UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,
Petitioner,

v.

STRATASYS, INC.,
Patent Owner.

Case IPR2025-00438
Patent 10,569,466

PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE

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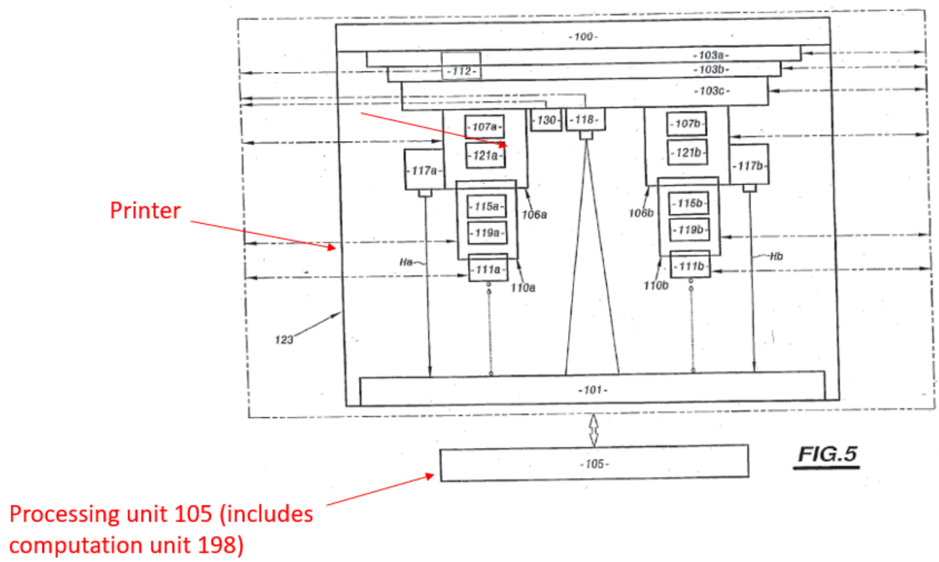
I. The Loughran-Dubois Combination Teaches Element 1[f] and Claim 5 (Grounds 1A-1B)

A. A POSITA Would Have Been Motivated to Combine Loughran and Dubois, and the Loughran-Dubois Combination Provides Element 1[f]

The Loughran-Dubois combination described in the Petition is straightforward and surely does not require "redesigning Loughran" as alleged by Patent Owner ("PO"). Pet., 10-13, 23-28; EX1003, ¶¶45-48, 63-70; POR, 12-13. Loughran's SFF system "104" performs "fabrication of physical objects," and SFF system "102" ***remote from SFF system 104*** "ha[s] CAD software running thereon to generate SFF fabrication jobs" and "may be ***considered a client*** to" SFF system 104. EX1004, [0027], [0012], [0020], FIG. 1. Loughran is also clear that "material information server 108 sends [material] information back to the first SFF system 102" and "CAD software 610" executing on SFF system 102 "***generates a SFF fabrication job*** for fabrication from a specific material ***based on the information regarding that material*** which has been received." EX1004, [0027]-[0028], [0055], [0041]-[0042], [0050]-[0051]. The SFF system then "sends the SFF fabrication job to the…SFF system 104." *Id.*, [0055]; EX1042, ¶7.

The fact that client SFF system 102 generates the fabrication job ***based on the material information*** is true regardless of whether Loughran's SFF system 104 (the 3D printer) is ***also*** capable of "dynamically adjust[ing] its own parameters for fabricating physical objects" based on material information. EX1004, [0037]; EX1003, ¶¶63-64, 68-69; EX1042, ¶¶8, 12; EX2015, 54:11-55:5, 76:8-77:3. That is, Loughran describes a networked 3D printing system in which ***both*** the client device and 3D printer use material information to set operational parameters for fabrication jobs. *Id*; EX1003, ¶¶61-62. Therefore, the proposed modification of Loughran based on Dubois does not involve "redesigning Loughran" to "shift[] parameter-setting into the client-generated job" as PO asserts. POR, 12-13. Rather, it merely implements Dubois's suggestion to provide additional details on material-based operational parameters that would be beneficially determined during fabrication job generation to complement Loughran's express disclosure of "generat[ing] a SFF fabrication job for fabrication ***from a specific material based on the information regarding that material***." EX1004, [0055]; EX1005, [0027], [0056]-[0059], [0109]-[0112]; EX1003, ¶¶45-48, 63-70; Pet., 10-13, 23-28.

Loughran's disclosure of generating print jobs at the remote client computer "based on the information regarding that material" is complemented by Dubois, which suggests the conventional option of determining material-specific operational parameters at a computer separate from the printer at the time of generating print jobs (prior to printing). EX1004, [0055]; EX1005, [0069]-[0073], [0081]-[0092], [0128], [0170]. For example, Dubois suggests associating the material-specific "printing parameters" with the print job "during the stage of cutting up the 3D representation of the component," which can be performed during a slicing stage by "computation unit 198" implemented as "***software on a personal computer***," not the printer. EX1005, [0081]-[0092], [0148]-[0150], [0170]; EX1042, ¶¶9, 14; EX1045, 73:15-76:13. Dubois's FIG. 5 shows processing unit 105 (which includes computation unit 198) as separate from and in communication with the printer.

