29. Petitioners are limited to the arguments actually advanced in the Petition, which only asserted that Sung '026 disclosed “pressing a CMP pad dresser against a CMP pad.” *Id.*; *see Magnum Oil*, 829 F.3d at 1381; *Sirona*, 892 F.3d at 1356. But the cited portions of Sung '026 fail to disclose the precise scenario that Claim Limitation [1A] recites.

Petitioners, supported by Dr. Shanfield, instead rely upon portions of Sung '026 that disclose (at most) that the CMP pad and dresser are somehow in contact. Pet. at 26-27 (citing Ex. 1004 at [0009], [0051]; Ex. 1002 at ¶¶ 90-91). From the fact that generally-described contact, Petitioners rely upon Dr. Shanfield’s conclusion that “Sung '026 discloses pressing a CMP pad dresser against a CMP pad” because the frictional forces described in Sung '026 “can only be the result” of such pressing. *See* Ex. 1002 at ¶ 90. Both as a matter of logic and as a matter of physics, Dr. Shanfield is incorrect. Ex. 2011 at ¶¶ 61-62; *see also id.* at ¶ 47.

Frictional forces between a cutting tool and a workpiece need not result from pressing the cutting tool against the workpiece. As a technical matter, the same frictional forces will result from contact between the cutting tool and the workpiece,

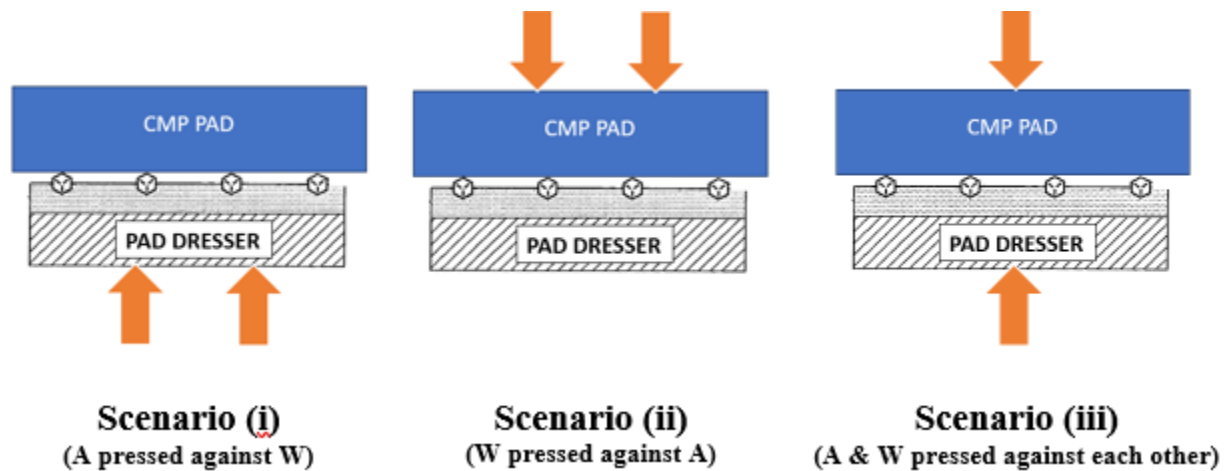
and the workpiece will be cut by the working surface of the cutting tool, no matter where the same net force is applied. As Dr. Tsai explains in his Second Declaration, this is demonstrated with how various different types of saws are used, as depicted schematically below:



Ex. 2011 at ¶¶ 51-53 & Fig.3. In each such case, the wood is cut. *See id.* Whether or not the wood is cut does not depend on whether force is applied to the wood, the saw, or both. *See id.* And merely knowing that wood has been cut by a saw does not disclose the object to which force was applied to bring the cutting surface in contact with the wood. *See id.*

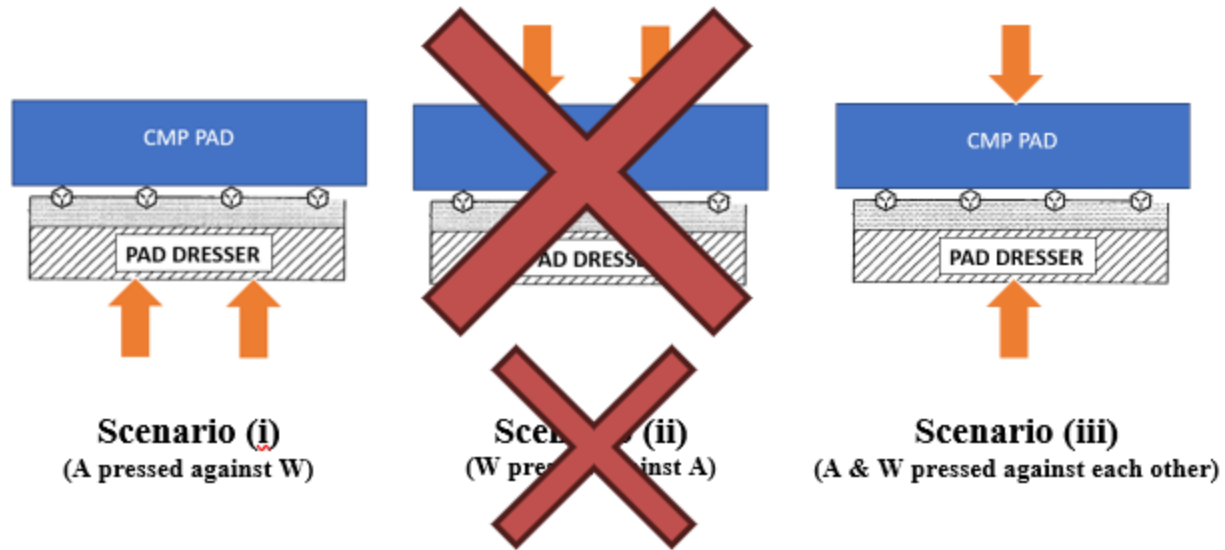
PO agrees that Sung '026 discloses a CMP pad and dresser ***in contact***. Ex. 2011 at ¶¶ 45-46. But nothing more. And that disclosure lacks the specificity recited in Claim Limitation [1A], because such contact can occur in several ways. *Id.* at ¶

47. Specifically: (i) the dresser can be pressed against the pad; (ii) the pad can be pressed against the dresser; or (iii) the pad and the dresser can be pressed against each other, as Figure 1 from Dr. Tsai's Second Declaration illustrates.



