UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,
Petitioner

v.

STRATASYS, INC.
Patent Owner.

IPR2025-00585
U.S. PATENT NO. 11,167,464

PATENT OWNER'S PRELIMINARY RESPONSE

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I. INTRODUCTION

Pursuant to 35 U.S.C. § 313 and 37 C.F.R. § 42.107, Stratasys, Inc. ("Stratasys" or "Patent Owner") hereby submits this Preliminary Response to the Petition for *inter partes* review ("Petition" or "Pet.") filed by Shenzhen Tuozhu Technology Co., Ltd. ("Petitioner"), challenging claims 1-6, 10-19 ("challenged claims") of U.S. Patent No. 11,167,464 ("the '464 Patent") (EX1001).

Petitioner alleges that the challenged claims are invalid based on three grounds (1A, 1B, 2). Petitioner argues in Ground 1A that independent claims 1 and 12 are obvious over U.S. Patent No. 6,022,207 ("*Dahlin*") (EX1011) in view of U.S. Patent Publication No. 2006/0127153 ("*Menchik*") (EX1009), in Ground 1B that independent claim 19 is obvious over *Dahlin* and *Menchik* in further view of U.S. Patent Publication No. 2006/0091199 ("*Loughran*") (EX1004), and in Ground 2 that independent claims 1, 12, and 19 are obvious over *Loughran* in view of Japanese Patent Publication No. JP2013-67018A ("*Toshiki*").

As explained below, Petitioner has failed to meet its burden of showing a reasonable likelihood that it would prevail with respect to any of the challenged claims because each of the asserted grounds has fatal defects.

The challenged claims of the '464 Patent are directed to solutions that include reading data from a tag included on a supply of a build material, determining an operational parameter of a fabrication process using the three-

dimensional printer based upon the data read from the tag, performing a diagnostic test to determine whether the operational parameter is suitable for the thee-dimensional printer, and controlling operation of the printer during the fabrication process according to the operational parameter when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test.

Ground 1A includes two references, *Dahlin* and *Menchik*, but lacks a motivation to combine as Petitioner's conclusory assertions ignore the teachings of the references and lack supporting evidence. Petitioner's attempt to rehash the consideration of *Dahlin* and *Menchik* by the examiner are without merit. The combination fails to teach several elements of claims 1 and 12. Petitioner presents flawed mappings to the claims with conclusory assertions that lack adequate explanation.

Ground 1B adds a third reference, *Loughran*, to Ground 1A, but Petitioner fails to satisfy its burden to show obviousness for claim 19. Despite the claim reciting several elements not found in other claims, Petitioner simply refers to its arguments for other claims, without providing any explanation to identify the grounds on which the challenge is based and the evidence that allegedly supports the ground.

Ground 2 asserts the combination of two references, *Loughran* and *Toshiki*, against independent claims 1, 12, and 19. But *Toshiki* is not prior art and there is

no motivation to combine the references even if it were. Additionally, the combination fails to teach several elements of claims 1 and 12. And similar to Petitioner's inadequate assertions in Ground 1B, Petitioner fails to provide any explanation to identify the grounds on which its challenge to claim 19 is based and the evidence that allegedly supports the ground.

In summary, the Board should not institute IPR because each of Petitioner's grounds are deficient and thus Petitioner cannot satisfy its burden to prove unpatentability.

II. THE '464 PATENT AND THE CHALLENGED CLAIMS

A. Summary of the '464 Patent (EX1001)

The '464 Patent relates to "three-dimensional printers" that "use build material of various type and configuration to print three-dimensional objects." EX1001 at 1:18-20. As the patent explains, "at least a basic set of characteristics of the build material to determine operation" may be needed "[i]n order to properly process the build material through the three-dimensional printer extruder for the fabrication of an object." *Id.* at 1:20-24. Thus, there is "a need for methods and systems for the automatic detection and acquiring of three-dimensional printer build material characteristics." *Id.* at 1:25-27.

Figure 3 of the '464 Patent shows a three-dimensional printer system 300 that includes a three-dimensional printer 306 with a tag sensor 310 to read a data tag 304 included on a supply 302 of build material 312.

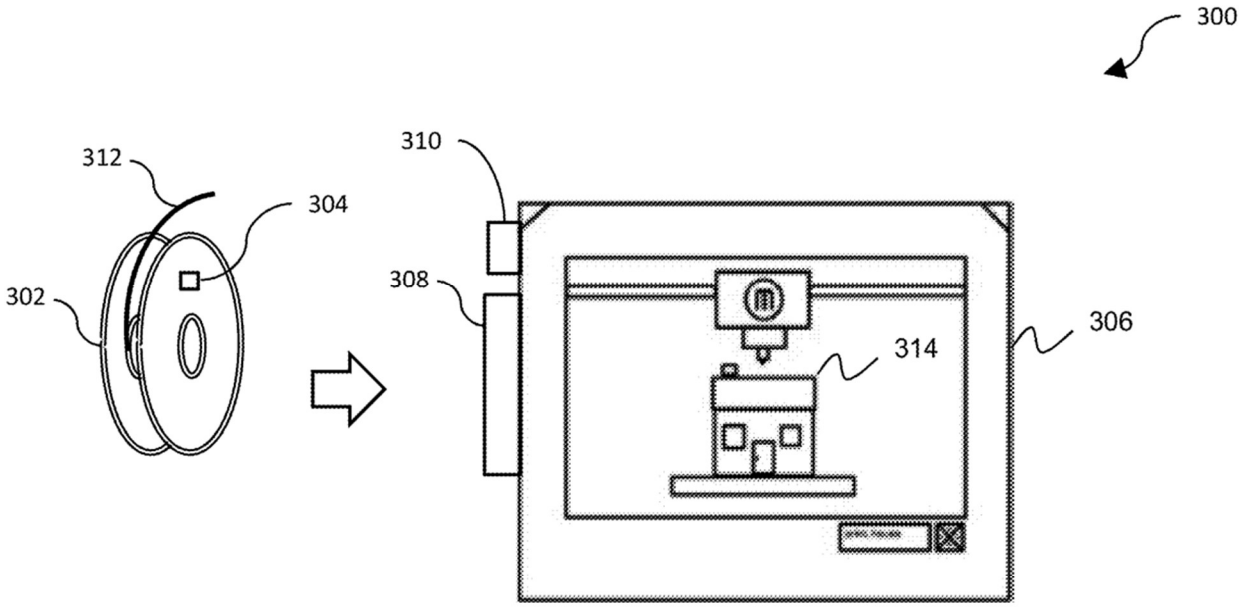


Fig. 3

Id. at 13:66-14:1, 14:31-36, 14:57-60, Fig. 3. As shown, the supply of material can be coupled via 308 to the three-dimensional printer 306 for the fabrication of an object 314. *Id.* at 14:10-24, 15:12-18, Fig. 3; *see also id.* at Figs. 4A-4C.

A diagram of a three-dimensional printer 100 is shown below in Figure 1 with a build platform 102, extruder 106, and controller 110 that cooperates "to fabricate an object 112 within a working volume 114 . . . ." *Id.* at 2:27-31, Fig. 1.