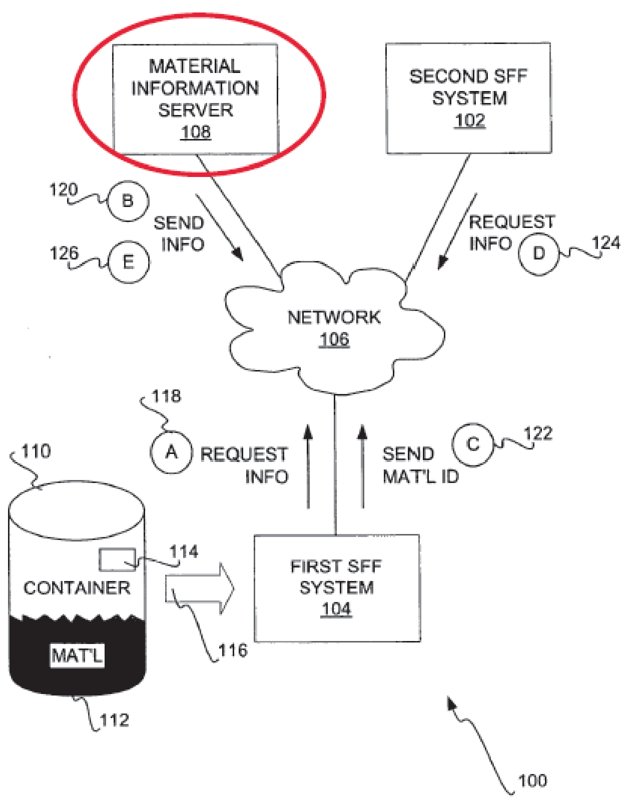


EX1005, FIG. 5 (annotated), [0147]-[0150].

PO insists that Dubois rigidly relies on "printer-side computation dependent on printer/deposition-condition inputs," but it would be error to constrain Dubois suggestions to a person of ordinary creativity. POR, 13-15; *Alivecor, Inc. v. Apple Inc.*, 130 F.4th 1006, 1015 (Fed. Cir. 2025). Rather, Dubois complements Loughran, which discloses that "client" SFF system 102 "may be or include a ***general-purpose computing device***, like a desktop, portable, or server computer running computer-aided drafting (CAD) software." EX1004, [0012]. Both references teach generation of print jobs based on material information at a computer communicating with, and separate from, the printer. The only difference is that Loughran's client computer 102 communicates with the printer over a network while Dubois client computer communicates with the printer over a local (wired) connection. EX1042, ¶10.

Regarding PO's assertion that "the client may not have the most current material database" (POR, 17), this argument ignores the fact that Loughran's client system "102" and printer-side system "104" receive material information from the ***same "material information server 108."*** EX1004, [0012], [0022]-[0023], [0038]-[0042].

FIG 1



EX1004, FIG. 1. In this way, the client would have the most current material database and the printer-specific constraints needed to set correct process parameters. EX1042, ¶15; EX1004, [0041]. The operational parameters are received at the printer from the client in the predictable combination. EX1003, ¶¶63-67; Pet., 23-26; EX1042, ¶¶10-11.

Loughran's additional disclosures of printer-side adjustment does not teach away from Loughran's express description to include material-specific printing parameters in the job. EX1004, [0055]; EX1042, ¶13. The disclosure of additional functionality or an alternative solution is not a teaching away from one of the known alternative solutions. *Intel,* 61 F.4th at 1379-80 ("not necessary to show … the best option, only … a suitable option"); *see also PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197-98 (Fed. Cir. 2014). Both Loughran and Dubois disclose determining material-specific printing parameters when generating a fabrication job, and nothing in the prior art criticizes this ordinary option. *SightSound Techs., LLC v. Apple Inc*., 809 F.3d 1307, 1320 (Fed. Cir. 2015); Pet., 23-28; EX1003, ¶¶63-70.

PO provides no support that Dr. Hickner must propose a "specific data flow or architecture for the asserted combination." POR, 14-15. Dr. Hickner is not required to further perform the engineering work of constructing/testing a physical system and verifying its operability. Such an approach would turn obviousness on its head, incorrectly requiring a reduction to practice as a predicate to showing obviousness. *See, e.g., In re O'Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988) ("Obviousness does not require absolute predictability of success. Indeed, for many inventions that seem quite obvious, there is no absolute predictability of success until the invention is reduced to practice.").

PO also adopts legal error in its demand for the Petition must identify a deficiency ***in Loughran*** itself. *See* POR, 14. As the *Intel* court stated:

> Additionally, "universal" motivations known in a particular field to improve technology provide "a motivation to combine prior art references ***even absent any hint of suggestion*** in the references themselves." *Intel*, 21 F.4th at 797-99 (cleaned up) (emphasis in original) [].

Intel, 61 F.4th at 1379-80. The proposed improvement to complete each fabrication job based on CAD information with the optimal set of material parameters (as suggested by Dubois) would have achieved numerous predictable benefits, as articulated in the Petition. Pet., 10-13; EX1003, ¶¶45-48.