Id. ¶¶ 47-48 & Fig.1. The same frictional forces and mechanical stresses will result in each of these scenarios.

But Element [1A] does not encompass all scenarios in which a CMP pad and a dresser are held in contact. *See id.* at ¶ 50. Its phrasing is narrower, limiting its scope to a particular subset of ways in which contact is maintained between the pad and the dresser: those in which pressure is applied to the dresser. *See id.* Its recitation specifically excludes scenarios in which the contact is maintained by applying pressure to the CMP pad alone. *See id.*



See Ex. 2011 at ¶ 50 & Fig.2.

Sung '026 is simply silent on how the CMP pad and dresser are held in contact. *Id.* at ¶ 54. That contact need not occur by pressing the dresser against the pad; it is both logically and technically possible for that contact to occur by pressing the pad against the dresser instead. *Id.* at ¶¶ 55. As such, “pressing a CMP pad dresser against a CMP pad” is not inherently disclosed by the mere fact of their being in contact. See *Atofina*, 441 F.3d at 1000; *In re Robertson*, 169 F.3d at 745. Thus, because Sung '026 does not describe **how** the CMP pad and the dresser are in contact as Claim Limitation [1A] requires, Petitioner has failed to establish that Sung '026 discloses Claim Limitation [1A] “as recited in the claim” as necessary for anticipation. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008)

b) Sung '026 does not disclose Claim Limitation [1C] (“*wherein the difference in protrusion distance between the highest protruding tip and the second highest protruding tip of the monolayer of superabrasive particles is less than or equal to about 10 microns and the difference in protrusion distance between the highest 10 protruding tips of the monolayer of superabrasive particles are [sic] within about 20 microns or less*”) arranged or combined as recited.

Petitioners rely on certain portions of Sung '026 in an effort to establish disclosure of Claim Limitation [1C]. Pet. at 30-31 (citing Ex. 1004 at ¶¶ [0053], [0056], [0073]). As the Petition argues, these several distinct portions of Sung '026 purportedly, ***when viewed together***, disclose an embodiment that satisfies the recitation of Claim Limitation [1C]. See *id.* But these individual embodiments of Sung '026—which it describes in separate portions of the reference as discrete “aspects” of the invention of Sung '026—cannot not be used collectively to satisfy the anticipation standard. *Net MoneyIN*, 545 F.3d at 1371. Simply put, because Sung '026 fails to disclose these various aspects in a single embodiment as Claim Limitation [1C] recites, as elaborated below, Sung '026 cannot anticipate claim 1.

As Dr. Tsai explains in detail, Petitioners rely on combining several distinct embodiments from Sung '026 in arguing that Claim Limitation [1C] is disclosed. Ex. 2011 at ¶¶ 74-94.

Petitioners begin with a first “aspect” of Sung '026 relating to the superabrasive particle tip heights being arranged according to a predetermined height profile. Ex. 1004 at [0053]; Ex. 2011 at ¶¶ 76-78. In other words, this aspect

taught that “blueprints” could be drawn for the arrangement of superabrasive particles. Petitioners specifically select the disclosed planar profile embodiment from among the “numerous configurations” for such designated profiles that are “possible.” Ex. 2011 at ¶ 78.

Next, Petitioners turn to a second “aspect” of Sung ’026 relating to the extent to which the particle tip heights are permitted to vary Ex. 1004 at [0056]. Although also involving potential differences between the particle tip heights, this “aspect” is distinct from the prior one. Ex. 2011 at ¶¶ 79-81. While the first aspect related to their intended arrangement, this aspect taught that different amounts of variance from that plan could be permitted. Ex. 2011 at ¶ 90. Out of the thirteen specific variances disclosed, Petitioners specifically select the narrowed possible variance, i.e., less than about 1µm. *Id.*

Even though both the first and second aspects relate to differences between the heights of the various superabrasive particle tips, Petitioners do not identify anything in the cited portions of Sung ’026 that simultaneously describes these two “aspects” of Sung ’026 simultaneously in a single embodiment, let alone with the specific parameters necessary to satisfy the numerical requirements of Claim Limitation [1C]. Ex. 2011 at ¶¶ 81, 88.

But this was not sufficient to satisfy the recitation of Claim Limitation [1C]. Petitioners then turn to a third set of “aspects” described in paragraph [0073], which

relate to the extent to which the superabrasive particles protrude from the organic matrix layer as well as variances permitted from that protrusion. Although this again relates in an indirect fashion to the heights of the superabrasive particles and the distances between their tips, this set of aspects is distinct from both the first and the second aspects previously described; it describes the permitted tip height variance being based off of the protrusion from the retaining matrix, and not directly from other superabrasive particles. Ex. 2011 at ¶¶ 82, 84. From this third set of “aspects,” Petitioners specifically select the narrowest possible protrusion height variance range, i.e., about 10µm to about 20µm. *Id.* at ¶ 84.

Yet again, Petitioners do not identify anything in the disclosure of Sung '026 that describes this third set of aspects simultaneously with either of the first two aspects, let alone with both. Ex. 2011 at ¶¶ 82, 85 89-91. Nor does the Petition identify any such embodiment having all three of these aspects with the specific parameters necessary to meet the numerical requirements of Claim Limitation [1C]. *Id.* at ¶ 94. That is because Sung '026 does not disclose any embodiment “arranged or combined as recited in the claim” limitation [1C]. *Id.* at ¶ 95; *see Net MoneyIN*, 545 F.3d at 1371.