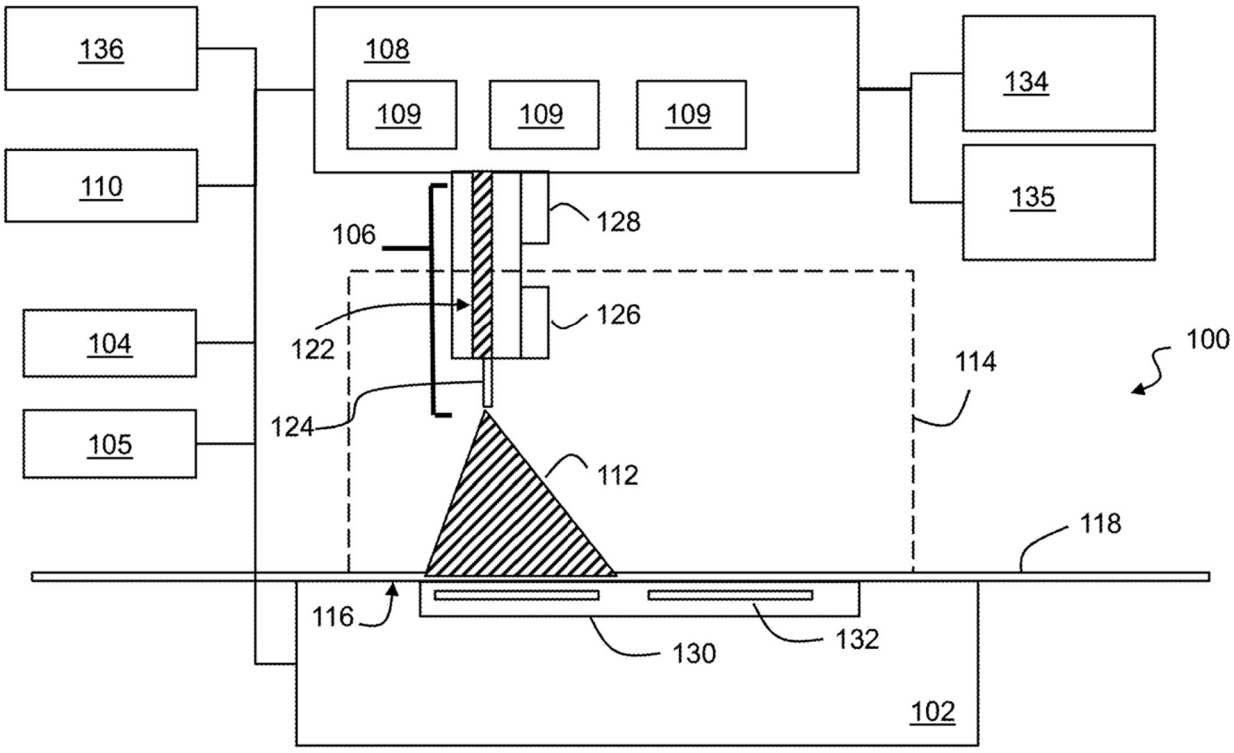


Fig. 1

Id. at Fig. 1. The extruder 106 may include a chamber 122 that receives build material that "can usefully be extruded to form a three-dimensional object." *Id.* at 2:45-51. For instance, the extruder 106 may include an extrusion tip 124 that includes an exit port that "extrudes build material." *Id.* at 2:51-55. In particular, the heater 106 may include a heater 126 to melt the build material "within the chamber 122 for extrusion through an extrusion tip 124 in liquid form." *Id.* at 2:56-59. Further, "[b]y controlling a rate of the motor 128, the temperature of the heater

126, and/or other process parameters, the build material may be extruded at a controlled volumetric rate." *Id.* at 3:7-9.

To read build material tag data and fabricate an object, the '464 Patent illustrates a flowchart in Figure 6. *Id.* at 1:52-54.

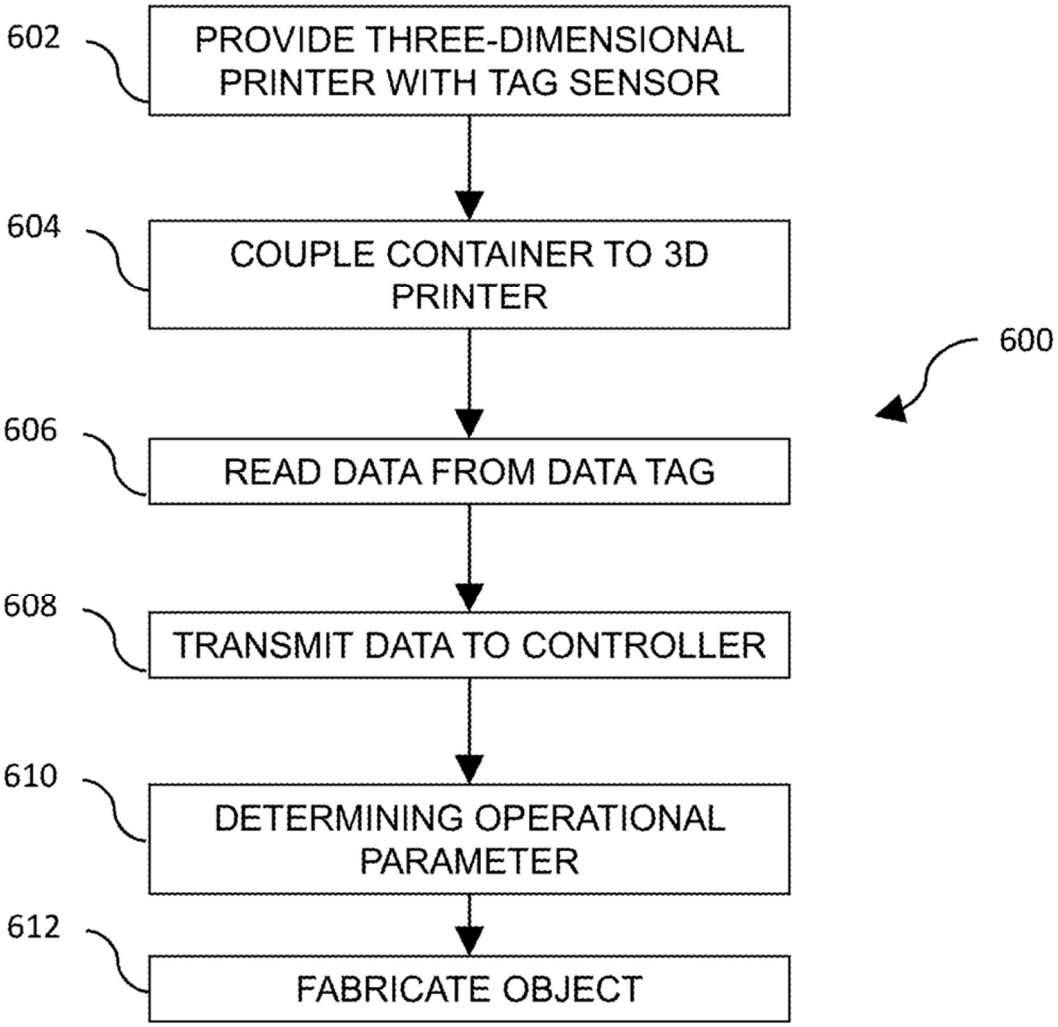


Fig. 6

Id. at Fig. 6. At step 602, a three-dimensional printer is provided with a tag sensor, such as via an add-on component to the printer. *See id.* at 20:65-21:5. At step 604, a container for build material with a data tag is coupled to the three-dimensional printer. *Id.* at 21:6-15. The data on the tag may include information about the mechanical, structural, thermal, and aesthetic properties of the build material. *Id.* at 21:15-22.

Although such information can be used to determine operational parameters, the data tag may also store data that is not "tied to operational parameters . . . such as an amount of material in the container . . . , an expiration date, [and] a brand name . . . ." *Id.* at 21:23-21:27. As explained by the '464 Patent, the amount of material in the container may be an initial amount or a measured amount using active circuitry. *Id.*; *see also, e.g.*, *id.* at 18:41-44 (The supply of material "may optionally include sensors and processing circuitry to actively provide data concerning an amount of build material."), Fig. 4B.

Additionally, the data on the data tag may include "data indirectly related to build material properties such as a unique identifier for the build material or the container." *Id.* at 21:28-30.

At step 606, the data on the data tag is read using the tag sensor. *Id.* at 21:41-43. And then, at step 608, the data read from the tag sensor may be transmitted to a controller. *Id.* at 21:46-47.

At step 610, an operational parameter for fabrication of the object may be determined based on data from the data tag. Namely, information about the build material that is stored in the data tag can be used to determine how the build material should be used in a fabrication process. *See id.* at 21:52-58. For instance, a controller associated with the three-dimensional printer may use the type of build material to determine "an extruder temperature, a feed rate, a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, an extruder movement speed, and a cooling requirement." *See id.* at 21:58-63. The determined operational parameter may be transmitted from a remote resource to the three-dimensional printer to fabricate an object. *See id.* at 16:35-41, 16:42-56.

At step 612, the object is fabricated while using the operational parameter to control operation of the three-dimensional printer. *See id.* at 22:23-26. As a result, "a user may simply load a build materially from a suitably instrumented container and select an object to print without specifying various configuration details that might otherwise be required." *Id.* at 21:29-33.

Numerous claims embody these solutions, including independent claims 1, 12, and 19. For instance, claim 1 recites "reading data from a tag included on a supply of a build material using a tag sensor in communication with a controller of a three-dimensional printer, the data including at least one property of the build

material;" "determining an operational parameter of a fabrication process using the three-dimensional printer based upon the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement;" "performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer; and" and "when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, controlling operation of the three-dimensional printer during the fabrication process with the controller according to the operational parameter to fabricate an object with the three-dimensional printer." *Id.* at 23:34-53. Similarly, claim 12 recites "a tag sensor communicatively associated with the three-dimensional printer, the tag sensor configured to read data from a data tag associated with the supply of the build material, the data including at least one property of the build material;" "a processor configured to determine an operational parameter of a fabrication process using the three-dimensional printer based upon the data and to perform a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement; and" and "a controller for the three-

dimensional printer, the controller configured to, when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, control operation of the three-dimensional printer during the fabrication process according to the operational parameter to fabricate an object with the three-dimensional printer." *Id.* at 24:28-49. And claim 19 recites "reading first data from a tag included on a supply of a build material using a tag sensor associated with a three-dimensional printer, the first data related to the build material;" "retrieving second data from a data store, the second data including additional data related to the build material;" "determining an operational parameter to configure the three-dimensional printer for a fabrication process using the build material based upon the combination of the first data and the second data;" "performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer; and" and "when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, controlling operation of the three-dimensional printer during the fabrication process according to the operational parameter to fabricate an object with the three-dimensional printer." *Id.* at 25:1-21.

As explained below, the asserted grounds fail to teach the elements of claims 1, 12, and 19. Because claims 2-6, 10-11 depend from claim 1 and claims 13-18

depend from claim 12, the asserted grounds also fail to teach the elements of dependent claims 2-6, 10-11, 13-18 for at least the same reasons.

B. Summary of Prosecution History of the '464 Patent (EX1002)

During prosecution leading to the issuance of the '464 Patent, the applicant explained that the cited art, U.S. Pat. No. 8,658,250 to Batchelder, et al. ("*Batchelder*"), did not teach performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer. EX1002 at 140; *see also id.* at 100-31 (office action), 133-46 (response with amendment).

