

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,
Petitioner,

v.

STRATASYS, INC.,
Patent Owner.

IPR2025-00321
Patent 9,421,713 B2

Before MITCHELL G. WEATHERLY, CHRISTOPHER M. KAISER, and
LILAN REN, *Administrative Patent Judges*.

KAISER, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background and Summary*

Shenzhen Tuozhu Technology Co., Ltd. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1, 2, 5–7, 9, 16, and 17 (“the challenged claims”) of U.S. Patent No. 9,421,713 B2 (Ex. 1001, “the ’713 patent”). Stratasys, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”). In addition, Petitioner filed a Preliminary Reply (Paper 8, “Prelim. Reply”), and Patent Owner filed a Preliminary Sur-Reply (Paper 9, “Prelim. Sur-Reply”).

On June 18, 2025, we instituted *inter partes* review of the challenged claims on all grounds set forth in the Petition. Paper 10 (“Inst. Dec.”). Patent Owner filed a Response (Paper 19, “PO Resp.”), Petitioner filed a Reply (Paper 26, “Reply”), and Patent Owner filed a Sur-reply (Paper 29, “Sur-reply”). At the request of both parties, we held an oral hearing, the transcript of which has been entered into the record. Paper 35 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the challenged claims of the ’713 patent. For the reasons discussed below, we determine Petitioner has not established by a preponderance of the evidence that any of the challenged claims are unpatentable.

B. *Real Parties-in-Interest*

Petitioner identifies itself, Bambulab Limited, Shanghai Lunkuo Technology Co., Ltd., Tuozhu Technology Limited, and Bambulab USA Inc. as real parties-in-interest. Pet. 80. Patent Owner identifies itself and Stratasys Ltd. as real parties-in-interest. Paper 4, 2.

C. Related Matters

The parties identify the following related court proceedings: *Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd. et al.*, Case No. 2:24-cv-00645 (E.D. Tex.) (consolidated with Case No. 2:24-cv-00644 (E.D. Tex.)), and *BambuLab USA, Inc. et al. v. Stratasys, Inc.*, Case No. 1:24-cv-01511 (W.D. Tex.). Pet. 80; Paper 4, 2. In addition, the parties note that related patents are being challenged in IPR2025-00257, IPR2025-00311, and IPR2025-00354. Pet. 80; Paper 4, 2.

D. The '713 Patent

The '713 patent, titled “Additive Manufacturing Method for Printing Three-Dimensional Parts with Purge Towers,” is directed to “[a] method for printing a three-dimensional part with an additive manufacturing system.” Ex. 1001, codes (54), (57). The application giving rise to the '713 patent was filed on March 8, 2013. *Id.* at codes (21), (22).

The '713 patent describes an “additive manufacturing system” and “method” for printing a three-dimensional part and a support structure using a “layer-based, additive manufacturing technique.” *Id.* at 1:57–2:3. The system includes multiple print heads or deposition lines for depositing layers of a “part material” to print the three-dimensional part and for depositing layers of a “support material” to print the support structure. *Id.* at 2:4–33.

Each print head or deposition line can toggle between an “operating mode” in which it deposits material and a “stand-by mode” in which it does not deposit material. *Id.* at 1:57–2:33. When a print head or deposition line is switched from the stand-by mode to the operating mode, some material within the print head or deposition line is purged prior to depositing the next layer of material. *Id.* at 4:39–62. In the method of the '713 patent, this

purging is accomplished by printing a layer of “a purge tower (or multiple purge towers)” rather than discharging material into “a separate purge station.” *Id.* at 4:63–5:17, 8:39–53, Figs. 3A, 3B, 6, 8, 9.

E. Illustrative Claim

Petitioner challenges claims 1, 2, 5–7, 9, 16, and 17 of the ’713 patent. Claims 1 and 16 are independent. Claim 1 is illustrative; it is reproduced below.

1. A method for printing a three-dimensional part with an additive manufacturing system, the method comprising:

printing layers of the three-dimensional part and of a support structure for the three-dimensional part from multiple print heads or deposition lines using a layer-based, additive manufacturing technique;

switching the print heads or deposition line between stand-by modes and operating modes in-between the printing of the layers of the three-dimensional part and the support structure;

performing a purge operation for each print head or deposition line switched to the operating mode, the purge operation comprising printing at least one purge tower in a layer-by-layer manner, wherein the layers of the at least one purge tower are printed from the print head or deposition line switched to the operating mode.

Ex. 1001, 15:43–58.

F. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability (Pet. 1, 7–77):

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
1, 2, 5–7, 9, 16, 17	103	Leavitt, ² RepRap Article, ³ RepRap Video ⁴
1, 2, 6, 7, 9, 16, 17	103	Priedeman, ⁵ KISSlicer ⁶
5	103	Priedeman, KISSlicer, RepRap Article, RepRap Video
1, 2, 6, 7, 9	102	Boyer ⁷

In support of its unpatentability arguments, Petitioner relies on the declarations of Dr. Michael A. Hickner. Ex. 1003; Ex. 1023. Patent Owner relies on the declarations of Gary Larson, Paul Leavitt, and Dr. Tim A. Osswald. Ex. 2010; Ex. 2011; Ex. 2013; Ex. 2014; Ex. 2015.