B. The Loughran-Dubois Combination Teaches Claim 5

As discussed in the Petition, Loughran teaches the printer is coupled to multiple supplies of different materials, each supply including a tag that stores a property of the material. Pet., 15-16, 19-21, 28; EX1004, Abstract, [0016], [0020]-[0021]; EX1003, ¶¶51, 60, 62, 72. Dubois similarly describes "production of three-dimensional structures consisting of a plurality of different materials" stored in a "plurality of material storage tanks." EX1005, [0021], [0133]; Pet., 28; EX1003, ¶¶76, 79. Loughran teaches that the printer provides the tag data for multiple supplies to the client. EX1004, [0052]; Pet., 21-23; EX1003, ¶¶60-62. Therefore, the Loughran-Dubois combination teaches the printer providing tag data for at least two supplies to the client. EX1003, ¶74; EX1042, ¶¶16, 19.

The Loughran-Dubios combination provides a CAD client that selects optimum parameters as a function of materials, printer characteristics, and deposition conditions and sends the parameters in the fabrication job. Pet., 23-30; EX1003, ¶¶63-67; EX1042, ¶17. The CAD client would predictably slice "the 3D representation of the component into print layers." EX1005, [0075]; Pet., 29-30; EX1003, ¶¶75-77. Dr. Hickner explained what Dubois's "slicing" description taught to a POSITA—that a "slice specifies a selection of build material for use in printing the layer of the multi-material component"—citing other literature as corroboration of a POSITA's knowledge of this fact. EX1003, ¶¶78-79 ("[m]ultiple references, in addition to Dubois, corroborate"); EX1006, [0039]-[0040], [0193]-[0194]; EX2015, 26:1-6.

PO does not dispute that this fact that such slices would specify a selection of build material. POR, 23-25.[1] Instead, PO argues that "'slice-level material assignment' is not the claimed step of receiving from the client a selection of one of the two tagged supplies" without any evidence/analysis for this implicit claim construction. POR, 23-25. Worse yet, PO's argument ignores that, in the Loughran-Dubois combination, the CAD client would provide the printer with the fabrication job that includes such conventional slices, each of which specifying a selection of one of two build materials for use in printing a layer of the object using the printer. EX1003, ¶79; Pet., 30; EX2015, 26:1-6; Pet., 15-16, 19-23, 28-30; EX1003, ¶¶51, 60-67, 72, 75-79; EX1042, ¶18.

[1] PO complains that Dr. Hickner cited to a corroborating publication (Napadensky) as evidence of the POSITA's background knowledge of this fact. POR, 24-25. Not only does this complaint ignore the law regarding such corroboration, but it is belied by PO's subsequent failure to dispute this now-unrebutted fact. *Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337-38 (Fed. Cir. 2020) ("relied on expert evidence, which was corroborated…").

II. Devos Teaches Element 19[e]'s Support Structure Requirement (Ground 2)

Devos is express: "***The system*** can also use the data encoded in or on the memory mechanism 146 to determine certain ***operating parameters***" including "powder settling coefficients (e.g., to ***determine whether powder supports need to be included***, and if so, ***how much support***)." EX1008, [0032]. Devos's disclosure regarding "supports need[ed]" is not "an explanatory aside" as PO insists. POR, 39. Rather, it is an express disclosure that "***[t]he system***" functions to "determine…how much support" is needed based on material information from the tag. *Id.*; EX1003, ¶¶113-115; EX1042, ¶20. PO's expert acknowledges that "a POSITA would understand a 'support structure requirement' as an operational parameter would specify whether/where supports should be generated and printed and with what settings." EX2013, ¶133.

PO argues that "a POSITA would understand that printing rigid support structures is not needed because the powder surrounding the part provides the necessary support." POR, 40-41 (citing EX2014, p. 326). However, Devos is plainly directed to the 3D printing process and does not mention any requirement for "thermal post-processing" after printing. EX1008, [0001]; EX1042, ¶21. Even if the support structure were only required due to this alleged "post-processing" such support structures would still need to be created during the printing process and therefore represent a support structure requirement operational parameter. *Id*. The mere fact that a ***different*** publication (EX2014) contends "[n]o support structures allow complex geometry to be created" is far afield from PO's leap-of-faith that Devos would never need 3D printed support structures. *Id.* Rather, the evidence here plainly confirms the traditional understanding that in some powder bed processes, "overhanging surfaces… are not directly possible" and "support structures are necessary to guarantee adequate process continuation." *Id.* (quoting corroborating publications at EX1043, 4 and EX1044, 1-2). Devos makes clear "***[t]he system***…determine[s]…how much support" is needed based on the settling coefficients and therefore constitutes a support structure operational parameter. *Id.*; EX1008, [0032]; EX1003, ¶¶113-115; EX2013, ¶139.