Further, the examiner expressly considered two of the asserted references in this IPR, *Menchik* and *Dahlin*. *See* EX1002 at 109-12, 114-31 (EAST Search History dated Oct. 1, 2020) (referencing *Menchik* (US2006/0127153) at 117 (S18), 127 (S126, S127, S128, S129), 128 (S134), 129 (S156), 130 (S166 and S167) and *Dahlin* (USP 6,022,207) at 119 (S47), 120 (S52), 122 (S73), 124-25 (S97).

In response to the applicant's amendment and remarks, the examiner maintained a double-patenting rejection but no longer asserted a rejection based on *Batchelder*. *See* EX1002 at 150-53. The prosecution history confirms that the examiner performed a search for prior art after the applicant's amendment and remarks, including a search for art based on *Menchik* and *Dahlin*. *See id.* at 156-74 (EAST Search History dated Mar. 24, 2021) (referencing Menchik (US2006/0127153) at 157 (S18), 167 (S126, S127, S128), 168 (S129, S134), 169-

70 (S156, S166, S167) and Dahlin (USP 6,022,207) at 159 (S47), 160 (S52), 162-63 (S73), 164-65 (S97). Thereafter, the examiner allowed the application after the filing of a terminal disclaimer. *See* EX1002 at 191-92; *see also id.* at 175-76, 182-88.

As explained below, the references asserted in the Petition (including *Menchik* and *Dahlin*) suffer from similar deficiencies as the art cited during prosecution and the asserted grounds do not teach all elements of independent claims 1, 12, and 19 of the '464 Patent.

III. LEVEL OF ORDINARY SKILL

For the purpose of this Preliminary Response, a personal of ordinary skill in the art (a "POSITA") in relation to the subject matter of the '464 Patent would have had a bachelor's degree in Mechanical Engineering, Computer Engineering, Electrical Engineering, Chemical Engineering, Materials Science, or a comparable field and at least two years of experience related to 3D printing, with additional experience potentially being a substitute for a formal degree or training (and vice versa).

As explained below, the Petition has failed to show that the claims of the '464 Patent are unpatentable irrespective of the level of skill of a skilled artisan.

IV. CLAIM CONSTRUCTION

For the purposes of this Preliminary Response, Patent Owner submits that the Board does not need to construe any claim terms in any particular way to conclude that the Petition is deficient and thus institution of review is not warranted. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("need only be construed 'to the extent necessary to resolve the controversy'").

V. APPLICABLE LEGAL STANDARDS

At a minimum, Petitioner must show there is a reasonable likelihood of prevailing with respect to at least one challenged claim. *See* 35 U.S.C. § 314(a); 37 C.F.R. § 42.108(c); Practice Guide at 3 ("The Board, acting on behalf of the Director, may institute a trial where the petitioner establishes that the standards for instituting the requested trial are met . . . .")

Each of Petitioner's grounds relies on obviousness under 35 U.S.C. § 103. A claim cannot be considered obvious if even one element of the claim is absent from the prior art. *See CFMT, Inc. v. YieldUp Int'l Corp.*, 349 F.3d 1333, 1342 (Fed. Cir. 2003) ("Obviousness requires a suggestion of all limitations in a claim.") (citing *In re Royka*, 490 F.2d 981, 985 (C.C.P.A. 1974)); *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993) (reversing obviousness rejection as not all claim elements were taught or suggested); *Garmin Int'l, Inc. v. Patent of Cuozzo Speed*

Techs. LLC, IPR2012-00001, Paper 15 at 15 (PTAB Jan. 9, 2013) (denying institution of IPR in part as prior art did not disclose all claim limitations in obviousness challenge).

Obviousness is resolved based on several factual determinations including the scope and content of the prior art, any differences between the claimed subject matter and the prior art, and the level of ordinary skill in the art. *See Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). IPR petitions "must address the *Graham* factors." *Eizo Corp. v. Barco N.V.*, IPR2014-00358, Paper 11 at 29-30 (PTAB July 23, 2014) (citing *Graham*, 383 U.S. at 17-18) (faulting Petitioner for its failure to identify differences between the claimed subject matter and the prior art and its conclusory assertions about the teachings of the prior art); *see also Moses Lake Indus., Inc. v. Enthone, Inc.*, IPR2014-00243, Paper 6 at 18 (PTAB June 18, 2014); *Moses Lake Indus., Inc. v. Enthone, Inc.*, IPR2014-00246, Paper 6 at 17 (PTAB June 18, 2014); *eBay, Inc. v. Paid, Inc.*, CBM2014-00125, Paper 15 at 21 (PTAB Sept. 30, 2014).

The conclusion of obviousness based on the combination of references must be supported by an explicit analysis of a reason to combine such references. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). Mere conclusory statements are insufficient. Instead, "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 also LG Elecs., Inc. v. Cellular Commc'ns Equip. LLC*, IPR2016-00197, Paper 7 at 7-11 (PTAB Apr. 29, 2016) (petition's conclusion of obviousness lacked sufficient articulated reasons with rational underpinnings for modifying references to achieve specific elements of the claims).

VI. THE PETITION DOES NOT SHOW THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE UNDER GROUND 1A

A. Overview of *Dahlin* (EX1011)

Dahlin discloses a rapid prototyping system with filament supply spool monitoring. EX1001 at Title. *Dahlin* explains that the filament spool includes a circuit monitoring data concerning the filament on the spool. *Id.* at 1:61-64; *see also id.* at Abstract. When the spool is mounted onto a spindle of the system, the circuit connects to the electronic control of the system and data indicating the amount of filament on the spool is updated as filament is used by the system. *Id.* Additionally, an operator is notified "if the type of filament does not match the type of material identified by object specification data or if the amount of filament on the spool is insufficient to create a desired object." *Id.* at 1:66-2:2.

B. Overview of *Menchik* (EX1009)

Menchik discloses three-dimensional object printing. EX1009 at Title. The system includes cartridges with modeling models that are connected via valves for dispensing material. *Id.* at Abstract, Fig. 1 (reproduced below).

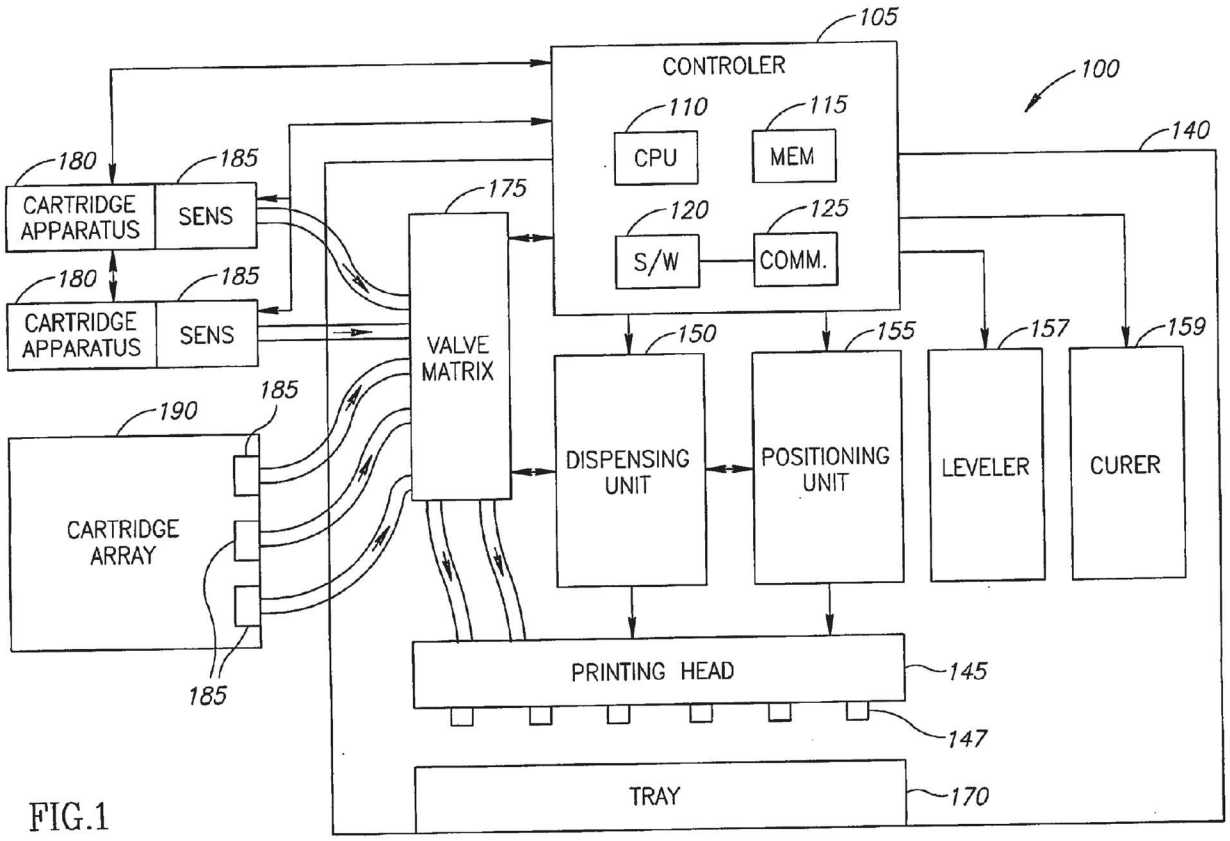


FIG.1

Sensors associated with the cartridges can monitor the status of the material, and a controller receives data from the cartridges and computes supply parameters for the materials. *Id.*

C. There Is No Motivation To Combine *Dahlin* and *Menchik*

In addition to the deficiencies of the *Dahlin-Menchik* combination address below, there is no motivation to combine *Dahlin* and *Menchik* as Petitioner proposes. Petitioner asserts that Menchik suggests "a data tag/readable memory storing optimal operation parameters, optimum building parameters, and material parameters, and the system computing material and supply parameters including the amount of material required for printing a given object." Pet. at 14. Based on

this assertion, Petitioner purports that a "POSITA would have been motivated to implement Dahlin's system in a manner that employs Menchik's suggestion . . . to thereby enable Dahlin's system to determine operational parameters based on data stored in its circuit, including the amount of modeling and support filament required for completing the job, in order to 'calculate whether a spool 42 or 56 contains enough filament to complete the job.'" *Id.* at 14-15.