II. ANALYSIS

A. Legal Standards

A claim may be unpatentable as anticipated if “each and every limitation is found either expressly or inherently in a single prior art

¹ Amendments to 35 U.S.C. §§ 102 and 103 enacted by the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), took effect on March 16, 2013. The ’713 patent issued from an application filed on March 8, 2013. *See* Ex. 1001, code (22). Therefore, we apply the pre-AIA versions of §§ 102 and 103. Neither party, however, argues that the outcome of this case would differ based on applying the pre-AIA or post-AIA versions of these laws.

² US 2009/0035405 A1, published Feb. 5, 2009 (Ex. 1004).

³ Dual extruder PLA printing (Oct. 29, 2012), available at <https://www.okob.net/wp/index.php/2012/10/29/dual-extruderpla-printing/> (Ex. 1005).

⁴ x2 dual color print (Oct. 29, 2012), available at <https://www.youtube.com/watch?v=ZAafPtKjZSc> (Ex. 1006).

⁵ US 2003/0004600 A1, published Jan. 2, 2003 (Ex. 1007).

⁶ KISSlicer Quick-Start Guide (2012), available at <https://web.archive.org/web/20121224171520/http://kisslicer.com/files/KISSlicerQuickStart.pdf#expand> (Ex. 1010).

⁷ US 2014/0034214 A1, published Feb. 6, 2014 (Ex. 1008).

reference.” *Sanofi-Synthelabo v. Apotex, Inc.*, 470 F.3d 1368, 1375 (Fed. Cir. 2006). Anticipation under § 102 may be established by showing, as a matter of fact, that all elements arranged as specified in a claim are disclosed within the four corners of a reference, either expressly or inherently, in a manner enabling one skilled in the art to practice an embodiment of the claimed invention without undue experimentation. *See ClearValue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340, 1344 (Fed. Cir. 2012).

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and “the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). “While the sequence of these questions might be reordered in any particular case,” *KSR*, 550 U.S. at 407, the U.S. Court of Appeals for the Federal Circuit has repeatedly emphasized that “it is error to reach a conclusion of obviousness until all those factors are considered,” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1328 (Fed. Cir. 2016). Because Patent Owner does not address objective evidence of non-obviousness, we focus solely on the first three *Graham* factors.

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is

unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

We analyze the asserted grounds with the above-noted principles in mind.

B. Level of Ordinary Skill in the Art

The level of ordinary skill in the pertinent art at the time of the invention is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham*, 383 U.S. at 17–18.

Factors pertinent to a determination of the level of ordinary skill in the art include “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Envtl. Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). “Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case.” *Id.*

Petitioner contends that one of ordinary skill in the art “would have had (1) at least a bachelor’s degree in Mechanical Engineering, Computer Engineering, Chemical Engineering, Materials Science, or a related field, and (2) at least two years of research or industry experience in 3D printing or materials used for 3D printing.” Pet. 5 (citing Ex. 1003 ¶¶ 14–16). Petitioner also argues that “[a]dditional experience could substitute for a formal degree or formal training (and vice versa).” *Id.* Patent Owner proposes a slightly different level of skill, arguing that a person of ordinary skill in the art “would have had a bachelor’s degree in Mechanical Engineering, Computer 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).” Prelim. Resp. 24. Neither party explains why the outcome of this case would be affected by the adoption of any of the proffered definitions of a person of ordinary skill in the art.

We adopt Petitioner’s assessment of the level of ordinary skill in the art, as it appears consistent with the ’324 patent and the asserted prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

We apply the same claim-construction standard used in the federal courts—in other words, the claim-construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), which is articulated in *Phillips*. *See* 37 C.F.R. § 42.100(b). Under the *Phillips* standard, the “words of a claim ‘are generally given their ordinary and customary meaning,’” which “is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e.,

as of the effective filing date of the patent application.” *Phillips*, 415 F.3d at 1312–13.

The parties disagree about the proper construction of the phrase “purge tower.” In particular, Petitioner argues that the purge tower may be in contact with the three-dimensional object being printed or with the support structure being printed, and Patent Owner argues that the purge tower must be separate from the three-dimensional object and the support structure. PO Resp. 62–63, 92–93; Reply 2; Sur-reply 1.

According to the ’713 patent, “[p]urge tower 24 itself may be . . . recycled or otherwise discarded as desired.” Ex. 1001, 8:27–28. This description provides some support for Patent Owner’s view, because a purge tower too intimately integrated with the part would be difficult or impossible to recycle or discard. This is further supported by the ’713 patent’s statement that “purge tower 24 may be printed at any suitable location on build substrate 44 (i.e., at any location in the x-y build plane not occupied by 3D part 20 or support structure 22).” *Id.* at 8:30–34. It also is supported by Dr. Hickner’s testimony that the ’713 patent “clearly shows . . . the 24 purge tower separated from the part” and that “the purge tower is a separate physical object.” Ex. 2016, 28:8–10, 64:1–9.