PO argues that Devos's support structure requires "undue experimentation." POR, 43-44. Not only does PO ignore that Devos is presumptively enabled, PO produces no evidence to rebut this presumption. *Apple Inc. v. Corephotonics, Ltd*., 861 Fed. Appx. 443, 450 (Fed. Cir. 2021) ("enjoy a presumption of enablement, and the patentee/applicant has the burden to prove nonenablement"); *Apple Inc. v. Gesture Tech. Partners, LLC*, 129 F.4th 1367, 1379-80 (Fed. Cir. 2025) ("in general, a prior art reference asserted under § 103 does not necessarily have to enable its own disclosure, i.e., be 'self-enabling,' to be relevant to the obviousness inquiry"). PO and its expert fatally ignore the many *Wands* factors that must be considered to carry the

PO's burden of establishing undue experimentation. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988); *Liberty Mutual Ins. Co. v. Progressive Casualty Ins. Co*., CBM2013- 00009, Paper 68, 40 (PTAB Feb. 11, 2014); EX2013, ¶41.

III. Menchik Teaches Elements 1[b], 1[e], 1[f], 19[e], and Claims 3-5, 10 (Grounds 3A-3D)

A. Menchik Teaches a Client (Elements 1[b], 1[e], 1[f])

As discussed in the Petition and reiterated below, Menchik renders obvious all aspects of a client that PO alleges is required. POR, 46 ("distinct from the printer's controller," "sends a fabrication request," "a separate computing device that submits a job/request over a network"); EX2013, ¶150 ("user-operated role of initiating/managing/monitoring print jobs"); EX1042, ¶¶22-23. As such, the Institution Decision correctly concluded that "controller 105 discloses or teaches/suggests a client." ID, 52.

Menchik discloses that "a separate unit, such as a personal computer or workstation… may provide some control or data storage capability." EX1009, [0021]; Pet., 57-58; EX1003, ¶128. Specifically, "[c]ontroller 105 may be located… ***outside of printing apparatus 100***," "may be ***connectable to a… communications network***," and "may communicate with printing system 100, for example, over a wire and/or using wireless communications." EX1009, [0024], [0053]. Controller

105 can be "a ***computing device such as a personal computer…external to 3D printer system***." EX1009, [0026].

The controller/computing device is operated by users to generate and initiate print jobs and send print jobs to the printer. Pet., 58-59; EX1003, ¶¶129-130; EX1009, [0024] ("controller 105 may include a CAD system"). A POSITA would have understood that a CAD system is installed on a user-operated computing device for generating CAD data for print jobs. EX1042, ¶23 (citing to a corroborating example of this conventional knowledge at EX1045, 56:14-57:9). The "printing file" is "provided…by a computing platform ***connected to*** 3D printer system." EX1009, [0025]. As Dr. Hickner explains and the Board agreed, the "computing platform" providing the printing file is an example of the controller 105 external to the printing apparatus 140. EX1003, ¶¶129-130; ID, 32. PO's expert agreed that a functionality of a client is submitting objects for 3D printing. EX1045, 39:19-22.

B. Menchik Teaches a Request (Element 1[b])

PO appears to argue that Menchik's print file is not a request because "a file can be created and transferred without initiating fabrication until a separate start/build command is issued to the printer." POR, 48. However, element 1[b] does not expressly mandate that the request must "initiate" fabrication. EX1042, ¶24. Menchik's print file teaches a request to fabricate an object because it is provided to the printer by the client that communicates with the printer over a wired or wireless network, as discussed above, and it includes instructions for the printer to print the object. EX1009, [0024]-[0026]; EX1003, ¶130. Here, Petitioner relies on obviousness over Menchik, not anticipation, and therefore PO's argument regarding Menchik not having "an anticipation disclosure" is strawman. POR, 49.

C. Menchik Teaches Element 1[e]

PO admits that "Menchik's cited disclosures describe transmitting information from a cartridge memory mechanism/chip to the controller." POR, 49. As discussed above, Menchik teaches that the controller is a client that communicates with the printer over a wired or wireless network, and therefore Menchik teaches providing the information from the memory chip (data from the tag) to the client over the network. EX1009, [0027], [0047]-[0048]; EX1003, ¶¶133-134; EX1042, ¶25.

D. Menchik Teaches Element 1[f]

Menchik teaches a client-side selection of operational parameters and then a receipt of those selected parameters by the printer. EX1042, ¶26. PO does not dispute that Menchik's controller computes parameters and provides a printing file that is used to determine "the order and configuration of deposition of building material." *See* POR, 50-54; EX1009, [0025]. Nothing in the two-word phrase "operational parameter" excludes these parameters of Menchik's printing file. EX1001, 15:17-24; ID, 34.

Menchik's controller provides the printer with the computed parameters and instructions in order to "control the supply of building material." Pet., 61-63; EX1009, [0027], [0006]-[0007], [0014], [0018], [0037]-[0038], [0044]-[0045], [0051]-[0052]. Because the controller is a client that communicates with the printer over a wired or wireless network (*supra* §III.A), a POSITA would have found it obvious that the controller would provide the parameters and instructions (as part of the printing file) to the printer over the network. EX1042, ¶27.

E. Menchik Teaches Element 19[e]

The Petition's analysis of element 1[f] establishes that Menchik teaches "determining an operational parameter… based upon at least one property of the build material in the data" read from the tag and the operational parameter includes "a support structure requirement" as required by element 19[e]. Pet., 61-63. The Petition first established that Menchik teaches "a tag that stores at least one property of the build material" in the form of "a memory device" that stores "information relating to the material stored within cartridge" Pet., 59-60, 67-68; EX1009, [0035], [0043]. Each of Menchik's examples of information stored on the memory chip is a property of the build material, and PO does not dispute that Menchik's memory chip stores data including property of the build material. Pet., 59-60; EX1001, 14:60-15:3, 21:28-38; EX1042, ¶28.