However, Petitioner fails to recognize that *Dahlin's* system has no need for *Menchik's* purported improvements. Namely, *Dahlin* already determines if the amount of material is sufficient to create a desired object and notifies the operator if the amount of material is insufficient and thus the spool will need subsequent replacement. *See* EX1011, 1:64-2:2 (cited by Pet. at 11); *see also* EX1011, 2:2-8, 5:29-32. Although Petitioner acknowledges in its summary of *Dahlin* that the reference teaches notifying the operator if the amount of material is insufficient and the spool needs replacement (*see* Pet. 11), Petitioner ignores these teachings in *Dahlin* when it asserts that "a POSITA would have been motivated to apply Menchik's suggestion to Dahlin" in order to "beneficially facilitate Dahlin's ability to provide the operator with the opportunity to respond to the notification before the printing begins." Pet. at 16. *Dahlin* already provides the operator with a notification and opportunity to respond. *See* EX1011, 1:64-2:2, 2:4-8.

Petitioner also fails to recognize *Menchik's* teachings in asserting that *Menchik* enables *Dahlin's* system "to determine operational parameters based on data stored in its circuit" including the amount of material required for a job. Pet. at 14-15. In particular, *Menchik* teaches that its controller "may utilize data relating to the object to be printed, such as print data, CAD data, control data" for computing "the amount of modeling material, support liquid, or combination of modeling and support materials required for printing a given three-dimensional object." EX1009, ¶¶[0047]-[0048]. Thus, *Menchik* determines the amount of material required for a job based on the data for the object to the printed and not "data stored in [a] circuit" (e.g., information stored on *Menchik's* memory chip that is associated with a cartridge of material). *See id.*

Nor is there any support for Petitioner's conclusory assertion that *Menchik* allows *Dahlin* to use materials "efficiently" or to enable "continuous and uninterrupted supply" of materials. *See* Pet. at 15-16 (citing to EX1009 at ¶¶[0017], [0035], [0049]). *Menchik* only mentions the term "efficiently" once in its background without explaining what the term means and *Menchik* does not describe a "continuous and uninterrupted supply" in cited paragraph [0017]. *See* EX1009 at ¶¶ [0005], [0017]. Instead, it appears that Petitioner is merely referring to *Menchik's* teaching about the computation of supply parameters for the material in each cartridge. *See* Pet. at 15 (citing EX1009 at ¶[0049]). As explained above,

Dahlin has no need for *Menchik's* purported improvements because *Dahlin* already determines if the material supply is sufficient and provides an operator with a notification on insufficient material and an opportunity to respond such as by replacing a filament spool.

Moreover, there is no motivation related to "ensur[ing] continuous and uninterrupted supply of required material(s) to a 3D printing apparatus" and "negat[ing] the necessity for manual monitoring of materials and on-hand replacement of containers during printing." Pet. at 16. Petitioner admits that the combination simply has two spools (42 and 56) from *Dahlin*. *See id.* (citing EX1011 at 5:26-37). Spool 42 is for a modeling material and spool 56 is for a support material. *See* EX1011 at Fig. 3, 2:62, 3:8-9. Accordingly, modeling material is used when required, as is the support material, and each material must be available when required for uninterrupted supply. But again, *Dahlin* already determines if the amount of each material is sufficient and notifies the operator, without manual monitoring, if either amount of material is insufficient and thus the corresponding spool will need subsequent replacement. *See* EX1011, 1:64-2:2 (cited by Pet. at 11); *see also* EX1011, 2:2-8. Thus, there is no motivation to look to *Menchik* for the teachings that are already found in *Dahlin*.

Further, there is no motivation "to apply Menchik's suggestion to Dahlin to provide a system that uses the optimal" parameters "for the materials and the job"

or "to implement Dahlin based on Menchik's suggestion to advantageously allow optimal use of the various functions of the printer based on the nature of the materials in the printer and production of a higher quality object." Pet at 16 (citing EX1003, ¶49 (parroting same conclusory assertion as Petitioner)). Petitioner fails to provide any support for its rationale, except for its expert, which indicates that Petitioner's rationale relies on impermissible hindsight. As the Federal Circuit has explained, it is hindsight to use "the invention to define the problem the invention solves" because "when someone is presented with the identical problem and told to make the patented invention, it often becomes virtually certain that the artisan will succeed in making the invention." *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1377 (Fed. Cir. 2012); *see also AT&T Services Inc. et. Al. v. Innovative Sonic Ltd.*, IPR2024-001143 (PTAB Feb. 11, 2025) (denying institution after finding no motivation to combine because of an overly broad conclusion that "suffers from hindsight bias"). And similar to Petitioner's other flawed motivation to combine arguments, *Dahlin* already teaches using "proper" parameters for dispensing material with "high-precision." *See* EX1011, 1:56, 7:1-3. Thus, there is no motivation to look to *Menchik* for the teachings that *Dahlin* already provides.

D. Ground 1A Does Not Render Claims 1 and 12 Obvious

As discussed below, Petitioner fails to show that Ground 1A (*Dahlin-Menchik*) discloses or teaches each of the elements of claims 1 and 12 and thus the reference does not anticipate or render obvious the claims.

1. The *Dahlin-Menchik* combination does not teach claim elements 1[b] and 12[d]

The Petition fails to show that the *Dahlin-Menchik* combination teaches claim element 1[b] ("determining an operational parameter of a fabrication process using the three-dimensional printer based upon the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement") and claim element 12[d] ("a processor configured to determine an operational parameter of a fabrication process using the three-dimensional printer based upon the data . . . the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement"). As explained below, each of Petitioner's mappings is flawed.

Petitioner first argues that a POSITA would have been motivated to implement *Dahlin's* tag to store "proper extrusion parameters" to enable the system to determine parameters by reading the tag and to fabricate objects using those parameters. *See* Pet. at 24. But Petitioner fails to explain why the "proper

extrusion parameters" teaches one of the operational parameters provided in claim element 1[b] and 12[d], which do not recite extrusion parameters.

Petitioner then argues that the combination teaches determining "the amount of support material required for printing a given object (operational parameter) based on building material information stored in its tag." Pet. at 25; *see also id.* at 24. In particular, Petitioner points to *Menchik* as suggesting a "memory device storing optimal operation parameters, optimum building parameters, material parameters, and building material information, and the controller computing material and supply parameters including the amount of material required for printing a given object." *Id.* at 25. As explained above, there is no motivation to combine *Dahlin* and *Menchik* to obtain optimal parameters as *Dahlin* already discloses proper parameters. *Supra* § VI.C. As Petitioner readily admits "the amount of material required for printing a given object" is computed by *Menchik's* controller and is not stored or based on information stored on the memory device. *See id.* at 25. In particular, *Menchik* teaches that its controller "may utilize data relating to the object to be printed, such as print data, CAD data, control data" for computing "the amount of modeling material, support liquid, or combination of modeling and support materials required for printing a given three-dimensional object." EX1009, ¶¶[0047], [0048] (cited by Pet. at 25-26). Thus, *Menchik's* teachings are contrary to Petitioner's conclusion that the combination "would have

readily determined an operational parameter of a fabrication process using the 3D printer ('the amount of modeling material, support liquid, or combination of modeling and support materials required for printing a given three-dimensional object') based on such data read from the electronic tag (e.g., building material information)." Pet. at 27.

Additionally, Petitioner again fails to explain why the purported parameters stored on the tag teaches one of the operational parameters provided in claim element 1[b] and 12[d], which does not recite the amount of material required for printing a particular object.

Referring to *Dahlin* alone, Petitioner then argues that a POSITA would have understood the amount of support filament required for completing a job is a support structure requirement. *See* Pet. at 27-28. But Petitioner fails to explain why the amount of support filament required for completing a job is based on the data from the spool of material. For instance, *Dahlin* does not teach that the amount of support filament required for completing a job is based on the data from the spool of material. Indeed, the result that Petitioner proposes is non-sensical as the data from *Dahlin's* filament spool contains information about the filament or material itself and not information about objects to be built. *See, e.g.*, EX1011 at Abstract ("A filament spool used in a rapid prototyping system carries a circuit which maintains data regarding the type and amount of filament on the spool.").