That Sung '026 discloses no such embodiment is actually confirmed by Dr. Shanfield's Declaration, and specifically, his creation of a mockup schematic to illustrate what he contends “is disclosed” by Sung '026. But while this might

arguably depict what a POSITA *could have been able to create in view of Sung '026*, that schematic based on a specific combination of numerous distinct “aspects” of Sung '026 with specific parameters does not depict anything that Sung '026 describes “arranged or combined as recited.”

Accordingly, because Petitioners rely on a specific permutation of distinct embodiments with particular parameters purported to satisfy the recitation of Claim Limitation [1C] that Sung '026 never describes being “arranged or combined as recited,” Petitioner’s anticipation argument must be rejected.

c) Sung '026 does not provide an enabling disclosure of [1D] (rotating the dresser against the CMP pad such that asperities are cut into the CMP pad having a maximum cutting depth of about 60μm)

As with Claim Limitation [1A], it bears emphasizing that Petitioners *did not* argue that Sung '026 inherently disclosed Claim Limitation [1D], or that a POSITA would have “at once envisioned” Claim Limitation [1D] upon reading Sung '026. *See* Pet. at 36-37. Petitioners are limited to the arguments actually advanced in the Petition, which only asserted that Sung '026 *disclosed* Claim Limitation [1D] in paragraphs [0010] and [0052]. *Id.*; *see Magnum Oil*, 829 F.3d at 1381; *Sirona*, 892 F.3d at 1356. Petitioners cite to nothing else, but the cited portions of Sung '026 do not identify any embodiment “arranged or combined as recited in the claim” Claim Limitation [1D]. Ex. 2011 at ¶¶ 108-111.

Rather, the portions of the Sung '026 disclosure relied upon by Petitioners simply identifies a particular cutting depth that “in one specific aspect the predetermined height may produce a cutting depth of from about 10 micron[s] to about 20 microns when used to abrade a work piece.” Ex. 1004 at [0052]; *see also id.* at [0010] (lacking “specific”). The particular “predetermined height” that “may produce” this cutting range is not identified. *Id.*; *see* Ex. 2011 at ¶ 112. Whatever this discloses, it does not describe, in one embodiment, ***a dresser satisfying the structural requirements of Claim Limitations [1B] and [1C]*** as being what produces the cutting depth. Ex. 2011 at ¶ 106. And that is what Claim Limitation [1D] requires. Moreover, whatever disclosure Sung '026 provides in relation to the various embodiments fails to disclose the recited cutting depth (or any other cutting depth) resulting from any particular height profile for the superabrasive particle tips. It thus fails to provide an enabling disclosure of what Claim Limitation [1D] recites.

(1) Sung '026's Disclosure of a 10-20 μ m Asperity Cutting Depth Fails to Identify the Height Profile that “May Produce” It.

The cited portions of Sung '026 state only that “in another aspect” or “in another specific aspect,” “the predetermined height [of the protruding superabrasive particles] may produce a cutting depth of from about 10 micron[s] to about 20 microns when used to abrade a work piece.” Ex. 1004 at [0010], [0052]. But Sung '026 never identifies the corresponding “predetermined height” or values of such

that would produce such results or the two other ranges of results those paragraphs describe. *See* Ex. 2011 at ¶¶ 114-115. All it teaches about such heights are that they are in some way “predetermined.” *Id.* at ¶ 118. Their dimensions are simply not identified in the cited portions of Sung ’026. *See id.* at ¶ 108.

In the two paragraphs of Sung ’026 that use nearly-identical language to describe the three different specific cutting depths that “the predetermined height” may produce, no such “predetermined height” is ever identified. *See id.* at ¶116. If anything, Sung ’026 teaches away from such disclosure, stating instead in [0052] that that “***any predetermined height that that would be useful in an abrading tool*** would be considered to be within the presently claimed scope.” Ex. 2011 at ¶117. Sung ’026 fails to describe any relationship whatsoever between desired asperity cutting depths that would result from use of its invention and the corresponding appropriate height profiles that could be used to produce those results. *Id.* at ¶ 119.

Nor would a POSITA “have at once envisioned” the appropriate height profile(s) that would have produced the identified 10µm-20µm cutting depth or the recited 50µm maximum cutting depth. *See id.* at ¶ 125. The opposite is true. As Dr. Tsai explains, Sung ’026 would not have taught a POSITA, circa 2011, how to select any particular height profile that would produce any particular cutting depth when used to abrade a workpiece. *Id.* at ¶ 124. As Dr. Tsai explains, a particular asperity

cutting depth (or range) alone provides insufficient information to determine the height profile of the dresser that produced it. *Id.* at ¶ 123.

Moreover, circa 2011, it was not possible to characterize the relationship between asperity cutting depth and the tip height profile in general fashion. *See id.* The actual performance of a dresser (which includes the cutting depth) is highly dependent on its actual usage conditions, which include a substantial number of variables, parameters, and usage conditions that were not well-characterized circa 2011. *Id.*

Accordingly, Sung '026 fails to disclose Claim Limitation [1D] because it fails to disclose the tip height profile (or range of such profiles) that would produce either the described 10µm-20µm range or the recited 60µm maximum depth; nor would a POSITA have been “at once able to envision” such ranges immediately upon reading Sung '026.

(2) Sung '026 Says Nothing About What Asperity Cutting Depth Would Result from Using a Dresser Satisfying Claim Limitations [1B] and [1C]

Not only does Sung '026 fail to disclose the particular tip height profile(s) that would produce the described 10µm-20µm cutting range or the recited 60µm maximum depth, but the converse is also true. *See Ex. 2011 at ¶126.* Sung '026 also fails to disclose **any** cutting depth—let alone the relied-upon 10µm-20µm cutting range or the recited 60µm maximum cutting depth—that would result from use of a

dresser having the structural features recited in Claim Limitations [1B] and [1C]. *Id.* at ¶143. Even assuming that Sung '026 disclosed such a dresser in a single embodiment (and it does not), it never identifies that embodiment as being “the predetermined height [that] may produce” the described 10µm-20µm cutting depth range. *Id.* at ¶134.