For the "operational parameter," the Petition relied on Menchik's disclosure that "[c]ontroller 105 may use the data received, for example, data from memory chip reader 225, data from load cell 230, and other data, to compute printing parameters, including, for example, guidelines for which cartridges to use, how many to use, if and when any replacements are necessary etc." Pet., 61; EX1009, [0037]. The Petition further relied on Menchik's disclosure of the controller processing the data "to compute material parameters for building material(s), material required to construct one or more objects, and supply parameters for materials in one or more cartridges." EX1009, [0027]; Pet., 61-62. Dr. Hickner further explained that "Menchik's client controller 105 external to the printing apparatus 140 (per 1[b]) 'control[s] the supply of building material to printing apparatus 140' based on the data by sending operational parameters to the printing apparatus 140." EX1003, ¶135; Pet., 62. In Menchik, "the term 'building material'" includes "any suitable combination of model material and/or support material" used in printing the object. EX1009, [0017], [0028]; EX1042, ¶29.

PO acknowledges that "Menchik's cited disclosures describe transmitting information from a cartridge memory mechanism/chip to the controller so the controller can compute or use parameters for printing and material supply" and "Menchik's cited workflow is that controller 105 uses data from sensors and cartridge memory chips to compute 'material parameters' and 'supply parameters,' including computing quantities/availability and determining whether/when/how much material to extract according to printer requirements for a particular object." POR, 49 (citing Pet., 60-62; EX1009, [0027], [0047]-[0048]), 50. PO's expert acknowledges that "a POSITA would understand a 'support structure requirement' as an operational parameter would specify whether/where supports should be generated and printed and with what settings." EX2013, ¶133. Because building material includes support material and Menchik determines quantities/availability and whether/when/how much support material to extract using data including property of the build material from the memory chips, Menchik teaches computing an operational parameter that is a support structure requirement based on a property of the build material in the data read from the tag. EX1042, ¶30.

The Petition's analysis of claim 10 provides another example that satisfies element 19[e]. As discussed in the Petition and reiterated above, Menchik describes that each cartridge memory chip stores "information relating to the material" including "***optimum building parameters*** (e.g., for building ***or support***)." Pet., 59-60, 67-68; EX1009, [0035], [0043]. The optimum building parameters for support structures is a property of the build material stored in the memory chip and used to determine the parameters for support structures which is a support structure requirement. Pet., 67-68; EX1042, ¶31.

Claim 19 does not recite a FFF process as PO's expert asserts. EX2013, ¶169; POR, 56-57; EX1001, 24:54-25:9. The '466 specification makes clear that "numerous additive fabrication techniques" fall within the scope of the term "three-dimensional printer." EX1001, 2:4-14. PO's expert, during his deposition, admitted that other fabrication techniques use similar operational parameters as those listed in claim 19. *See infra*, §III.G. Indeed, both fused deposition modeling (which is synonymous with FFF) and multi-jet modelling create support structures during the printing process. EX2014, 7-8; EX1045, 47:9-48:4 (testifying that in FDM "sometimes support structures are needed"); 52:1-14 (testifying that in multi-jet modelling "sometimes requiring a support material"); EX1042, ¶32.

PO further relies on the Board's decision in IPR2025-00585 as a basis for its arguments that Menchik fails to teach claim 19. POR, 57-58. However, the Board did not have the benefit of a fulsome record, merely relying on disclosures in Menchik's paragraphs [0047]-[0048]. IPR2025-00585, Paper 11, 29-30 (PTAB Oct. 6, 2025). Based upon relevant disclosures in Menchik considered "for all that it teaches," as discussed in the Petition and reiterated above, and PO's admissions, as discussed above, Menchik teaches element 19[e]. *Smith & Nephew, Inc. v. Rea*, 721 F.3d 1371, 1378 (Fed. Cir. 2013).

F. Menchik Teaches Claims 3-5

PO ignores Menchik's teaching of "an array 400 of cartridges 410, each of which may contain building material," "may have different forms, colors, composition," and "may be located within printing apparatus 140." EX1009, [0042], [0017], [0028]. "Each type and/or color or suitable combination etc. of building material may be contained separately within one or more cartridges." EX1009, [0042]. Menchik further discloses controlling "the supply of building materials of multiple colors or types." EX1009, [0018]. "Each cartridge 410 may be associated with a memory or storage device such as a memory chip 260 and reader or data transfer device such as a memory chip reader 225." EX1009, [0043]. The memory chip stores "information relating to the material stored within cartridge 250, for example, the type of building material in the cartridge bag 300, the material's color, manufacturing date, optimal operation parameters (e.g., recommended jetting temperature), optimum building parameters (e.g., for building or support)." EX1009, [0035], [0043]. Therefore, the Petition established that Menchik teaches first and second supplies of different build materials, each supply having a memory chip storing a property of the build material. Pet., 56-57, 59-60; EX1042, ¶33.