Finally, tacitly recognizing that its prior theories are deficient, Petitioner asserts that a "POSITA would have been motivated to implement Dahlin's system in a manner that employs Menchik's suggestion (e.g., the controller computing the amount of support material required for printing a given 3D object) to thereby enable Dahlin's system to determine the amount of support filament required for completing the job (an operational parameter specifying a support structure requirement) in order to 'calculate whether a spool… 56 contains enough filament to complete the job.'" *See* Pet. at 28. However, Petitioner again fails to explain why the amount of support filament required for completing a job is based on the data from the spool of material. As explained above, *Menchik* teaches determining the amount of material required for completing a job based on "data relating to the object to be printed, such as print data, CAD data, control data" and not the information stored in *Mencik's* memory chip that is associated with the filament/material. EX1009, ¶¶ [0047]-[0048]; *supra* § VI.C. In addition, Petitioner fails to explain why determining the amount of material required for completing a job is a support structure requirement. Thus, each of Petitioner's mappings are flawed and the combination fails to teach claim elements 1[b] and 12[d].

2. The *Dahlin-Menchik* combination does not teach claim elements 1[c] and 12[d]

The Petition fails to show that the *Dahlin-Menchik* combination teaches claim element 1[c] ("performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer; and") and claim element 12[d] ("a processor configured . . . to perform a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer . . ."). Petitioner asserts that "calculating whether a spool contains enough support filament to complete the job is a diagnostic test to determine whether the amount of support filament required (operational parameter specifying a support structure requirement) is suitable for the printer to complete the print job." Pet. at 29.

However, Petitioner's failure to explain how the amount of material required for a job (purported operational parameter) is based on data read from a tag included on a supply of build material under claim elements 1[b] and 12[d] also shows that the combination fails to teach claim element 1[c] and the similar elements of claim element 12[d] because there is no operational parameter for the purported diagnostic test. *Supra* § VI.D.1. Thus, the combination also fails to teach claim elements 1[c] and 12[d].

3. The *Dahlin-Menchik* combination does not teach claim elements 1[d] and 12[e]

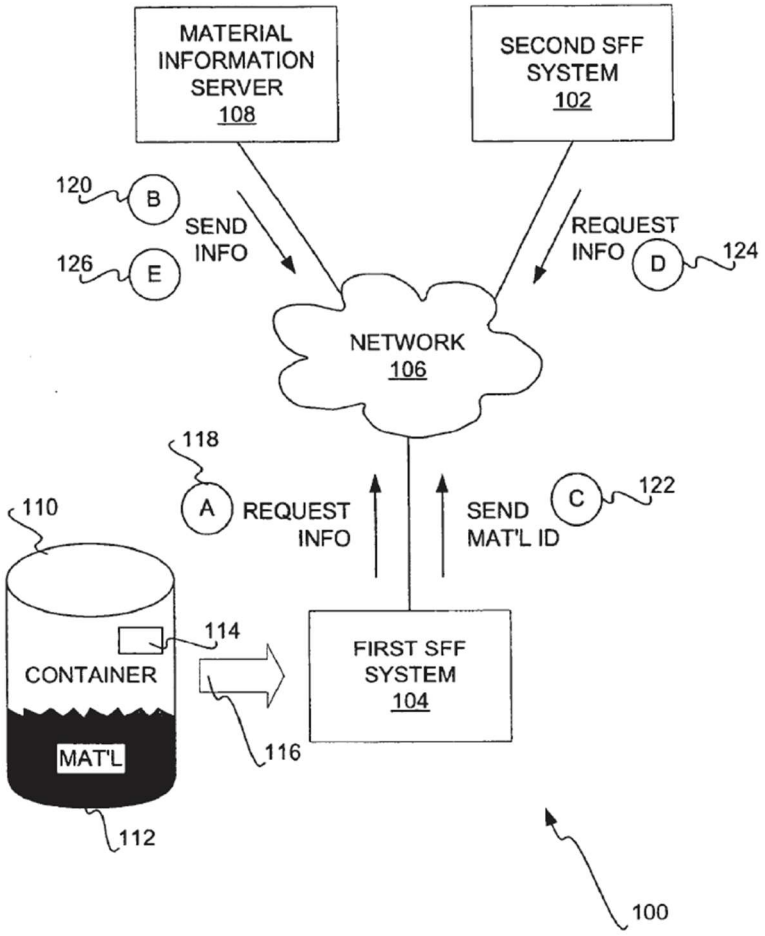
The Petition fails to show that the *Dahlin-Menchik* combination teaches claim element 1[d] ("when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, controlling operation of the three-dimensional printer during the fabrication process with the controller according to the operational parameter to fabricate an object with the three-dimensional printer") and claim element 12[e] ("a controller for the three-dimensional printer, the controller configured to, when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, control operation of the three-dimensional printer during the fabrication process according to the operational parameter to fabricate an object with the three-dimensional printer"). Petitioner asserts that when the amount of support filament required for completing the job is suitable for the printer to complete the job, the CPU in *Dahlin* controls operation of the printer during fabrication according to the purported operational parameter by monitoring the purported operational parameter and replacing the cartridge during the fabrication process. Pet. at 29-31. However, Petitioner fails to explain why controlling operation of the printer is performed when the operational parameter is suitable. And Petitioner's reference to monitoring and replacing the cartridge during fabrication only suggests that controlling operation of the printer is performed when the purported operational

parameter is not suitable. Thus, the combination also fails to teach claim elements 1[d] and 12[e].

VII. THE PETITION DOES NOT SHOW THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE UNDER GROUND 1B

A. Overview of *Loughran* (EX1004)

Loughran discloses retrieving information on material used in solid freeform fabrication (SFF). *See* EX1004 at Title. As shown below in Figure 1, *Loughran*'s system 100 includes two SFF systems (102, 104) and a material information server (108).



Id. at Fig. 1, ¶ [0012]. Material container 110 is shown with a tag 114 that includes a material identifier. *See id.* at ¶¶ [0020], [0021]. Based on the material identifier, the SFF system (104)[1] is able to recognize material 112 introduced to the system and determine whether the material is known or unknown. *See id.* at ¶[0020]. When *Loughran*'s teachings are used in an inkjet SFF system, the material is held in a melted liquid state in reservoirs and fed to individual jetting heads that squirt tiny droplets of the materials in the required pattern. *Id.* at ¶[0016]. After a layer of the object is formed, *Loughran* explains that a milling head is passed over the layer to cut the layer in a destructive manner to achieve uniformity. *See id.*

If the material is unknown, SFF system 104 requests information about the material from material information server (108) as indicated by the letter 'A.' *See id.* at ¶[0022], Fig. 1

In response to the request, material information server 108 sends information about the material to SFF system 104, as indicated by the letter 'B.' *See id.* at

[1] The description of *Loughran* refers to SFF system 104 as the second SFF system whereas Figure 1 of *Loughran* refers to system 104 as the first SFF system. *Compare* EX1004 at ¶[0020] *with* EX1004 at Fig. 1. Patent Owner refers to SFF system 104 and SFF system 102 consistent with Figure 1 and the written description of *Loughran*.

¶[0023], Fig. 1. SFF system 104 then knows the material and stores the material identifier in association with the information received from material information server 108. *Id.* As a result, SFF system 104 can "automatically and dynamically" adjust its use of the material to fabricate physical objects. *See id.*at ¶¶[0024], [0025]. These adjustments can occur while SFF system 104 is running, without having to reboot the system and can also occur without user intervention and involvement. *See id.* at ¶[0037].

Another SFF system (102) in *Loughran* provides SFF jobs to SFF system 104, which fabricates the objects for the jobs as discussed above. *Id.* at ¶[0012]. SFF system 102 can also request information about the material. SFF system 104 can send a material identifier to SFF system 102 as indicated by the letter 'C." *Id.* at ¶[0028], Fig. 1. SFF system 102 may request information about the material from material information server 108 as indicated by the letter 'D.' *See id.* And, the material information server 108 sends the information to SFF system 102 as indicated by the letter 'E.' *See id. Loughran* explains that SFF system 102 can use material information, for example, to estimate build time, suggest feature orientation, or determine part scaling based on expected shrinkage. *See id.* at ¶[0027].

B. Ground 1B Does Not Render Claim 19 Unpatentable

1. The *Dahlin-Menchik-Loughran* combination does not teach or suggest claim 19

Petitioner fails to satisfy its burden to show in any way that claim 19 is obvious over the *Dahlin-Menchik-Loughran* combination. Petition must include a "full statement of the reasons for the relief requested, including a detailed explanation of the significance of the evidence including material facts." 37 C.F.R. § 42.22. The Petition "may be considered only if" it "identifies, 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." 35 U.S.C. § 312(a)(3). Against these standards, Petitioner's argument for Ground 1B and claim 19 is plainly deficient. Indeed, Petitioner merely refers back to its arguments for claims 1 and 10 as a shortcut to providing a proper explanation of its arguments. *See* Pet. at 47. Neither claim 1 nor claim 10 recite several elements of claim 19, including:

- claim element 19[a] ("reading first data from a tag included on a supply of a build material using a tag sensor associated with a three-dimensional printer, the first data related to the build material;"),

- claim element 19[b] ("retrieving second data from a data store, the second data including additional data related to the build material;"), 19[c] ("combining the first data and the second data;"), and

- claim element 19[d] ("determining an operational parameter to configure the three-dimensional printer for a fabrication process using the build material based upon the combination of the first data and the second data;").