As discussed above for Claim Limitation [1C], Sung '026 does not disclose a single embodiment “arranged or combined as recited in the claim” limitation [1C]. Because such a single embodiment is not disclosed within Sung '026, it logically cannot be what produces the 10µm-20µm asperity cutting depth identified in [0010] and [0052]. *See* Ex. 2011 at ¶127. Moreover, those structural features of Claim Limitations [1B] and [1C] are further described in Sung '026 as being different “aspects” than the “aspects” describing cutting depth. *See id.* at ¶¶129-133.

In addition, Sung '026 provides no explanation of the cutting depths that would result from any of the various “aspects” that are relied upon for disclosure of Claim Limitation [1C] either individually or in combination, let alone with the specific parameters that would satisfy Claim Limitation [1C]. *Id.* at ¶¶138, 141-142. Sung '026 is silent about the effect of a planar profile or any other predetermined profile on cutting depth. *Id.* at ¶135. Sung '026 is silent about the effect on cutting depth from different amounts of height variance from a predetermined profile. *See id.* at ¶136. Nor does Sung '026 describe any relationship

between resultant cutting depth and changing or controlling protrusion height above the organic matrix layer (or the permitted variances thereof). *Id.* at ¶137.

In fact, the only relationship at all in Sung '026 between tip heights and cutting depth is a statement about the limited performance of a prior art pad dresser in [0006]. *Id.* at ¶139. Sung '026 simply notes that its tip height “variation [$>50\mu\text{m}$] would render a dresser useless if it were required to . . . achieve a uniform asperity depth of” under $20\mu\text{m}$. *Id.* (quoting Ex. 1004 at [0006].) But that prior art dresser is identified as using a “traditional metal matrix” to retain its superabrasive particles; it lacks solidified organic material layer recited by Claim Limitation [1B] which is a required feature of the dresser that Claim Limitation [1D] recites as producing the claimed cutting range. *See id.* at ¶¶140. That critique of the prior art is not the structure “arranged or combined as recited in the claim.” *Net MoneyIN*, 545 F.3d at 1371.

(3) Sung '026 Did Not Provide an Enabling Disclosure for Claim Limitation [1D] Have Enabled a POSITA Says Nothing About What Asperity Cutting Depth Would Result from Using a Dresser Satisfying Claim Limitations [1B] and [1C]

As set forth above, it is clear that whatever limited information Sung '026 disclosed about a relationship between a superabrasive tip height profile and resultant cutting depth, Sung '026's disclosure would not have enabled a POSITA to achieve the recited result without undue experimentation. Ex. 2011 at ¶144. Circa

2011, it was not possible to characterize the relationship between asperity cutting depth and tip height profile in general fashion. *Id.* at ¶123.

But not only does Sung '026 fail to identify the particular “predetermined height” or ranges of such that would produce a cutting depth of 10μm-20μm, it would not have enabled a POSITA to determine the particular predetermined height(s) that would have produced such cutting depths without undue experimentation. *See* Ex. 2011 at ¶¶ 123-125, 144-145.

As discussed above, and as confirmed by Dr. Tsai, the actual performance of CMP dressers and their diamond grits was known to be “unpredictable” in actual usage. Ex. 2001 at ¶¶ 22, 25-29; Ex. 2011 at ¶¶ 146-147, 153-159; *see* Ex. 2002 at 3-4, Ex. 2003 at 1. Circa 2011, based on the difficulty in controlling variation in tip height, the cutting performance of CMP pad dressers remained unpredictable in actual usage. Ex. 2011 at ¶148.

As Dr. Tsai testified, even one of extraordinary skill in the art would not have been able, at that time, readily predict or otherwise determine the expected cutting depth produced by a dresser in actual usage based on the variance in its tip heights without substantial experimentation involving the actual usage conditions. *Id.* ¶149. Likewise, even one of extraordinary skill would not have been able to readily predict or otherwise determine a maximum cutting depth from use of a dresser with any particular level of variation in tip height, as Dr. Tsai’s 2009 article (Ex. 2009)

demonstrated by characterizing the effect of only a single particle. *See* Ex. 2011 at ¶ 149.

Based on these challenges to even one of extraordinary skill in the art at that time, one of merely ordinary skill in art would have likewise required substantial experimentation to assess any such relationship. *See id.* at ¶ 150. Such determinations would require substantial characterizations of the usage parameters and conditions of the dresser, including the characteristics of the CMP pad being conditioned. *Id.* at ¶ 151. That experimentation would have also involved at least detailed surface measurements of CMP pad dressers post-manufacture and post-use, along with examination of various types of CMP pads on which they were used, even to begin to understand a general relationship between a particular variation in particle tip height and a particular cutting depth produced on a particular CMP pad. *See id.* at ¶ 152.

As Dr. Tsai explains, the limited disclosure of Sung '026 would not have enabled a POSITA to cut asperities within the recited 60µm limit without extensive empirical testing of the intended usage parameters. *Id.* at ¶¶ 157-159. These parameters (which Sung '026 does not describe) would include (among others) the composition of the dresser, the amount and angle of force applied, the angular velocity and size of the dresser, and the structural and material characteristics of the CMP pad being conditioned. *Id.* at ¶ 159.

In sum, Sung '026 fails to provide an enabling disclosure of Claim Limitation [1D] because it fails to describe the predetermined profile that produces a cutting depth within the recited limits, and because it conversely fails to describe a cutting depth within the recited limits as being produced by a dresser having a structure that satisfies Claim Limitations [1B] and [1C]. Moreover, Sung '026 provides no guidance on any general relationship between cutting depth and tip height profile for a dresser that satisfies the requirements of claim 1, and a POSITA would not have been able to determine, without undue experimentation, a tip height profile that would satisfy the recitation of claim 1 in actual usage based on the unpredictability of dresser performance circa 2011.

2. Dependent Claims 2-6, 9-12, 20

Because each of these dependent claims depend from independent claim 1, Ground 1A should be rejected for these claims for the same reason. In addition, PO identifies further deficiencies in Petitioners' arguments for these dependent claims below.

a) Dependent Claims 6, 9-10

[6] The method of claim 5, wherein the peripheral location extends from an outer edge of the dresser

inwardly toward a center point of the dresser for up to about 90% of the dresser radius.