G. Menchik Teaches Claim 10

As discussed in the Petition and reiterated above, Menchik describes that each cartridge includes "a memory device such as a memory chip 260" which stores "information relating to the material stored within cartridge 250, for example,… optimal operation parameters (e.g., recommended jetting temperature), optimum building parameters (e.g., for building or support)." Pet., 59-60, 67-68; EX1009, [0035], [0043]. Both Menchik's "recommended jetting temperature" and the claim's "extruder temperature" are temperatures for dispensing material and are therefore analogous terms in different printing techniques. EX1042, ¶34. The optimum building parameters for support structures is a property of the build material stored in the memory chip and used to determine the parameters for support structures which is a support structure requirement. *Id.*; Pet., 67-68. Also as discussed in the Petition and reiterated above in §III.D, PO does not dispute that Menchik's controller computes parameters and provides a printing file that is used to determine "the order and configuration of deposition of building material." *See* POR, 50-54; EX1009, [0025]. Menchik also teaches that controller is a client that provides the printer with the parameters and instructions in order to "control the supply of building material." Pet., 61-63; EX1009, [0027], [0006]-[0007].

PO's expert argues that "FFF is fundamentally different from inkjet printing." POR, 61-62. However, claim 10 does not recite a FFF process. EX1001, 24:54-25:9, 2:4-14; EX1042, ¶35. PO's expert, during his deposition, admitted that other fabrication techniques use similar operational parameters as those listed in claims 10. EX1045, 13:21-15:4, 51:14-25, 16:25-17:25, 22:1-10, 23:2-24:6, 44:19-50:22.

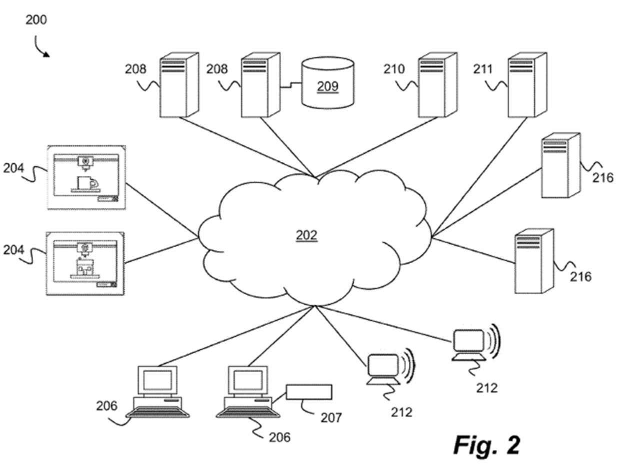
IV. A POSITA Would Have Been Motivated to Combine the Teachings of Jazayeri with References Related to 3D Printing to Render Obvious Element 1[b] (Grounds 1B/1D/1F/3B/3D/3F/3H)

A. Jazayeri is Analogous Art (Grounds 1B/1D/1F/3B/3D/3F/3H)

"A petitioner is not required to anticipate and raise analogous art arguments in its petition" and thus Petitioner, below, properly addresses both "field of endeavor" and "reasonably pertinent" arguments here in "its reply." *Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1009 (Fed. Cir. 2023); *Apple Inc. v. Andrea Elecs. Corp.*, 949 F.3d 697, 705-07 (Fed. Cir. 2020); *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1238 (Fed. Cir. 2010); *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1001 (Fed. Cir. 2016); *Netflix, Inc. v. DivX, LLC*, 80 F.4th 1352, 1359 (Fed. Cir., 2023) ("expansive view"); *Donner Tech., LLC v. Pro Stage Gear, LLC.*, 979 F.3d 1353 (Fed. Cir. 2020).

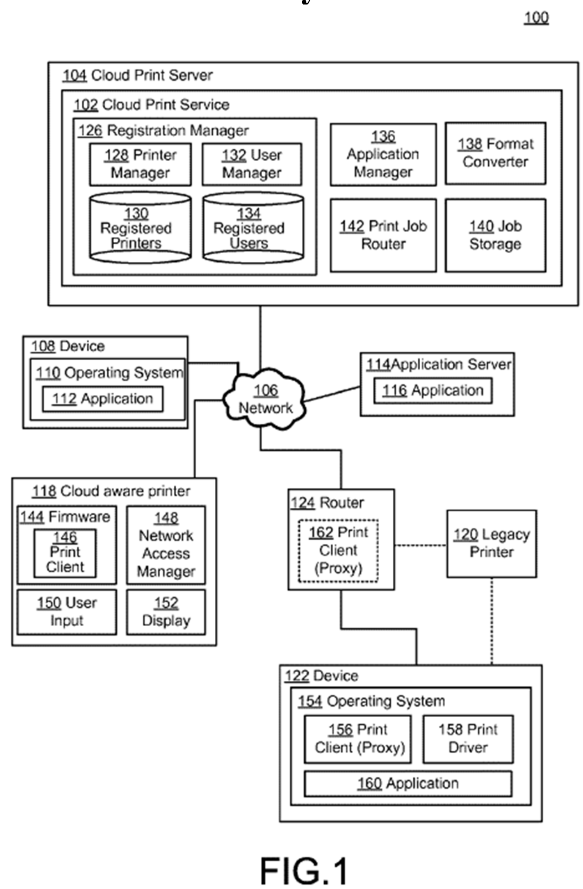
Jazayeri is analogous art because it falls within the same general field of endeavor of the '466 patent of "a networked three-dimensional printing environment." EX1001, 1:41-42, 4:57-13:64, FIG. 2; EX1010, [0001], [0002], [0003], [0018], FIG. 1; EX1045, 40:22-25. Jazayeri is directed toward the same field of endeavor of providing "printing capabilities over a network." EX1001, 1:41-42; EX1010, [0018]; EX1042, ¶36.