Further, Petitioner never mentions what is purportedly the "second data" and "data store." *See* Pet. at viii (sole references in Petition to "second data" and "data store" are in the claim listing). *See TCL Commc'n Tech. Holdings Ltd. v. DataQuill Ltd.*, IPR2020-00746, Paper 21 at 22 (Sept. 18, 2020) (denying institution and explaining that it is "Petitioner's responsibility to cite specific evidence to support its arguments, not the Board's responsibility to piece together evidence or speculate as to Petitioner's position"); *see also* 35 U.S.C. § 312(a)(3) (the petition must identify "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"); 37 C.F.R. § 42.104(b)(4) (requiring that Petitioner provide "a statement of the precise relief requested for each claim challenged" including "*How the construed claim is*

unpatentable under the statutory grounds identified … . The petition must specify *where each element of the claim is found* in the prior art patents or printed publications relied upon."); *United States v. Dunkel*, 927 F.2d 955, 956 (7th Cir. 1991) ("Judges are not like pigs, hunting for truffles buried in briefs."); *DeSilva v. DiLeonardi*, 181 F. 3d 865, 867 (7th Cir. 1999) ("A brief must make all arguments accessible to the judges, rather than ask them to play archaeologist with the record.").

To the extent that Petitioner relies on its expert to provides its arguments, doing so is improper and still deficient. Indeed, Petitioner's expert merely repeats the same conclusory assertions as Petitioner. *See* EX1003, ¶¶90-96 (cited by Pet. at 47).

For these reasons, Petitioner has failed to show that Ground 1B teaches claim 19.

VIII. THE PETITION DOES NOT SHOW THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE UNDER GROUND 2

A. Overview of *Toshiki* (EX1024)

Toshiki discloses a three-dimensional modeling device that can automatically start model processing to end at a user-designated time. EX1024, Abstract. Figure 9 of *Toshiki* shows a block diagram of the system.

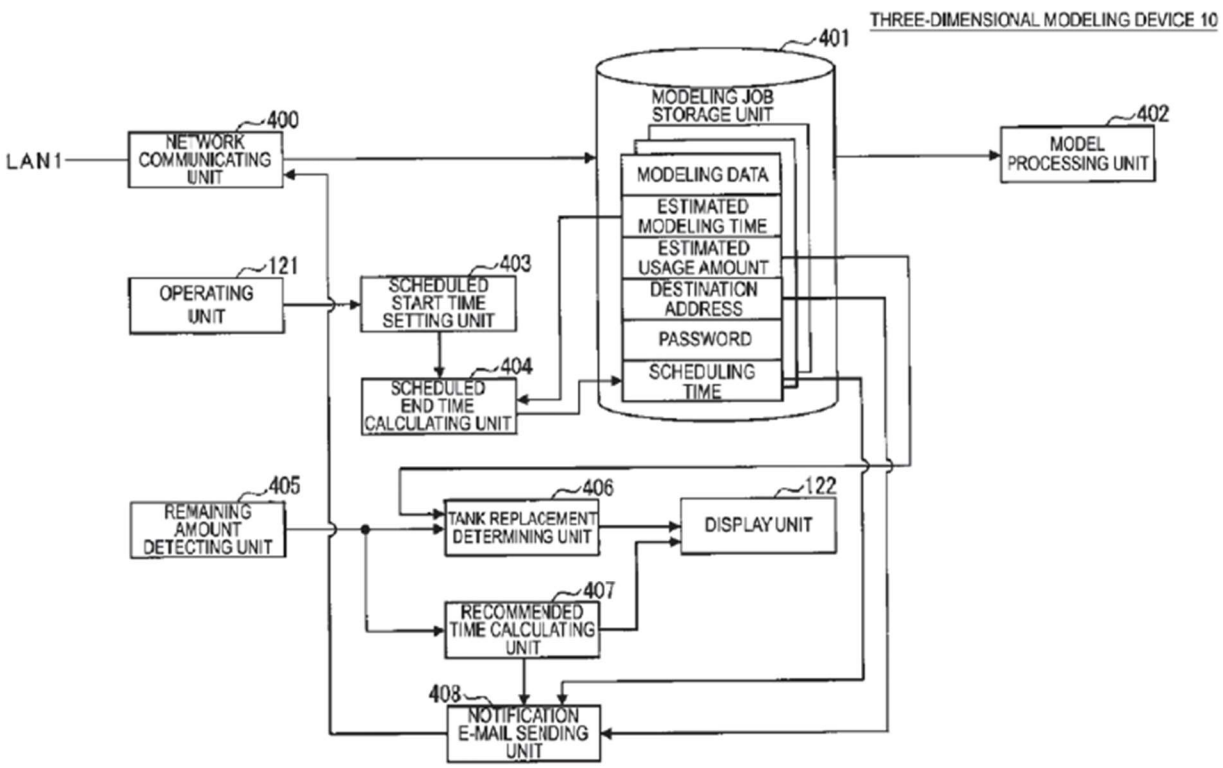


FIG. 9

Id. at Fig. 9. The system includes a model setting storage unit (401) that stores modeling data, estimated modeling time, and estimated usage amount, a model processing unit (402) to perform model processing to form the model target object, and a scheduled start time setting unit (403) to set the scheduled start time. *See id.* at Fig. 9, Abstract.

B. *Toshiki* Is Not Prior Art

The *Loughran-Toshiki* combination does not render any of the challenged claims under Ground 2 obvious because the *Toshiki* reference is not prior art. Petitioner asserts that *Toshiki* was published on April 18, 2013 (*see* Pet. at 2), after

the October 29, 2012 filing of a provisional application to which the '464 Patent properly claims priority.

Indeed, Petitioner concedes that one of the four purported requirements of each challenged claim—reading data from a tag—is disclosed in the earlier filing. *See* Pet. at 8-10 (failing to mention no disclosure for reading data from a tag or claim elements 1[a], 12[c], or 19[a]). Petitioner also concedes that the elements separately recited in the challenged dependent claims are disclosed in the earlier filing. *See id.* Thus, Petitioner's argument is limited to three purported requirements of each challenged independent claim.

For determining an operational parameter based upon the data (claim elements 1[b], 12[d], and 19[d]), Petitioner sole argument is that paragraph [0088] does not disclose that the "amount of build material required for a print job" is determined based on the tag data. *See* Pet. at 9. However, Petitioner fails to explain why determining the "amount of build material required for a print job" is relevant to determining an operational parameter. Petitioner fails to appreciate and address numerous interrelated disclosures in the provisional application that support the claim elements. For example, paragraph [0027] discloses that "printer 706 may include one or more readers, scanners, sensors or the like to detect the tag 704 and obtain data therefrom." *Id.* at 78. The tag "may encode data such as an identification number that can be used to retrieve relevant information from a

remote source, or the tag 704 may directly encode relevant information." *Id.* This may include "data describing the build material such as the type, color, diameter, and so forth of the build material in the supply 702" and/or "tracking information such as a lot number for the build material, billing information (e.g., so that build material can be metered by the printer 706 and charged to an appropriate party), descriptive material such as density, tensile strength, melting temperature, and so forth." For instance, the system may include an extruder with a heater to melt a build material for extrusion, a variety of fans and thermal controls to control the thermal environment in which deposition occurs, and a build platform with a thermal element, cooling element, or combination. *See id.* at 31 (¶¶[0037]-[0038]), 85 (¶[0060]), 86 (¶[0064]), 28-29 (¶¶ [0028]-[0029])

As another example, paragraph [0028] discloses that "the printer 706 may be programmed to employ information obtained using the tag 704 . . . ." EX1022 at 79. This includes "data stored directly on the tag 704 or data that can be retrieved for the build material and/or supply 702 from a remote source based upon the data from the tag 704." *See id.* This may also include a "selection of defaults for tool instructions such as a build platform temperature, extrusion temperature, and so forth, any of which may be selected according to the properties of the build material and/or the characteristics of the three-dimensional printer." *See id.* Thus,

the provisional application supports determining the operational parameter based upon the data read from a tag.

Additional disclosures in the provisional application also support this conclusion. For example, the system includes one or more sensors 134 "may include a heater (instead of or in addition to the thermal element 130) to heat the working volume 114 such as a radiant heater or forced hot air to maintain the object 112 at a fixed, elevated temperature throughout a build" or "may also or instead include a cooling element to maintain the object 112 at a predetermined sub-ambient temperature throughout a build." *Id.* at 34 (¶[0045]); *see also id.* at 76-78 (¶¶[0020]-[0023] (thermal control build volume), 85 (¶[0060] (tool cooling)), 86 (¶¶[0063]-[0064] (heating and cooling)). As another example, various fill materials may be used with a tool of the printer to fill voids within a fabricated object, to provide suitable structural filler to improve strength across adjacent layers of a layered fabrication or aesthetic filler, or be deposited around an object during fabrication as a support material. *See id.* at 53-54 (¶¶[0031]-[0034). As yet another example, additional equipment requirements and fabrication challenges are required for fabricating support structures for fused deposition modeling to support the creation of overhangs such as steep, overhanging angles and unsupported horizontal edges. *See id.* at 74 (¶[0011]). This includes the use of additional build materials, such as a dissolvable material, additional equipment, additional

fabrication time, and additional finishing steps. *See id.* As another example, the system can include a material that can be deposited to facilitate adhesion during fabrication and then separation of a completed object by dissolving the layer of material. *See id.* at 33 (¶¶[0032]-[0033]). Additionally, material to cover build surface defects may be different from usual build materials, such as a material with a higher melting point or a material that resists bonding to other build materials. *See id.* at 81 (¶¶[0040]-[0043]).

For performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer (claim elements 1[c], 12[d], 19[e]), Petitioner demands the exact words of the claim appear in the earlier filing. *See* 8-9 (requiring use of the term "diagnostic test"). But Petitioner's arguments run afoul of the Federal Circuit's warning that "a prior application need not contain precisely the same words as are found in the asserted claims." *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306 (Fed. Cir. 2008); *see also Purdue Pharma LP v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000) (holding that the prior disclosure need not provide in haec verba support).

Again, Petitioner fails to appreciate and address numerous interrelated disclosures in the provisional application that support the claim elements. *See* Pet. at 8-10. For example, defaults for tool instructions such as a build platform temperature, extrusion temperature, and so forth, may be selected according to the

properties of the build material and diagnostic test may be performed to determine whether a selected default is appropriate for the three-dimensional printer. *See, e.g.*, EX1022 at 79, ¶[0028]. As another example, a variety of diagnostic tests may be performed that may be based upon sensors that permit determinations concerning the ability of the three-dimensional printer to execute a print job. *See id.* at 49-50, ¶¶[0087]-[0088]; *see also id.* at ¶[0089]. The printer may include one or more "readers, scanners, sensors or the like" to detect the tag of a supply of material and "obtain data therefrom." *Id.* at 78. The tag "may encode data such as an identification number that can be used to retrieve relevant information from a remote source, or the tag 704 may directly encode relevant information." *Id.* As discussed above, numerous additional disclosures in the provisional application show that it determines the operational parameter based upon the data read from the tag when certain materials are to be used or provided. Thus, the provisional application supports performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer.

Similarly, for controlling operation of the three-dimensional printer according to the operational parameter when the parameter is suitable for the printer according to the diagnostic test (*see* claim elements 1[d], 12[e], 19[f]), Petitioner demands the use of the term "operational parameter" in the earlier filing. *See* Pet. at 8 (requiring explicit disclosure of phrase "operational parameter").

As with the other claim elements, Petitioner fails to appreciate and address numerous disclosures in the provisional application that support the claim elements. For example, fabrication of an object is initiated when the three-dimensional printer is available or suitable, by performing a wide variety of evaluations, including those based on sensors in the system that permit determinations concerning the ability of the three-dimensional printer to execute a print job. *See* EX1022 at 53 (¶[0097]), 49-50 (¶¶[0087]-[0089]). The printer may include one or more "readers, scanners, sensors or the like" to detect the tag of a supply of material and "obtain data" directly and/or indirectly. *Id.* at 78. And as discussed above, an operational parameter is based on the data read from the tag, such as by determining selected defaults according to the properties of build material. *See, e.g.*, *id.* at 79, ¶[0028]. Further, a diagnostic test may be performed to determine whether the operational parameter is appropriate for the three-dimensional printer. *See id.* When the diagnostic test indicates the operational parameter is suitable or appropriate for the three-dimensional printer, fabrication of the object may be initiated. *See id.* at 53 (¶[0097]); *see also id.* at 28-29 (¶¶[0026], [0028]), 31-33 (¶¶[0036]-[0041]), 55 (¶[00103]), 77 (¶[0021]), 80 (¶[0032]). Thus, the provisional application supports controlling operation of the three-dimensional printer according to the operational parameter when the parameter is suitable for the printer according to the diagnostic test.

Therefore, Petitioner's assertions are inconsistent with both the disclosure of the earlier filing when considered as whole and the legal standard for claiming priority to an earlier filing, and therefore, Petitioner has failed to show that *Toshiki* is prior art.

C. There Is No Motivation To Combine *Loughran* and *Toshiki*

In addition to the deficiencies of the *Loughran*-*Toshiki* combination addressed in the sections below, there is no motivation to combine *Loughran* and *Toshiki*. Indeed, Petitioner's sole citation to *Loughran* throughout its argument on the combination merely indicates that the systems of the references are related to fabricating three-dimensional objects, a conclusion that is insufficient to support Petitioner's rationale for the combination. *See* Pet. at 51 (citing EX1004, [0001], [0013], [0016]); *see also* Pet. at 50-52. And yet, Petitioner makes several assertions about *Loughran* without providing any evidence:

- "A POSITA would have been motivated to implement Loughran's system in a manner that employs Toshiki's suggestion … to thereby enable Loughran's system to determine … ." Pet. at 50.
- "A POSITA would have been motivated to implement Loughran's system in this predictable manner to beneficially provide the operator with the opportunity to respond to the notification before the printing begins … ." Pet. at 51.

- "Such an implementation of Loughran's system based on Toshiki's suggested techniques … ." Pet. at 51.

Without evidence to support its assertions, Petitioner has failed to satisfy its "Petitioner's responsibility to cite specific evidence to support its arguments." *See TCL Commc'n Tech. Holdings Ltd.*, IPR2020-00746, Paper 21 at 22; *DeSilva v. DiLeonardi*, 181 F. 3d 865, 867 (7th Cir. 1999) ("A brief must make all arguments accessible to the judges, rather than ask them to play archaeologist with the record."). It is improper for the Board or Patent Owner to "piece together evidence" for Petitioner. *TCL Commc'n Tech. Holdings Ltd.*, IPR2020-00746, Paper 21 at 22. Petitions must identify "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." 35 U.S.C. § 312(a)(3). It is well established that conclusory statements about a motivation to combine are insufficient. Without a rational underpinning with evidence to support an obviousness assertion, there is no motivation to combine *Loughran* and *Toshiki* in the manner described by Petitioner. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006); *see also LG Elecs., Inc. v. Cellular Commc'ns Equip. LLC*, IPR2016-00197, Paper 7 at 7-11 (PTAB Apr. 29, 2016).

D. Ground 2 Does Not Render Claim 1 Unpatentable

1. The *Loughran-Toshiki* combination does not teach claim elements 1[b] and 12[d]

The Petition fails to show that the *Loughran-Toshiki* combination teaches claim element 1[b] ("determining an operational parameter of a fabrication process using the three-dimensional printer based upon the data, the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement") and claim element 12[d][2] ("a processor configured to determine an operational parameter of a fabrication process using the three-dimensional printer based upon the data . . . the operational parameter including at least one of a build platform temperature, a build volume temperature, an infill requirement, a rafting requirement, a support structure requirement, and a cooling requirement").

Petitioner abandons the obviousness theory asserted in its motivation to combine (*see* Pet. at 50; modifying *Loughran's* system using *Toshiki's* suggestion to compare the current remaining amount of material to the cumulative amount to be used and to display the result, to enable Loughran to determine the amount of

[2] Petitioner's argument for claim element 12[d] references back to its arguments for claim elements 1[b] and 1[c]. *See* Pet. at 72-73.

modeling material to be used and provide a user notification), and presents a new theory for claim element 1[b] and 12[d]. *See* Pet. at 58-60. Namely, Petitioner asserts it would have been obvious "to implement Loughran's parameters that are retrieved based on the material identification number to include modeling parameters." *Id.* at 59. Although Petitioner does not explain where *Loughran's* parameters are retrieved from, Petitioner quotes portions of *Loughran* that indicate the SFF system/printer "retrieves information regarding the material 112 from the material information server 108 over the network 106, based on the material identifier (316)" and "parses the retrieved information regarding the material 112 to, for instance, extract parameters regarding the material 112, and dynamically adjusts its own parameters based on parameters extracted (326)." *See* EX1004, ¶¶ [0035], [0037]. Petitioner also does not explain the rationale that underpins this new obviousness theory. It merely provides a citation to its expert (EX1003, ¶108), who repeats the same argument as Petitioner without any explanation or evidentiary support for the conclusory assertion.

Petitioner also asserts that a "POSITA would have been motivated to implement Loughran so that the SFF system 104 also determines the amount of model material and support material to be used in the modeling process based on modeling parameters that are retrieved using the material identification number, based on Loughran's and Toshiki's suggestions." Pet. at 60 (citing EX1003, ¶109).

Again, Petitioner does not explain the rationale that underpins this obviousness theory. It merely provides a citation to its expert (EX1003, ¶109), who repeats the same argument as Petitioner without any explanation or evidentiary support for the conclusory assertion. Petitioner also cites its motivation-to-combine argument (*see* Pet. at 60 (citing Section III.C.2)), which does not even mention retrieving information, a material information server, material identifier or material identification number, *Loughran's* parameters, or *Toshiki's* modeling parameters.