On the other hand, there is evidence supporting Petitioner’s view that, as long as the purge tower is generally separate from the part and the support structure, it may still make contact with those portions of the print. As noted above, “purge tower 24 may be printed at any suitable location on build substrate 44 (i.e., at any location in the x-y build plane not occupied by 3D part 20 or support structure 22).” Ex. 1001, 8:30–34. This language does not exclude locations adjacent to or in contact with the part or the

support structure. Thus, determine that a “purge tower,” as that term is used in the context of the ’713 patent, may not be an integrated portion of a printed part or support structure but need not be free of all contact with the printed part or support structure.

D. Asserted Obviousness Based on the Combination of Leavitt, RepRap Article, and RepRap Video

Petitioner argues that claims 1, 2, 5–7, 9, 16, and 17 would have been obvious over the combination of Leavitt, RepRap Article, and RepRap Video. Pet. 1, 7–42.

1. Overview of Leavitt

Leavitt, titled “Extrusion Head for Use in Extrusion-Based Layered Deposition Modeling,” “relates to extrusion-based layered deposition systems for building three-dimensional (3D) objects.” Ex. 1004, code (54), ¶ 1. The extrusion head of Leavitt “is configured to toggle between a ‘build state’ and a ‘support state’, where extrusion head 18 deposits a build material for 3D object 20 in the build state and deposits a support material for support structure 22 in the support state.” *Id.* ¶ 22.

2. Overview of RepRap Article

RepRap Article, titled “Dual extruder PLA printing,” is a printed blog post related to “plastic leaking from the idle extruder” when printing with dual extruders. Ex. 1005, 1. The article notes that one solution to this problem is to “[l]ower[] the temperature of the idle extruder while it is not needed and restore it when it is time to start printing with that extruder again.” *Id.* The article notes, however, that this temperature-change process “is tricky . . . since leaking has to be prevented during the temperature change.” *Id.* When changing the active extruder, the article recommends “position[ing] the nozzles above [a] ‘parking space’ object and chang[ing]

the active extruder while lowering the temperature of the idle and restoring it for the active hotend before letting the printing continue.” *Id.*

3. *Overview of RepRap Video*

RepRap Video, titled “x2 dual color print,” is a video recording of the execution of a three-dimensional print job in which two objects are printed layer by layer using materials of two different colors. Ex. 1006, Title, 0:03–4:59.

4. *Prior-Art Status of RepRap Video and RepRap Article*

Patent Owner argues that the inventors of the ’713 patent both conceived of the invention and actually reduced it to practice before the October 29, 2012 publication date of RepRap Video and RepRap Article. PO Resp. 9–39; Sur-reply 2–9. Petitioner disagrees, arguing that Patent Owner “has failed to demonstrate an actual reduction to practice of the claims” on a date early enough to antedate the RepRap references. Reply 2–12. On the record developed at trial, we agree with Petitioner.

Patent Owner argues that the inventors of the ’713 patent executed a particular CMB file, dated July 5, 2011, and exhibiting the characteristics of the printing process of the challenged claims, on a particular printer that exhibited the characteristics of the printer of the challenged claims. PO Resp. 11–39; Ex. 2014 ¶¶ 6–25, Appx.⁸ A, Appx. E; Ex. 2015 ¶¶ 6–25, Appx. A, Appx. E. Through this execution of a particular CMB file on a particular printer, Patent Owner argues that the inventors reduced the invention to practice. *Id.*

⁸ The attachments to Exhibits 2014 and 2015 are labeled as “Exhibit A” through “Exhibit G,” but we refer to them as “Appendix A” through “Appendix G” in order to avoid confusion between the parent exhibits (i.e., Exhibits 2014 and 2015) and the attachments to those exhibits.

On the record developed at trial, however, the preponderance of the evidence fails to show that the CMB file in question was actually executed on the printer in question. First, Mr. Larson testifies that he “could not say for certain” whether he “ever, personally, execute[d] this CMB file on a three-dimensional printer.” Ex. 1029, 19:16–18. He also testifies that he does not “recall, personally, witnessing anyone execute this CMB file on a three-dimensional printer.” *Id.* at 20:6–8. Similarly, Mr. Leavitt testifies that he does not recall either personally executing the CMB file in question on any three-dimensional printer or witnessing anyone else do so. Ex. 1030, 22:20–23:23. In addition, Mr. Leavitt testifies that any such execution of the CMB file in question on the Solo printer would have occurred in the first quarter of 2011, but the CMB file in question is dated July 5, 2011, too late to have been printed in the first quarter. Ex. 1030, 47:19–21; Ex. 2015 ¶ 16.