[9] The method of claim 1, wherein substantially all of the superabrasive particles are located at a peripheral location of the dresser.

[10] The method of claim 1, wherein substantially all of the superabrasive particles are arranged in uniform predetermined pattern at a peripheral location of the dresser.

As discussed above, Petitioner has failed to show that Sung '026 discloses any of Claim Limitations [1A], [1C], or [1D], let alone all of them. Because dependent claim 6 depends from (and thus incorporates all the limitations of) claim 5, which in turn depends from claim 1, Petitioner has correspondingly failed to show that Sung '026 discloses claim 6. This also applies to claims 9-10, which depend from (and thus incorporates all the limitations of) claim 1. Thus Petitioner has correspondingly failed to show that Sung '026 discloses claim 9-10.

Petitioner's argument for claims 9-10 also fails for additional reasons. Based on a description of one particular "aspect" of Sung '026 describing a "central location" extending from about 20% to about 90% of the radius, Petitioner jumps to the completely unsupported conclusion that "the region from the center of the disk to about 20% of the radius is ***devoid of superabrasive particles*** in this particular example." Pet. at 43 (citing nothing).

But this assertion is nothing but pure *ipse dixit*, and Petitioner has provided no basis for it. Sung '026 ***never says that this unnamed region is "devoid of***

superabrasive particles.” It is simply silent about this region, both in nomenclature and what its contents might be. Petitioner provides no citation—nothing from Sung ’026, and not even anything from its expert—to support its imaginative reading of Sung ’026. The absence of evidence regarding the superabrasive particles in this location does not qualify as evidence of their absence.

Having failed to provide any basis for its assumption that there are no superabrasive particles in that unnamed region (or any portion of it), Petitioner cannot establish from that silence that “substantially all” of the superabrasive particles are located at a peripheral location on the dresser, even if that peripheral location extends 90% of the way toward the center. And Petitioner has not even attempted to do so without that assumption being true. Thus, Petitioner has failed to show that claims 9 and 10⁵ are disclosed by Sung ’026.

Petitioner’s argument for Claim 10 also fails for an additional reason. As with a number of Petitioner’s other arguments, Petitioner improperly cobbles together multiple “aspects” of Sung ’026 to make a simulacrum of an anticipating disclosure. Specifically, Petitioner combines one “aspect” with a particularly defined central

⁵ Petitioner’s argument for claim 10 relies solely on the Petition’s argument for claim 9 for the “substantially all of the superabrasive particles are . . . at a peripheral location of the dresser” portion of its recitation. See Pet. at 46.

area (Pet. at 43 (citing Ex. 1004 at [0036])) with a different and highly detailed “Example 1” of a particular pad dresser that makes no mention of superabrasive particles being absent from any portion of the dresser. *Id.* at 46-47 (citing Ex. 1004 at [0094]). (Tellingly, Sung ’026 **does** provide an Example 7 that identifies changes in the pad dresser along the radius toward the center. *See* Ex. 1004 at [0100]. But this cannot support anticipation.) But Petitioner never identifies a single embodiment with both a grid **and** substantially all of the superabrasive particles arranged at a peripheral location. And that is what anticipation requires. *See Net MoneyIN*, 545 F.3d at 1371.

b) Dependent Claims 2-5

[2] The method of claim 1, wherein at least 100 tips of the plurality of superabrasive particles cut asperities into the CMP pad as the dresser is rotated.

[3] The method of claim 1, wherein at least 50 tips of the plurality of superabrasive particles cut asperities into the CMP pad as the dresser is rotated.

[4] The method of claim 1, wherein at least 25 tips of the plurality of superabrasive particles cut asperities into the CMP pad as the dresser is rotated.

[5] The method of claim 1, wherein substantially all of the asperities are cut in the CMP pad by superabrasive particles located at a peripheral location of the dresser.

As discussed above, Petitioner has failed to show that Sung ’026 discloses any of Claim Limitations [1A], [1C], or [1D], let alone all of them. Because dependent

claims 2-5 depend from (and thus incorporate all the limitations of) claim 1, Petitioner has correspondingly failed to show that Sung '026 discloses the additional limitations recited in each of these dependent claims. Petitioner has also failed to show that Sung '026 discloses any number of tips cutting asperities into the CMP pad as the dresser is rotated or asperities . That is because, as discussed for claim 1, Sung '026 does not disclose using the dresser of claim 1 to condition a pad, and thus does not disclose actually the cutting of asperities by superabrasive particles ***in any number or at any location***. As a POSITA would have understood, which particles (and how many) actually cut ***during use*** can only be determined by examining the pad dresser ***post-use***. See Ex. 1015 at 7; Ex. 2001 at ¶¶ 26-29, 31.

Petitioner attempts to calculate the number of superabrasive particles that would have been on one particular Sung '026 pad dresser, based on the outdated and incorrect view that “substantially all of the superabrasive particles are contributing to cutting asperities.” Pet. at 38. Petitioner’s assumption contradicts the '862 patent, which explains that “only a small percentage of superabrasive particles in a typical CMP pad dresser are positioned so as to penetrate or cut into a CMP pad.” Ex. 1001 at 7:21-23. Rather, a POSITA would instead have understood that because “the dressing behaviors of polishing pads are unpredictable,” (Ex. 2002 at 3-4), it could not be determined from the pad design or even a manufactured pad how many superabrasive particles of any of the aspects of Sung '026 would cut asperities even

if such dressers were disclosed by Sung '026 as being used (which they were not). Ex. 2001 at ¶¶ 26-29, 31.

Nor could it be determined which particular superabrasive particles in any location of the dresser would be the ones to actually cut asperities, let alone peripherally-located ones as claim 5 requires. *Id.* at ¶¶ 28-31.

c) Dependent Claim 11

As discussed above, Petitioner has failed to show that Sung '026 discloses any of Claim Limitations [1A], [1C], or [1D], let alone all of them. Because dependent claim 11 depends from (and thus incorporate all the limitations of) claim 1, Petitioner has correspondingly failed to show that Sung '026 discloses claim 11. But Petitioner has also failed to show that Sung '026 discloses the additional elements of claim 11.