’466 patent



EX1001, FIG. 2

Jazayeri



EX1010, FIG. 1

Jazayeri is also reasonably pertinent to the problems addressed by the ’466 patent of a system “interconnecting a plurality of participating devices in a communicating relationship” to provide “a networked three-dimensional printing environment.” EX1001, 4:57-65. Jazayeri describes a system that “provides an ability for virtually any application running on any device within the network… to communicate with the cloud print service… to thereby print to any printer which is also in (direct or indirect) communication with the cloud print service.” EX1010, [0028]; EX1042, ¶37.

"[A] reference can be analogous art with respect to a patent even if there are significant differences." *Donner Tech.*, 979 F.3d at 1361; *Scientific Plastic Prods., Inc. v. Biotage AB*, 766 F.3d 1355, 1360 (Fed. Cir. 2014); *Paulsen*, 30 F.3d 1475, 1481 (Fed. Cir. 1994). Here, although Jazayeri provides examples of a cloud print service with 2D printers, Jazayeri explicitly states that a cloud print service can be provided "as a general service which is ***not specific to any particular type of printer***." EX1010, [0076]; EX1042, ¶37.

Whether Jazayeri describes a print request being received at a server or at the printer is irrelevant to the analogous art inquiry. *See* POR, 28. Even if relevant, the '466 patent describes that "a print server 208 may maintain print queues for participating three-dimensional printers 204" that "include print data (e.g., the three-dimensional model or tool instructions to fabricate an object) for a number of print job" and the print server "allocate[s] print requests to various three-dimensional printers." EX1001, 8:27-28, 8:53-58, 17:2-12. Similarly, Jazayeri describes a print server receiving a print request over a network. EX1010, [0008]-[0010], [0036], [0066]. Element 1[b] does not preclude a server receiving a print request from a client. EX1042, ¶38.

B. A POSITA Would Have Been Motivated to Combine Jazayeri with Loughran-Dubois, and the Loughran-Dubois-Jazayeri Combination Teaches Element 1[b] (Grounds 1B/1D/1F)

PO does not dispute that the Loughran-Dubois-Jazayeri combination teaches element 1[b]. POR, 34. Rather, PO argues that "Petitioner fails to establish the requisite motivation to combine." POR, 34-35, 31-33. PO argues that adding Jazayeri's teachings to Loughran "would not improve—and would potentially complicate—the material-parameter control that is central to Loughran." POR, 31. But PO never explains how Loughran's material-parameter control would be affected by adding a print server to receive print requests and printer selections from a client. The Petition does not propose modifying Loughran's material-parameter control, Loughran's SFF fabrication-job workflow, or Loughran-Dubois's parameter-control teachings. Pet., 33-36. In the Loughran-Dubois-Jazayeri combination, the selected printer would send the material information to the client, receive a fabrication job from the client, and complete the fabrication job based on CAD information with the optimal set of material parameters in the same manner as discussed in the Petition and reiterated above in §I.A. EX1042, ¶39.

PO also argues that "Petitioner's asserted 'need' to add Jazayeri's cloud-print request layer is not tied to any deficiency in Loughran's disclosed job-submission architecture" and that Petitioner's motivations are not "grounded in the teachings of Loughran and Dubois." POR, 31, 33. As discussed above in §I.A, a reference need not be deficient for a finding of obviousness. *Intel*, 61 F.4th at 1379-80. A POSITA would have recognized that Jazayeri's suggestion would have improved Loughran-Dubois's system by allowing multiple clients and multiple printers on a network and a client to select one of multiple printers for fabricating an object without requiring that a local printer driver be installed on the client device, as well as other improvements and benefits discussed in the Petition. Pet., 33-36; EX1042, ¶39.

C. A POSITA Would Have Been Motivated to Combine Jazayeri with Menchik, and the Menchik-Jazayeri Combination Teaches Element 1[b] (Grounds 3B/3D/3F/3H)

PO repeats its arguments from Ground 1B. POR, 63-64. For similar reasons as discussed above in §IV.A-IV.B, a POSITA would have been motivated to combine Jazayeri with Menchik. EX1042, ¶40.

V. Menchik in view of Dahlin (in the Combinations of Grounds 1E/1F/3E/3F) Teaches Claim 17

As discussed in the Petition and above in §III.E, Menchik determines quantities/availability and whether/when/how much support material to extract (support structure requirement) using data including property of the build material from the memory chips. Pet., 39-40; EX1009, [0017], [0027], [0028], [0035], [0037], [0043]; POR, 49-50 (citing Pet., 60-62); EX1042, ¶41. Loughran confirms that it was known to determine various operational parameters based on material information obtained from a tag or memory chip. EX1004, [0021]-[0024].