Patent Owner argues that, under a rule-of-reason analysis, there is sufficient evidence in the record to make a circumstantial case that some CMB file that met the claim limitations at issue was executed on the Solo printer. Sur-reply 3–5. As we have explained, however, there is a lack of evidence that the specific printing that was done with the Solo printer met the limitations of the challenged claims. Without knowing what, specifically, was printed and how, we are unpersuaded by Patent Owner’s argument that the inventors of the ’713 patent reduced it to practice before the priority date of the RepRap references.

5. *Printed-Publication Status of RepRap Video and RepRap Article*

Patent Owner argues that Petitioner fails to show that the RepRap references were sufficiently publicly accessible to be printed publications on

which Petitioner can rely for its obviousness case. PO Resp. 39–47; Sur-reply 9–11. Petitioner disagrees. Reply 13–16.

A reference is publicly accessible upon a satisfactory showing that the document has been “disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence [] can locate it.” *Kyocera Wireless Corp. v. ITC*, 545 F.3d 1340, 1350 (Fed. Cir. 2008).

a) RepRap Video

Here, Petitioner argues that a person of ordinary skill in the art could have located RepRap Video for three reasons: (1) a person of ordinary skill in the art would have been able to locate the video by “searching based on the title, specific subject matter, or other keywords,” (2) “YouTube is . . . a ‘well-known, reputable compiler and publisher,’” and (3) “interested members of the public would have been able to find RepRap Video through reasonable diligence, such as by . . . browsing pages dedicated to the relevant technology.” Reply 13–14 (quoting *Ericsson Inc. v. Intell. Ventures I LLC*, IPR2014-00527, Paper 41 at 10–11 (PTAB May 18, 2015)).

The title of the video on YouTube is “x2 dual color print.” Ex. 1016 ¶ 3, Ex. A. The video description is “Demonstrating the dual color printing technique utilizing temperature changes and ‘parking space’ object for fighting the plastic leaking from idle extruders.” *Id.* But Petitioner does not direct us to evidence regarding whether any of these terms actually would have commended themselves to a person of ordinary skill in the art searching for information about three-dimensional printing. Reply 13–15. Petitioner cites portions of the declarations of Denis Bakin and Kathryn Talbot in its argument for the public accessibility of RepRap Video. *Id.*

Denis Bakin testifies that he posted the video on YouTube on October 29, 2012, and that “YouTube included search functionality that would have allowed members of the public to search for this video based on the title and description.” Ex. 1016 ¶¶ 3, 5. Kathryn Talbot testifies regarding how YouTube functions, including that the YouTube video webpage includes “a title of the video, a description of the video, the upload date of the video, [and] comments that users have left about the video.” Ex. 1018 ¶¶ 12–21. Neither declarant’s testimony relates to whether a person of ordinary skill in the art would have searched for any of the terms on the YouTube webpage. Thus, Petitioner does not establish that a person of ordinary skill in the art could have located RepRap Video using reasonable diligence through searching for terms on the video webpage.

In addition, we are not persuaded that RepRap Video has been proven to have been sufficiently accessible to interested members of the public just because it was posted on YouTube, which Petitioner alleges is “a ‘well-known, reputable compiler and publisher.’” Reply 13–14. Petitioner cites two cases in support of the rule that a reference is presumed to be sufficiently accessible to interested members of the public if it was published by a well-known and reputable publisher. *Id.* In the first, *Ericsson Inc. v. Intell. Ventures I LLC*, the Board held that the fact that the Institute of Electrical and Electronics Engineers was “a well-known, reputable compiler and publisher of scientific and technical publications” and the fact that people “who both publish and engage in research rely on the information published on the copyright line of IEEE publications” meant that the copyright date of an IEEE publication could be relied on as evidence of the effective date of the publication, despite a hearsay objection. IPR2014-

00527, Paper 41, 10–11 (PTAB May 18, 2015). In the other case, *VidStream LLC v. Twitter, Inc.*, the Federal Circuit held that, for a published book, “there is a presumption of public accessibility as of the publication date” as long as “there is an established publisher.” 981 F.3d 1060, 1065–66 (Fed. Cir. 2020) (citing *George Angres, Ltd. v. Tinny Beauty & Figure, Inc.*, 116 F.3d 1497 (Fed. Cir. 1997) (also relating to public accessibility for a book)). It is not clear on this record (1) that the rule regarding the public accessibility of printed technical papers and books extends to videos posted online, (2) how to determine whether a particular publisher is “established,” “well-known,” or “reputable,” and (3) that YouTube is such a publisher. Particularly due to this last point, on which the record consists solely of Petitioner’s *ipse dixit* statement that “YouTube is also a ‘well-known, reputable compiler and publisher,’” with no cited supporting evidence, we are unpersuaded that we should find the RepRap Video sufficiently accessible to interested members of the public merely because it was posted to YouTube.