**[11A] The method of claim 1, further comprising:
rotating the CMP pad;**

**[11B] applying a slurry to a polishing surface of the
rotating CMP pad;**

**[11C] applying a workpiece to the polishing surface such
that the workpiece is polished by the asperities in
combination with the slurry.**

On Claim Limitations [11A] and [11C], Petitioner again seeks to improperly combine various “aspects” of Sung '026 to craft a Frankenstein’s Monster anticipation reference. See Pet. at 47-49. In particular, Petitioner combines the “background” section of Sung '026 for disclosure of these limitations with the

various different “aspects” of Sung ’026 that are relied upon to argue disclosure of the elements of claim 1. But all of these are separate embodiments in Sung ’026, and their combination does not properly support anticipation. *See Net MoneyIN*, 545 F.3d at 1371.

Specifically for limitation [11A], Sung ’026 does not disclose that “**the** CMP pad” of claim 1—against which the specific CMP pad dresser recited in claim 1 is pressed—is rotated. The sole support identified for alleged disclosure of this element in Sung ’026 is **a line from the background of the invention** section, not what Sung ’026 disclosed about its own CMP pad dresser. Pet. at 47 (citing Ex. 1004 at [0002]. Petitioner also utilized this improper mix-and-match approach to anticipation for Claim Limitation [11C], where only the background of the invention section of Sung ’026 was cited to support the alleged disclosure. Pet. at 48-49 (citing Ex. 1004 at [0002], [0004]-[0005]). But Sung ’026’s description of prior art usage in the background section cannot be combined with the various “aspects” of its invention to support anticipation, as they are separate embodiments. *Net MoneyIN*, 545 F.3d at 1371.

Because Petitioner does not argue inherency, and its anticipation argument for claim 11 is legally insufficient, Ground 1A must be rejected on Petitioners’ challenge to claim 11.

d) Dependent Claims 12, 20

[12, 20] The method of claim 11, wherein

[12] the workpiece is a semiconductor device.

[20] the CMP pad is polyurethane.

As discussed above, Petitioner has failed to show that Sung '026 discloses any of Claim Limitations [1A], [1C], or [1D], let alone all of them. Because dependent claims 12 and 20 depends from (and thus incorporate all the limitations of) claim 1, Petitioner has correspondingly failed to show that Sung '026 discloses the additional limitations each recites.

On claim 20, PO does not dispute that Sung '026 discloses the additional limitation recited by dependent claim 20 by itself. But that disclosure is not of any “aspect” *of the invention* but is instead (once again) a single line from the background of the invention addressing the prior art. Pet. at 50 (citing Ex. 1004 at [0002]). When Petitioner has failed to argue inherency or (*see id.*), merely identifying the content in the prior art described in the background section of Sung '026 does not place that disclosure within the same embodiment described in Sung '026 as a proper anticipation theory requires. *Net MoneyIN*, 545 F.3d at 1371.

3. Conclusion for Ground IA

As explained above, Ground 1A should be rejected in its entirety because Petitioners' anticipation theory as set forth in the Petition is legally defective and factually deficient. Sung '026 fails to disclose the specific scenario of Claim

Limitation [1A] in which pressure is applied to the dresser, disclosing only the more general scenario where the dresser and CMP pad are in contact. Sung '026 does not disclose any single embodiment—required for an anticipating reference—that satisfies the tip height variation requirements of Claim Limitation [1C], as confirmed by Dr. Shanfield's mock-up schematic based on one particular permutation of numerous distinct embodiments in the different parts of Sung '026 purported to satisfy this limitation. And Sung '026 fails to provide an enabling disclosure of a cutting depth as recited in Claim Limitation [1D] being achieved by a pad dresser satisfying the structural requirements of Claim Limitations [1B] and [1C]. These failures are fatal to Petitioners' anticipation argument. *Net MoneyIN*, 545 F.3d at 1371.

B. Ground 1B: Sung '026 Does Not Render Obvious Claims 1-6, 9-12, and 20

As discussed above, Petitioners have failed to establish that Sung '026 discloses Claim Limitations [1A], [1C], and [1D] “arranged or combined as recited in the claim.” *Net MoneyIN*, 545 F.3d at 1371. Because their anticipation argument is deficient in numerous ways, Petitioners must resort to obviousness. But here, too, Petitioners' argument is unavailing, because Petitioners failed to plug all of the gaps in their anticipation argument. Having tried to have it both ways in their original Ground 1 presented in the Petition, Petitioners have failed to sufficiently argue either.

1. Independent Claim 1

a) Because the Petition Only Argued Obviousness for Claim Limitation [1C] Falling back to an Express Obviousness Argument Cannot Supply Argument and Evidence that the Petition Failed to Advance for Claim Limitations [1A] and [1D]

Importantly, Petitioners failed to raise *any obviousness argument* in the Petition for any of Claim Limitations [1A] and [1D]. Pet. at 26-29, 36-27. Petitioners' obviousness argument only addressed the inadequacies of Sung '026's disclosure as to the recitation of Claim Limitation [1C], and even there, only contended that it would be "obvious to try" to level the tips as recited. Pet. at 34 ("a POSITA would have found it obvious to try to obtain a leveled diamond particles [*sic.*] that control the difference in protrusion distance between the highest set of protruding tips, including the highest, second highest, and the highest 10 protruding tips to be within the claimed range."); *see also id.* at 35-36.

But even assuming that Petitioners have sufficiently supported their obviousness argument for Claim Limitation [1C]—and they have not—the gaps in what Sung '026 discloses for Claim Limitations [1A] and [1D] remain. And they also remain fatal to Petitioners' invalidity arguments.