To the extent Petitioner is asserting that the combination would have retrieved *Toshiki's* modeling parameters from *Loughran's* material information server using the material identification number, Petitioner does not explain why information specific to model generation, as opposed to information specific to the material, would be stored and retrieved from *Loughran's* material information server 108 using a material identifier, as opposed to a model identifier. *See* EX1004, [0035] (cited in Pet. at 58) (*Loughran* retrieves information regarding material 112 from material information server 108). Indeed, *Toshiki* teaches that modeling parameters relate to the model to be created and are not specific to the material and are stored in a separate storage unit of the three-dimensional printer (e.g., 206 in Fig. 8 or 401 in Fig. 9). *See* EX1024, [0029] (modeling parameters relate to the model and are not specific to the material), [0093] and Fig. 8 (teaching that modeling data (221) is stored in its own storage unit (206) as opposed to a

material information storage unit or server); *see also id.* at Fig. 9 (storage unit 401 in three-dimensional modeling device 10). Thus, there is no teaching or articulated rationale for storing *Toshiki's* modeling parameters in *Loughran's* material information server to be retrieved using a material identifier, as Petitioner asserts.

Additionally, to the extent Petitioner is asserting that the combination would have retrieved *Toshiki's* modeling parameters from *Loughran's* material information server using the material identification number, Petitioner also does not explain why *Toshiki* or *Loughran* teaches or suggests storing modeling parameters in the combination at a location remote from the printer and retrieving them from the remote location. *Toshiki* explains that his modeling data or modeling parameters that relate to the model are stored in their own storage unit that is within the three-dimensional printer. *See* EX1024, [0029], [0093] and Fig. 8; *see also id.* Fig. 9 (storage unit 401 in three-dimensional modeling device 10). Whereas *Toshiki* stores his modeling data locally at the printer, *Loughran* stores his material data remotely on a material information server (108) and his printer retrieves the material data from the material information server using a material identifier. *See* EX1004, [0035]. Although Petitioner appears to propose taking *Toshiki's* modeling parameters locally stored in its own storage unit and storing it remotely on a material information server, there is no teaching or articulated rationale for storing *Toshiki's* modeling parameters in *Loughran's* material information server that is remote from the printer.

For this additional reason, there is no teaching or articulated rationale for storing *Toshiki's* modeling parameters in *Loughran's* material information server to be retrieved using a material identifier, as Petitioner asserts.

Because *Toshiki's* modeling parameters would not have been stored in *Loughran's* material information server and because *Toshiki's* modeling parameters would not have been retrieved from the material information server using a material identifier that is purportedly read from a tag, *Toshiki's* modeling parameters cannot be an "operational parameter" because they are not determined "based upon the data" that is read a tag included on a supply of a build material. *See* claim elements 1[a] and 1[b]. Further, because the amount of support material to be used in the modeling process is purportedly based on modeling parameters, the amount of support material is also not an "operational parameter" because they are not determined "based upon the data" that is read a tag included on a supply of a build material. *See id.* In addition, because the amount of support material is not an "operational parameter," it also cannot be "an operational parameter specifying a support structure requirement" as Petitioner asserts. *See* Pet. at 60. Indeed, Petitioner fails to explain why "the amount of support material to be used in the modeling process is an operational parameter specifying a support structure requirement." Pet. at 60 (citing EX1003, ¶109) (repeating the same conclusory assertion as Petitioner without any explanation or support).

For each of these reasons, the combination fails to teach claim elements 1[b] and 12[d].

2. The *Loughran-Toshiki* combination does not teach does not teach claim elements 1[c] and 12[d]

The Petition also fails to show that the *Loughran-Toshiki* combination teaches claim element 1[c] ("performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer; and") and claim element 12[d] ("a processor configured . . . to perform a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer . . ."). Petitioner asserts that determining whether the modeling material storage tank needs to be replaced while performing model processing is a diagnostic test. *See* Pet. at 63; *see also* Pet. at 61-63.

Petitioner's failure to show determining an operational parameter based on tag data for a supply of build material for claim element 1[b] and 12[d] above also shows that the combination fails to teach performing a diagnostic test to determine whether the operational parameter is suitable for the three-dimensional printer because the purported operational parameters (modeling parameters and amount of support material to be used in the modeling process) are not based on the tag data for a supply of build material. *Supra* § VIII.D.1. Indeed, Petitioner annotates Figure 10A of *Toshiki* to show that the purported operational parameter including a

support structure requirement is based on the modeling parameters or modeling data, which as explained above is not based on tag data for a supply of build material. *Supra* § VIII.D.1. Thus, the combination also fails to teach claim elements [1c] and 12[d].

3. The *Loughran-Toshiki* combination does not teach does not teach claim elements 1[d] and 12[e]

The Petition also fails to show that the *Loughran-Toshiki* combination teaches claim element 1[d] ("when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, controlling operation of the three-dimensional printer during the fabrication process with the controller according to the operational parameter to fabricate an object with the three-dimensional printer") and claim element 12[e] ("a controller for the three-dimensional printer, the controller configured to, when the operational parameter is suitable for the three-dimensional printer according to the diagnostic test, control operation of the three-dimensional printer during the fabrication process according to the operational parameter to fabricate an object with the three-dimensional printer"). Petitioner asserts that a POSITA would been motivated to modify *Loughran's* system based on Toshiki such that when the amount of support material to be used in the modeling process is suitable for the printer to complete the job, the SFF mechanism 502 controls operations of the system during

fabrication by monitoring the amount of support material used and notifying the operator to replace the cartridge during fabrication. *See* Pet. at 65-66.

However, like Ground 1A, Petitioner fails to explain why controlling operation of the printer is performed when the operational parameter is suitable. Petitioner's reference to monitoring and replacing the cartridge during fabrication only suggests that controlling operation of the printer is performed when the purported operational parameter is not suitable. *See id.* at 64 (quoting EX1024, ¶[0014] (replacement "during model processing")). Thus, the combination also fails to teach claim elements 1[d] and 12[e].

E. Ground 2 Does Not Render Claim 19 Unpatentable

Similar to Petitioner's conclusory and deficient assertions for claim 19 under Ground 1B, Petitioner fails to explain its position and provide evidence and arguments for claim 19 under Ground 2. *See* Pet. at 74-75. Petitioner's deficiencies for Ground 2 are more glaring as Petitioner merely refers back to its arguments for claim 1. *See id.* However, claim 1 does not recite several elements of claim 19, including:

- claim element 19[a] ("reading first data from a tag included on a supply of a build material using a tag sensor associated with a three-dimensional printer, the first data related to the build material;"),

- claim element 19[b] ("retrieving second data from a data store, the second data including additional data related to the build material;"), 19[c] ("combining the first data and the second data;"), and

- claim element 19[d] ("determining an operational parameter to configure the three-dimensional printer for a fabrication process using the build material based upon the combination of the first data and the second data;").

Moreover, Petitioner never mentions what is purportedly the "second data" and "data store." *See* Pet. at viii (sole references in Petition to "second data" and "data store" are in the claim listing). It is "Petitioner's responsibility to cite specific evidence to support its arguments, not the Board's [or Patent Owner's] responsibility to piece together evidence or speculate as to Petitioner's position." *See TCL Commc'n Tech. Holdings Ltd. v. DataQuill Ltd.*, IPR2020-00746, Paper 21 at 22 (Sept. 18, 2020) (denying institution). The Petition must identify "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" 35 U.S.C. § 312(a)(3). In particular, Petitioner must provide "a statement of the precise relief requested for each claim challenged" that includes "[h]ow the construed claim is unpatentable under the statutory grounds

identified." 37 C.F.R. § 42.104(b)(4) (The petition must specify *where each element of the claim is found* in the prior art patents or printed publications relied upon."). And to the extent Petitioner seeks to rely on its expert to provide its arguments, doing so is improper and deficient as the expert merely repeats Petitioner's conclusory assertions. *See* EX1003, ¶¶137-143 (cited by Pet. at 74-75). Thus, the Petitioner has failed to show that Ground 2 teaches claim 19.

IX. ADDITIONAL COMMENTS

With respect to any arguments in the Petition that are not specifically addressed herein, Patent Owner does not concede the legitimacy of such arguments in the Petition and any underlying contentions in the Petition. If *inter partes* review is instituted, Patent Owner expressly reserves the right to rebut any such arguments and any such contentions at a later point, including in a Patent Owner Response. Patent Owner is not limited to the arguments presented here in this Preliminary Response and expressly reserves the right to raise further arguments, including claim construction arguments, not presented herein.

X. CONCLUSION

For the foregoing reasons, Patent Owner respectfully requests that the Board decline to institute *inter partes* review of the '464 Patent.

Respectfully submitted,

Dated: July 7, 2025

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I certify that this Preliminary Response complies with the type-volume limits of 37 C.F.R. § 42.24(b)(1) because it contains 10,642 words, excluding the parts that are exempted by 37 C.F.R. § 42.24(a), according to the word processing system used in preparation of this Request.

Dated: July 7, 2025

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e)(4), the undersigned certifies that on July 7, 2025, a complete copy of the foregoing Patent Owner's Preliminary Response was served on Lead and Back-up Counsel for Petitioner at the service address provided in Petitioner's Mandatory Notices:

Email: IPR56224-0010IP1@fr.com

Dated: July 7, 2025

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