Finally, we are unpersuaded of RepRap Video’s public accessibility by Petitioner’s third argument, “that interested members of the public would have been able to find RepRap Video through reasonable diligence, such as by . . . browsing pages dedicated to the relevant technology.” Reply 14–15 (citing Ex. 1016 ¶¶ 3, 5). The cited evidence establishes that the video was posted online on October 29, 2012, and that “YouTube included search functionality that would have allowed members of the public to search for this video based on the title and the description.” Ex. 1016 ¶¶ 3, 5. This evidence does not, contrary to Petitioner’s argument, relate to the ability to locate the video by browsing non-YouTube sites. *Id.* ¶ 5. To the extent this

evidence relates to the ability of a person of ordinary skill in the art to have found the video via YouTube's search function, it suffers from the same problems discussed above with respect to Petitioner's first argument for public accessibility of RepRap Video.

For these reasons, we determine that Petitioner has not shown by a preponderance of the evidence that a person of ordinary skill in the art could have located RepRap Video by exercising reasonable diligence.

b) RepRap Article

Petitioner argues that a person of ordinary skill in the art could have located RepRap Article for two reasons: (1) Denis Bakin testifies that the article "was available on his website www.okob.net," and (2) the article "has been directly linked on the YouTube page for RepRap Video." Reply 15–16 (citing Ex. 1016 ¶ 7, Ex. B).

The cited testimony of Denis Bakin is that RepRap Article "has been publicly available in its current form . . . since October 29, 2012" on Mr. Bakin's "personal website where [he] post[s] thoughts, discussions, and information about [his] various interests, including 3D printing." Ex. 1016 ¶ 7. The "website allows visitors to browse blog posts by category (including a 3D printing category) or to search for specific blog posts using keyword searching." *Id.* "Additionally, interested members of the public would have been able to locate this blog post via keyword searching using popular search engines available at the time such as Google or Yahoo." *Id.* Mr. Bakin does not testify, and Petitioner does not direct us to any additional evidence, as to the search terms that a person of ordinary skill in the art would have used to locate and access RepRap Article. *Id.*; Reply 15–16.

Thus, Petitioner does not establish that a person of ordinary skill in the art could have located RepRap Article using reasonable diligence through searching for terms either on Mr. Bakin's personal website or on a search engine.

As for Petitioner's argument that RepRap Article is linked on RepRap Video's YouTube page, we are not persuaded that this establishes the public accessibility of RepRap Article. For the reasons discussed above, Petitioner does not show that RepRap Video was sufficiently accessible to interested members of the public, and the fact that RepRap Article was linked on a webpage not shown to be sufficiently accessible to interested members of the public cannot show RepRap Article's public accessibility.

c) Conclusion

For the reasons discussed above, Petitioner does not show that the RepRap references were sufficiently accessible to interested members of the public.

6. Analysis of Challenged Claims

Petitioner argues that claims 1, 2, 5–7, 9, 16, and 17 would have been obvious over the combination of Leavitt, RepRap Article, and RepRap Video. Pet. 1, 7–42. In challenging the patentability of each of these claims, Petitioner relies on the teachings of the RepRap references. *Id.* at 24–28 (limitation 1c), 37–38 (limitation 16b), 39–40 (limitation 16d); Ex. 1001, 15:43–18:15 (showing that claims 2, 5–7, 9, and 17 all depend, directly or indirectly, from claims 1 or 16). As discussed above, however, Petitioner fails to show sufficiently that the RepRap references were sufficiently accessible to interested members of the public. Accordingly, Petitioner does

not show that any of the challenged claims would have been obvious over the combination of Leavitt, RepRap Article, and RepRap Video.

E. Asserted Obviousness Based on the Combination of Priedeman and KISSlicer

Petitioner argues that claims 1, 2, 6, 7, 9, 16, and 17 would have been obvious over the combination of Priedeman and KISSlicer. Pet. 1, 42–62.

1. Overview of Priedeman

Priedeman “relates to forming three-dimensional objects by depositing a first solidifiable material in a predetermined pattern so as to form a three-dimensional object, in coordination with the depositing of a second solidifiable material so as to provide a support structure for the three-dimensional object as it is being built.” Ex. 1007 ¶ 2. Priedeman’s extrusion apparatus 10 includes at least one extrusion head 12 for depositing “modeling material A” to print the model 26 and depositing “modeling material B” to print the support structure 28. *Id.* ¶¶ 16–18, Fig. 1.

2. Overview of KISSlicer

KISSlicer is a “document” that “guide[s the user] through the creation of [their] first print file.” Ex. 1010, 1. It describes an overview of printer settings. *Id.* at 2–6. In addition, KISSlicer discusses loading a file and viewing and positioning a part. *Id.* at 6–8. It also describes setting printer parameters and provides a parameter quick reference guide. *Id.* at 8–11. Included in KISSlicer’s settings is an optional “wipe pillar” used to “clean the extruder tip” to “reduce[] hairing.” *Id.* at 9.