Because Petitioners must be held to the arguments made in their Petition, and not those that they could have made—*see Magnum Oil*, 829 F.3d at 1381 and *Sirona Dental*, 892 F.3d at 1356 (Fed. Cir. 2018)—their failures in the Petition to identify,

argue, or supply any evidence in favor of any proposed modifications of each of Claim Limitations [1A] and [1D] to fill in what is missing from the disclosure of Sung '026 require rejecting Ground 1B in its entirety.

b) Petitioners' Obviousness Arguments for 1C are Pure Hindsight Designed to Meet What Claim Limitation [1C] Recites from Among the Myriad Options Disclosed in Sung '026

Even if Petitioner were correct that it would have been obvious to “*try* to obtain a leveled diamond particles [*sic.*] that control the difference in protrusion distance between the highest set of protruding tips, including the highest, second highest, and the highest 10 protruding tips to be within the claimed range” (Pet. at 34), Petitioner fails to argue (let alone support) that a POSITA would have had a reasonable expectation of success in doing so.

Petitioner simply concludes that the claimed ranges “are what would result.” *Id.* This does not suffice. “[e]vidence of obviousness, especially when that evidence is proffered in support of an ‘obvious-to-try’ theory, is insufficient unless it indicates that the possible options skilled artisans would have encountered were ‘finite,’ ‘small,’ or ‘easily traversed,’ and that skilled artisans would have had a reason to select the route that produced the claimed invention.” *Eurand, Inc. v. Mylan Pharms., Inc.*, 676 F.3d 1063, 1072 (Fed. Cir. 2012). Petitioner has offered no such evidence here.

Rather, as is clear from the cited portions of Sung '026, Dr. Shanfield cobbles together no fewer than four different “aspects” of the invention of Sung '026 in the specific parameters necessary to arrive at a particular permutation that, according to Dr. Shanfield, just so happens to meet the requirements of Claim Limitation [1C]. *See* Ex. 2011 at ¶¶ 95-96, 99. This is pure hindsight bias.

In particular, Dr. Shanfield begin with a particular disclosed “planar profile” from the infinite set of potential tip profiles in paragraph [0053]. Based on that profile, Dr. Shanfield then selects a particular one of the thirteen specifically disclosed variance ranges in paragraph [0056] to which the tips may deviate, again from a potentially infinite set of such ranges.

From paragraph [0073], Dr. Shanfield selects the specifically-disclosed 20µm or more predetermined protrusion height from which the superabrasive tips can protrude from the organic material layer that retains them (among the potentially infinite set of ranges that the tips can protrude). From that same paragraph, Dr. Shanfield then selects one of three specifically-disclosed variances that are permitted from the predetermined protrusion height he adopted (again, out of a potentially infinite set of variances that could exist).

Overall, Dr. Shanfield has selected, from four different “aspects” of the invention of Sung '026, each of which has a potentially infinite set of values or ranges, a particular combination that satisfies the recitation of Claim Limitation

[1C]. To be sure, Dr. Shanfield has selected parameters and values that just so happen to satisfy what Claim Limitation [1C] requires. Dr. Shanfield claims that a POSITA would have been motivated to level the tips as precisely as possible, notwithstanding the statements in Sung '026 expressly recognizing that the invention is not limited to the narrowest tolerances in tip height variance.

But other than that, he has offered no rationale for why he chose that particular combination of the 39 specific variations disclosed and the potentially infinite number that a POSITA would have understood as being within the scope of the invention. *See* Ex. 2011 at ¶¶ 100-101. And many of those combinations of the specific disclosed parameters (out of the infinite number of variants of the parameters) result in far more variance than the 1-micron amount in tip height produced from the particular cobbled-together embodiment that Dr. Shanfield claims would necessarily result from merely trying to follow the teachings of Sung '026. *Id.* at ¶¶ 101-102. Such a set of potential options (both those specifically disclosed in Sung'026 and the others that a POSITA would have readily appreciated to be available for each “aspect) were hardly “finite,” “small,” or “easily traversed” and Petitioners and Dr. Shanfield fail to explain why he “would have had a reason to select the route that produced the claimed invention.” *Eurand, Inc. v. Mylan Pharms., Inc.*, 676 F.3d 1063, 1072 (Fed. Cir. 2012).

That is why “[w]here the prior art at best gives only general guidance as to the particular form of the claimed invention or how to achieve it, relying on an obvious-to-try theory to support an obviousness finding is impermissible.” *Leo Pharm. Prods. v. Rea*, 726 F.3d 1346, 1356 (Fed. Cir. 2018) (cleaned up)

While PO does not dispute that “it was well known that there are numerous disadvantages associated with unleveled tips,” it (again) simply does not logically follow from such knowledge alone that the ’862 patent’s claimed tip height variation ranges would result from mere “*efforts* to provide leveled diamond particles using a reverse casting process,” as Petitioner suggests. Pet. at 34-35; see Ex. 2011 at ¶¶ 101-102

Even if it might have been “obvious to try,” Petitioner fails to flesh out that argument with the requisite provide supporting evidence and explanation of why there would have been a reasonable expectation of success. Thus, Petitioner has failed to establish that Sung ’026 discloses [1C].

c) Conclusion for Ground 1B

As discussed above, Sung ’026 does not disclose any of Claim Limitations [1A], [1C], and [1D]. To the extent Petitioner identifies support for such disclosures in Sung ’026, such support impermissibly combines multiple embodiments or “aspects” of Sung ’026 and/or fails to apply to the specific pad dresser recited in the respective limitations. Moreover, Petitioners fail to make any express inherency

arguments for any limitation in claim 1, and having similarly declined to advance obviousness arguments for any limitation besides Claim Limitation [1C], Petitioners cannot argue that any of these other limitations would have been obvious to a POSITA in view of the disclosure of Sung '026. Even if Claim Limitation [1C] might have been “obvious to try” in view of Sung '026 (which it is not), Petitioners have failed to explain how the other limitations are obvious.

But Petitioner is stuck with those flawed arguments—see *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016); *Magnum Oil*, 829 F.3d at 1381; *Sirona Dental Sys. GmbH v. Institut Straumann AG*, 892 F.3d 1349, 1356 (Fed. Cir. 2018)—which cannot carry Petitioners’ burden to invalidate claim 1. Thus, they apply to all of the other challenged claims which depend therefrom. Accordingly, Ground 1B should be rejected as to challenged claim 1.