PO's expert acknowledges that "a POSITA would understand a 'support structure requirement' as an operational parameter would specify whether/where supports should be generated and printed and with what settings." EX2013, ¶133. In each of the proposed combinations, the material type information is read from a tag affixed to the material supply. EX1042, ¶42. The amount of material required (such as the amount of material ejected per layer) is "a function of the characteristics of the materials" used. EX1005, [0081]-[0090], [0069]-[0072]. In Menchik, the amount of support material required (indicating how much material to extract) is an operational parameter that controls printer operation during fabrication because Menchik chooses whether and when to use a cartridge based on the amount required. EX1009, [0007], [0027].

Menchik's and Dahlin's determination of whether the amount of support material is sufficient to complete the object is a diagnostic test. EX1042, ¶43. As explained in the '466 patent, a diagnostic test is used to determine "whether a desired fabrication can be performed with the supply." EX1001, 15:53-64. Determining whether there is enough supply to complete the object is a diagnostic test to determine "whether a desired fabrication can be performed with the supply." EX1042, ¶43.

The Board's decision in IPR2025-00585 is irrelevant to the issue here. There, the Board addressed the claim construction of the step of "determining an operational parameter" and the step of "performing a diagnostic test" and concluded that the scope is ambiguous. IPR2025-00585 at 11-18. The Board did not address Menchik's and Dahlin's disclosures with respect to the '466 patent element 1[f]'s "one or more operational parameters," which is different in scope from the '464 patent's "operational parameter…***based upon the data***." The Board also did not address Menchik's and Dahlin's disclosures with respect to the "diagnostic test" limitation.

VI. KISSlicer (in the Combination of Grounds 1C/1D/3G/3H) Teaches Claim 5

KISSlicer is a software executed by a computing device with an operating system such as Windows, Linux, or Mac and used for creation of a print file. EX1017, ¶2; EX1018, 1. KISSlicer "facilitates the conversion of 3D object models to specific path instructions for 3D printing by slicing STL files into 3D printer-ready G-code files." EX1017, ¶1; EX1045, 81:17-23. In the combinations of Grounds 1C/1D/3G/3H, software such as that disclosed in KISSlicer would be executed by the client (Loughran-Dubois's client that generates fabrication jobs from CAD information (EX1004, [0027], [0051], [0055]; *see* §I.B) or Menchik's client/controller that converts CAD data to instructions for the printer (EX1009, [0024]; *see* §III.A)), and therefore the selection of one of two tagged build materials would be received from the client.[2] EX1042, ¶44; EX1045, 73:23-74:17 (agreeing that in Dubois "the slicer software is executing on a personal computer"); 81:24-82:23 (testifying that both Dubois and KISSlicer "will generate the slice geometry").

PO argues that references describing "two very different 3D printing processes… represents an infeasible combination." POR, 71-72. In an obviousness inquiry, "the criterion [is] not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole." *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985) (en banc); *see also In re Keller*, 642 F.2d 413, 425 (CCPA 1981); *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) (citing *In re Keller*, 642 F.2d at 425); *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007).

Here, a POSITA would have understood that every 3D model "is reformatted into an stl file and sliced horizontally." EX2014, 2; EX1005, [0055], [0059], [0075]; EX1006, [0037]; EX1009, [0024]; EX1012, [0004]; EX1045, 73:6-19. KISSlicer "facilitates the conversion of 3D object models to specific path instructions for 3D printing by slicing STL files into 3D printer-ready G-code files." EX1017, ¶1. KISSlicer's teachings would apply to any 3D printing process. EX1042, ¶45. A POSITA would have found it obvious to apply KISSlicer's teachings to Loughran's

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[2] Claim 5 does not require that the selection is performed by the printer.

client that generates fabrication jobs from CAD information (EX1004, [0027], [0051], [0055]; *see* §I.B) and to Menchik's client/controller that converts CAD data to instructions for the printer (EX1009, [0024]; *see* §III.A). EX1042, ¶45.

PO's identified flaws in KISSlicer and Jazayeri individually (POR, 72) improperly attacks the references in isolation rather than the proposed combination as a whole. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). For example, PO argues that KISSlicer does not describe that "the printer receives a client-provided selection between two tagged build materials in response to tag data provided 'over the network.'" POR, 72. First, the claims do not require that the printer receive the selection "in response to" tag data; claim 5 does not even mention tag data. EX1001, 23:53-67. Second, the Petition relies on each combination as a whole to teach providing tag data to the client over the network and receiving a selection between two tagged build materials. EX1042, ¶46.

Respectfully submitted,

Dated April 10, 2026

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CERTIFICATION UNDER 37 CFR §42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petitioner's Reply to Patent Owner's Response totals 5,590 words, which is less than the 5,600 allowed under 37 CFR § 42.24(c)(4).

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e)(4), the undersigned certifies that on April 10, 2026, a complete and entire copy of this Petitioner's Reply to Patent Owner's Response and Accompanying Exhibits were provided by email, to the Patent Owner by serving the email correspondence address of record as follows:

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