3. Printed-Publication Status of KISSlicer

Patent Owner argues that Petitioner fails to show that KISSlicer was publicly accessible. PO Resp. 39–41; Sur-reply 11–13. Petitioner disagrees, arguing that multiple industry discussions of KISSlicer demonstrate that

those of ordinary skill in the art not only could find, but actually did find, the reference. Reply 16–18 (citing Ex. 1017 ¶ 2, Appx. A; Ex. 1028, 1; Ex. 1031, 1; Ex. 1032, 1).

On the record developed at trial, we agree with Petitioner. According to several industry forum posts, people interested in three-dimensional printing located the website where KISSlicer was posted between February 2012 and April 2012. Ex. 1028, 1 (post discussing and directing others to KISSlicer on April 11, 2012); Ex. 1031, 1 (two posts discussing KISSlicer on March 16, 2012, and March 21, 2012); Ex. 1032, 1 (two posts discussing KISSlicer on February 11, 2012, and February 14, 2012). Thus, not only was it possible for people of ordinary skill in the art to locate KISSlicer; people of ordinary skill in the art actually did locate it. Accordingly, Petitioner has shown by a preponderance of the evidence that KISSlicer was publicly accessible.

4. *Analysis of Claims 1 and 16*

Both claim 1 and claim 16 recite printing a “purge tower.” Ex. 1001, 16:53–58, 18:2–3, 18:6–7. In particular, claim 1 recites “printing at least one purge tower in a layer-by-layer manner, wherein the layers of the at least one purge tower are printed from the print head or deposition line switched to the operating mode,” and claim 16 recites “printing a first layer of a purge tower from a part material,” then later “printing a second layer of the purge tower from the support material.” *Id.* Petitioner argues that KISSlicer teaches these limitations. Pet. 51–52, 56–59 (citing Ex. 1010, 3, 5, 9, 10); Reply 26–29 (citing Ex. 1010, 3, 7, 9, 10). Patent Owner disagrees, arguing that KISSlicer teaches a tip-wipe operation, a separate step from purging by printing the purge tower of the challenged claims. PO Resp. 74–79; Sur-

reply 19–21. On the record developed during trial, we agree with Patent Owner.

According to the '713 patent, “a purge operation” and “a tip wipe operation” are different processes that may both be performed in series. Ex. 1001, 4:41–45; *see also* Ex. 1001, 9:47–59 (distinguishing purge function of purge tower from additional tip wipe function it may also serve). Thus, to show that KISSlicer teaches printing the purge tower of claims 1 and 16, Petitioner must show more than that KISSlicer merely conducts a tip-wipe operation.

KISSlicer teaches a “Wipe” setting, under which “after a warm up the printer will push (prime) [the selected] amount of filament to ensure the printer is ready.” *Id.* at 10. According to Petitioner, this disclosure of “ensur[ing] the printer is ready” by priming some filament “after a warm up” shows that KISSlicer teaches that “[e]ach time that one of ‘Extruder 1’ or ‘Extruder 2’ heats up to *switch* to the *operating mode*, that extruder prints one or more layers of the *purge tower* before printing the three-dimensional part or support structure.” Pet. 51–52. This argument relies on the testimony of Dr. Hickner, who testifies that KISSlicer’s reference to “a warm up” must refer to the switch of an extruder to the operating mode, because that switch requires warming up. Ex. 1003 ¶ 168.

But KISSlicer also states that its priming of filament “after a warm up” is done to “ensure the printer is ready,” rather than to ensure that a particular extruder within the printer is ready. Ex. 1010, 10. According to Patent Owner, this disclosure shows that the filament priming occurs “only once at the beginning of the print ‘after warm up’ of the printer.” PO Resp. 78–79. This argument relies on the testimony of Dr. Osswald, who

testifies that KISSlicer’s wipe setting is unrelated to its wipe pillar, with the wipe setting being related only to priming that “happens only once at the beginning of the print ‘after warm up’ of the printer,” while the wipe pillar is separately “printed for ‘every layer.’” Ex. 2013 ¶ 120.

There is evidence of record to support both Petitioner’s view and Patent Owner’s view. On the record developed at trial, however, we cannot say that the preponderance of the evidence favors Petitioner, who bears the burden of proof. *See* 35 U.S.C. § 316(e). Accordingly, Petitioner has not shown by a preponderance of the evidence that KISSlicer teaches printing a layer of a purge tower each time the printer switches one extruder to the operating mode. Because proving the obviousness of claims 1 and 16 requires such a showing, Petitioner has not shown by a preponderance of the evidence that claims 1 and 16 would have been obvious over the combination of Priedeman and KISSlicer.

5. *Analysis of Remaining Claims*

Claims 2, 6, 7, 9, and 17 all depend, directly or indirectly, from claim 1 or claim 16. Accordingly, they all include the limitations of either claim 1 or claim 16. Because, as discussed above, Petitioner has not shown that the combination of Priedeman and KISSlicer teaches or suggests all the limitations of claims 1 and 16, Petitioner also has not proven by a preponderance of the evidence that claims 2, 6, 7, 9, and 17 would have been obvious over that combination of references.