Because each of the dependent claims depends from claim 1, and claim 1 is not obvious in view of Sung '026, neither are any of the dependent claims that depend therefrom. Petitioner has thus failed to carry its burden to demonstrate that the dependent claims are unpatentable as obvious. Nevertheless, and expressly noting that this failure to establish the disclosure of the sole independent claim is fatal to Petitioners’ ability to prevail on the dependent claims, PO will proceed to

identify additional reasons why Petitioners have failed to discharge its burden to demonstrate the unpatentability of the dependent claims.

2. Dependent Claims 2-6, 9-12, 20

As discussed above, Petitioners have failed to show that Sung '026 discloses any of Claim Limitations [1A], [1C], or [1D], let alone all of them. And as discussed above, this deficiency is fatal to Petitioners' arguments regarding Ground 1A, contending that dependent claims 2-6, 9-12, and 20 are similarly invalid.

In addition, as with their arguments regarding Claim Limitations [1A] and [1D], Petitioners have failed to argue that these dependent claims would have been obvious in view of the disclosure of Sung '026. For these dependent claims, all Petitioners have done is have shown that Sung '026 also includes the additional limitations recited therein. But obviousness requires more than merely showing that the additional disclosure is also contained somewhere in Sung '026; rather, what is required is a rationale for why these additional limitations would have been combined as a whole with a modified version of Sung '026 that satisfied the requirements of claim 1. *Unigene Labs.*, 655 F.3d at 1360. But because no such rationale was supplied, Petitioners' Ground 1B must be rejected as to these dependent claims as well.

C. Ground 2: Sung '026 With SungICPT Does Not Render Obvious Claims 5-10

Claims 5 and 9-10 all recite additional limitations relating “superabrasive particles . . . at a peripheral location of the dresser.” But the cited portions of the secondary reference, SungICPT, fail to fill the gaps from Ground 1A/1B. Instead, it repeats the same error for these claims from those Grounds, again drawing an unsupported inference from a *lack of disclosure* from additional source material. That fails to carry Petitioner’s burden here.

Specifically, Petitioner assumes from the *lack of information* about the contents of the area within radius *a* in SungICPT’s figure 1 that there are no superabrasive particles there. Pet. at 50-52. But the figure’s showing the detail of between radius *b* and *c* does not establish that the other area has nothing, and Petitioner identifies nothing to the contrary in SungICPT. Again, this absence of evidence is not evidence of absence, and this lack of evidence cannot satisfy Petitioner’s burden to establish what SungICPT discloses. Simply put, it does not establish that any “peripheral location” contains substantially all of the superabrasive particles as each of these claims requires.

For claim 5,⁶ Petitioner cites only to three portions of SungICPT to fill the gap in Sung '026 (which Petitioner does not identify). Pet. at 53 (citing Ex. 1005 at

⁶ Because claims 6-8 depend from claim 5, they fail for these same reasons.

1:12-16, 5:4-5, 6:21-22). But at most, these cited portions of SungICPT say only that “all diamond grits . . . shar[e] the work” to produce more uniform asperities. *See id.* They say nothing about **which** particular asperities actually cut as claim 5 requires; rather, actual performance of dressers remained unpredictable. Ex. 2001 at ¶¶ 19-22, 26-29.

In view of the foregoing, Ground 2 should be rejected in its entirety.

D. Grounds 2-6: Petitioners Have Failed To Establish Obviousness For Each Identified Combination

Petitioners’ Grounds 2-6 each argue,⁷ with purported evidentiary support, that various dependent claims of the ’862 patent are invalid as obvious based on Sung ’026 in combination with a particular secondary reference.⁸ Each of these Grounds is argued in parallel fashion:⁹ it assumes that independent claim 1 has been established as invalid, and thus proceeds to argue that the additional element(s) of the dependent claim(s) are supplied by the respective secondary reference. This fails

⁷ Because the obviousness argument advanced each of these Grounds is defective in the same ways, PO addresses them collectively.

⁸ See Paper 14 at 9-10.

⁹ Other than the additional recitation recited by Claim 5 (which is addressed above for Ground 2), PO does not dispute that the secondary reference for each of Grounds 2-6 discloses the additional recitation of each of the respective dependent claims.

to establish unpatentability of the respective claims by a preponderance of the evidence, and thus requires that each such Ground be rejected.

Specifically, each such Ground involves dependent claims that depend from claim 1, the only independent claim. The argumentation and purported supporting evidence for each such Ground simply identifies, in the respective secondary reference, alleged support for the disclosure of the dependent claim's additional recitation. At no point do Petitioners contend that the secondary reference provides disclosure relating to the recitation of claim 1. Thus, Petitioners facially fail to argue that any portion of any such secondary reference discloses anything that satisfies any gaps in what Sung '026 discloses with regard to claim 1.

But as demonstrated above, Petitioners have failed to carry their burden to establish the unpatentability of claim 1 on both anticipation and obviousness grounds. And since each of these Grounds 2-6 requires the invalidity of claim 1, Petitioners' failure to invalidate claim 1 is correspondingly fatal to each of these invalidity arguments. As such, Petitioners' failures regarding Grounds 1A/1B require rejecting each other Ground in the Petition in its entirety.

VII. CONCLUSION

For at least the foregoing reasons, PO respectfully requests that the Board reject all seven grounds of unpatentability instituted in this Proceeding and find that

all of the challenged claims of the '862 patent are patentable in light of the references and arguments advanced by Petitioners.

Dated: December 11, 2024

Respectfully submitted,

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that there are 11,395 words in this paper, excluding any table of contents, table of authorities, mandatory notices under 37 C.F.R. § 42.8, certificate of word count, certificate of service, or appendix of exhibits. This certification relies on the word count of the word-processing system used to prepare this paper.

Dated: December 11, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on December 11, 2024, the foregoing document is being served via electronic mail upon the following counsel of record for Petitioner:

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