F. Asserted Obviousness Based on the Combination of Priedeman, KISSlicer, RepRap Article, and RepRap Video

Petitioner argues that claim 5 would have been obvious over the combination of Priedeman, KISSlicer, RepRap Article, and RepRap Video. Pet. 1, 62–63. As discussed above with respect to the ground based on

Leavitt, RepRap Article, and RepRap Video, Petitioner does not show that the RepRap references were sufficiently accessible to interested members of the public. Accordingly, Petitioner does not show by a preponderance of the evidence that claim 5 would have been obvious over the combination of Priedeman, KISSlicer, RepRap Article, and RepRap Video.

G. Asserted Anticipation by Boyer

Petitioner argues that claims 1, 2, 6, 7, and 9 were anticipated by Boyer. Pet. 1, 63–77.

1. Overview of Boyer

Boyer, titled “Build Material Switching,” relates to the use, in a three-dimensional printer, of “transitional lengths of build material to facilitate changes from one color to another during a fabrication process.” Ex. 1008, codes (54), (57).

Figure 4, reproduced below, illustrates “a cross section of a multi-material build.” *Id.* ¶ 32.

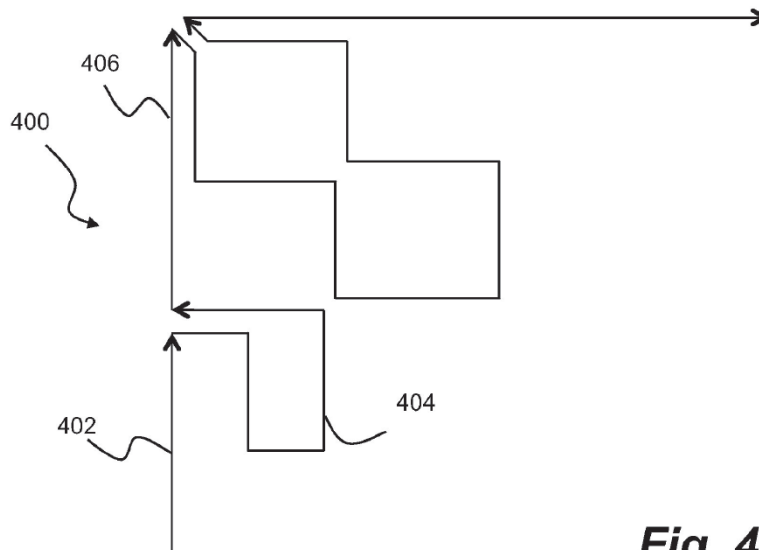


Fig. 4

Id. at Fig. 4. As shown in Figure 4 of Boyer, a tool path 400 is made up of multiple segments 402, 404, 406. *Id.* ¶ 32. “[F]irst segment 402 . . . may

traverse a portion of an exterior surface of an object with a first color, such as red.” *Id.* “The tool path 400 may then turn in toward an interior of the object and infill with a transition segment 404 between the first color and a second color, such as blue.” *Id.* “After the transition is complete and the second color can be extruded without mixing from the first color, the tool path 400 may return to the exterior of the object.” *Id.* At this point, “the tool path may provide a third segment 406 traversing a different portion of the exterior with the second color.” *Id.*

Boyer’s teachings are not limited to switching between materials that differ in color. Instead,

[w]hile color switching is one useful application of the systems and methods described herein; it will be further appreciated that the same techniques may be employed to switch between multiple build materials for a variety of other reasons. For example, different build materials may have different optical properties (opacity, color, finish, etc.), different mechanical properties (elasticity, strength, melting point, etc.), different chemical properties (curing conditions, solubility, etc.), thermal properties (insulation, etc.), electrical properties (conductance, etc.) and so forth, any of which might usefully be combined in an object fabricated from a model. The techniques described herein may be usefully employed to enable switching of build materials in any such multi-material models.

Id. ¶ 29.

2. *Prior-Art Status of Boyer*

Patent Owner argues that the inventors of the ’713 patent both conceived of the invention and actually reduced it to practice before the July 31, 2012 effective date of Boyer. PO Resp. 9–39; Sur-reply 2–9. Petitioner disagrees, arguing that Patent Owner “has failed to demonstrate an actual reduction to practice of the claims” on a date early enough to antedate

Boyer. Reply 2–12. On the record developed at trial, we agree with Petitioner for the same reasons discussed above with respect to Patent Owner’s argument for antedating the RepRap references. *See supra* § II.D.4.

3. *Analysis of Claim 1*

Among other limitations, claim 1 of Boyer recites

performing a purge operation for each print head or deposition line switched to the operating mode, the purge operation comprising printing at least one purge tower in a layer-by-layer manner, wherein the layers of the at least one purge tower are printed from the print head or deposition line switched to the operating mode.

Ex. 1001, 15:53–58. Petitioner argues that, when stacked in multiple layers, Boyer’s transition segments 404 form the recited purge tower. Pet. 70–74; Reply 33–34. Patent Owner raises two objections to this argument. First, Patent Owner argues that Boyer discloses printing its transition segment on the interior of the printed object, where it is integrated with the object itself, making it not a purge tower. PO Resp. 90–95; Sur-reply 26. Second, Patent Owner argues that Boyer fails to disclose stacking its transition segments, meaning that it does not print a purge tower in a layer-by-layer manner. *Id.* at 95–97; Sur-reply 27.

On the first of these arguments, we agree with Petitioner. As discussed above, we construe the “purge tower” of the challenged claims as an object not integrated into the object being printed, but we find that the purge tower can be in contact with the object being printed. *See supra* § II.C. In addition, Patent Owner is correct that Boyer discloses placing its transition segment on the inside of its object. Ex. 1008 ¶ 32, Fig. 4. But Boyer also discloses that the transition segment may be “sacrificial material

deposited outside the exterior of the object.” *Id.* ¶ 43; *see also id.* ¶ 3 (“The transitional lengths of build material may be positioned inside a fabricated object, such as infill, or outside the fabricated object”). Thus, Boyer’s disclosure is not limited to printing the transition segment on the interior of the object or to making the transition segment an integral part of the object.

On Patent Owner’s second argument, however, we agree with Patent Owner. According to Petitioner, because Boyer describes “tool path 400 as a ‘cross-section’ of a multi-material build, Boyer teaches that layers printed using a similar two-dimensional tool path can exist above and/or below FIG. 4’s cross-section.” Pet. 73 (citing Ex. 1008 ¶¶ 18, 24, 32–34, Fig. 4). But Boyer states that its “system can build a three-dimensional object by depositing lines of build material in successive layers—two-dimensional patterns derived from the cross-sections of the three-dimensional object.” Ex. 1008 ¶ 24. This does not state that either the object segments or the transition segments are placed directly above one another, so it does not disclose stacking transition segments to form a purge tower. Moreover, it defines “successive layers” as “two-dimensional patterns derived from the cross-sections of the three-dimensional object,” which, because the purge tower must be separate from the object (even though the two structures may touch one another), does not disclose layers of transition segments making up a purge tower. *Id.* Similarly, when discussing transition segments printed inside the object, Boyer discloses that the segments may either “follow an existing infill pattern . . . or depart from an existing infill pattern to deposit, e.g., within void spaces,” but when discussing transition segments printed “outside the exterior of the object, Boyer discloses merely that “sacrificial build material may be extruded during transitions from on[e]

color (or material) to the next.” *Id.* ¶ 34. Thus, the interior transition segments may be stacked to form part of the object’s infill pattern (or they may not be stacked), but the exterior transition segments are not disclosed as following any pattern, such as being stacked atop one another. There is a strict standard for anticipation. *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1296 (Fed. Cir. 2002). Because Petitioner has not directed us to evidence to support its view that Boyer discloses stacking transition segments printed outside the object in order to form a purge tower, as claim 1 requires, we determine that Petitioner has not shown by a preponderance of the evidence that Boyer anticipates claim 1.

4. *Analysis of Remaining Claims*

Petitioner argues that Boyer anticipates claims 2, 6, 7, and 9 of the ’713 patent. Pet. 73–77. Each of these claims depends, directly or indirectly, from claim 1. Ex. 1001, 15:59–16:39. Because dependent claims include all the limitations of the claim from which they depend, 37 C.F.R. § 1.75(c), claims 2, 6, 7, and 9 all include the limitation of claim 1 requiring printing a purge tower. As discussed above, *see supra* § II.G.3, Petitioner has not shown by a preponderance of the evidence that Boyer discloses this limitation of claim 1. Accordingly, Petitioner has not proven by a preponderance of the evidence that Boyer anticipates any of claims 2, 6, 7, and 9.

III. CONCLUSION⁹

After considering the briefs, evidence, and oral arguments in this case, we determine that Petitioner has not proven by a preponderance of the evidence that any of claims 1, 2, 5–7, 9, 16, and 17 of the '713 patent is unpatentable.

The following table summarizes the outcome for the challenged claims of this Final Written Decision:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not Shown Unpatentable
1, 2, 5–7, 9, 16, 17	103	Leavitt, RepRap Article, RepRap Video		1, 2, 5–7, 9, 16, 17
1, 2, 6, 7, 9, 16, 17	103	Priedeman, KISSlicer		1, 2, 6, 7, 9, 16, 17
5	103	Priedeman, KISSlicer, RepRap Article, RepRap Video		5
1, 2, 6, 7, 9	102	Boyer		1, 2, 6, 7, 9
Overall Outcome				1, 2, 5–7, 9, 16, 17

⁹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has not demonstrated, by a preponderance of the evidence, that claims 1, 2, 5–7, 9, 16, and 17 of the '713 patent are unpatentable; and

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

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Patent 9,421,713 B2

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