SHENZHEN TUOZHU TECHNOLOGY CO., LTD. (Petitioner)
v.
STRATASYS, INC. (Patent Owner)

Petitioner Demonstratives

Case No. IPR2025-00321
U.S. Patent No. 9,421,713

Before Hon. Mitchell G. Weatherly, Christopher M. Kaiser, and Lilan Ren,
Administrative Patent Judges

Shenzhen Tuozhu 1038
Shenzhen Tuozhu v. Stratasys
IPR2025-00321

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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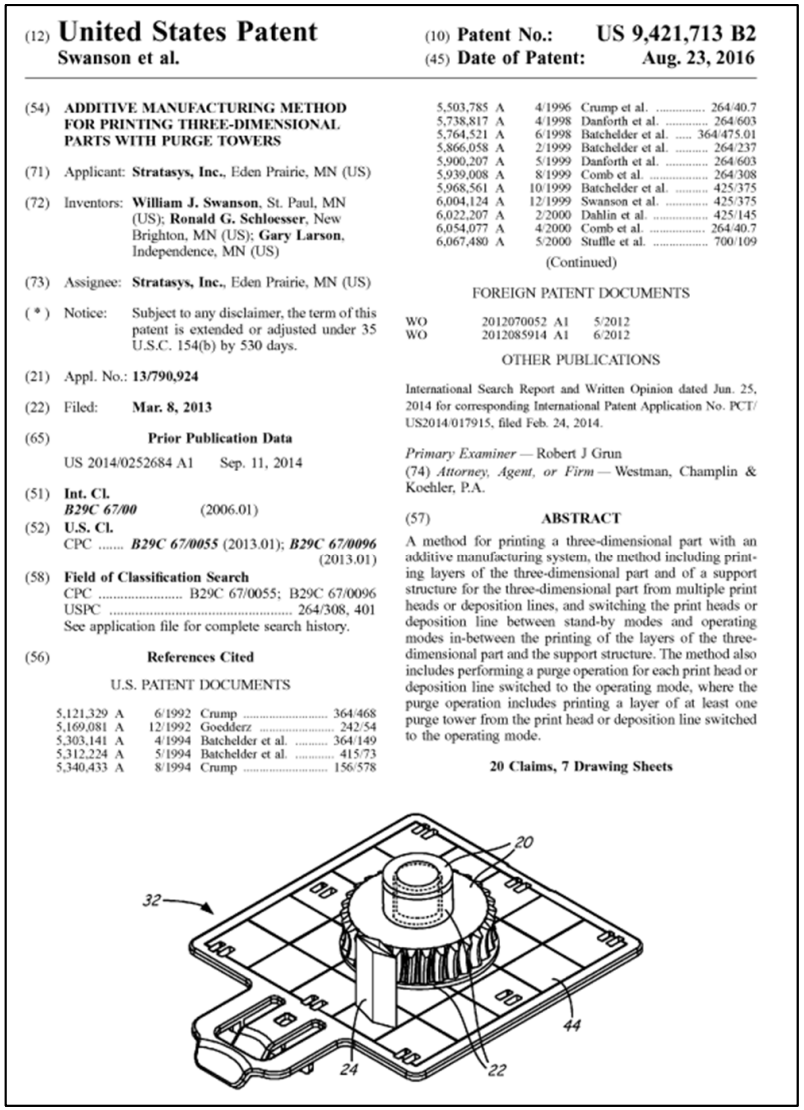
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’713 Patent Overview

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Overview of the ’713 Patent



(12) **United States Patent**
Swanson et al.

(10) **Patent No.: US 9,421,713 B2**
(45) **Date of Patent: Aug. 23, 2016**

(54) **ADDITIVE MANUFACTURING METHOD FOR PRINTING THREE-DIMENSIONAL PARTS WITH PURGE TOWERS**

(71) Applicant: **Stratasys, Inc.**, Eden Prairie, MN (US)

(72) Inventors: **William J. Swanson**, St. Paul, MN (US); **Ronald G. Schloesser**, New Brighton, MN (US); **Gary Larson**, Independence, MN (US)

(73) Assignee: **Stratasys, Inc.**, Eden Prairie, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 530 days.

(21) Appl. No.: **13/790,924**

(22) Filed: **Mar. 8, 2013**

(65) **Prior Publication Data**

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(51) **Int. Cl.**
B29C 67/00 (2006.01)

(52) **U.S. Cl.**
CPC ***B29C 67/0055*** (2013.01); ***B29C 67/0096*** (2013.01)

(58) **Field of Classification Search**
CPC B29C 67/0055; B29C 67/0096
USPC 264/308, 401
See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Robert J Grun
(74) *Attorney, Agent, or Firm* — Westman, Champlin & Koehler, P.A.

(57) **ABSTRACT**

A method for printing a three-dimensional part with an additive manufacturing system, the method including printing layers of the three-dimensional part and of a support structure for the three-dimensional part from multiple print heads or deposition lines, and 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. The method also includes performing a purge operation for each print head or deposition line switched to the operating mode, where the purge operation includes printing a layer of at least one purge tower from the print head or deposition line switched to the operating mode.

20 Claims, 7 Drawing Sheets

EX1001, Cover Page.

- The ’713 Patent was filed Mar. 8, 2013, which is its earliest claimed priority date.
- The ’713 Patent includes 20 claims.
- The IPR2025-00321 Petition challenges claims 1, 2, 5-7, 9, 16, and 17, of which claims 1 and 16 are independent.

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Overview of the ’713 Patent

’713 Patent

As such, the method of the present disclosure is directed to a process in which the part and support print heads print a purge tower (or multiple purge towers) during the purge operations. As discussed below, the purge tower allows each print head to achieve the above-discussed desired functions of a purge operation without requiring the use of a separate purge station. This can increase the useable build volume in the additive manufacturing system, as well as reducing the amount of part and support materials consumed during the purge operations and allowing the additive manufacturing system to operate in a fully automated manner.

FIG. **1** shows system **10** in use with two consumable assemblies **12**, which illustrates a suitable additive manufacturing system for performing the method of the present disclosure to print 3D parts and support structures along with one or more purge towers. Each consumable assembly **12** is an easily loadable, removable, and replaceable container device that retains a supply of a consumable filament for printing with system **10**. Typically, one of the consumable assemblies **12** contains a part material filament (“part material consumable assembly”), and the other consumable assembly **12** contains a support material filament (“support material consumable assembly”). However, both consumable assemblies **12** may be identical in structure.

In the shown embodiment, each consumable assembly **12** includes container portion **14**, guide tube **16**, print heads **18**, where print heads **18** are individually referred to as part print head **18***p* (for the part material) and support print head **18***s* (for the support material). Container portion **14** may retain a spool or coil of a consumable filament, such as discussed in Mannella et al., U.S. patent application Ser. Nos. 13/334,910 and 13/334,921. Guide tube **16** interconnects container portion **14** and print head **18**, where a drive mechanism of print head **18** (or of system **10**) draws successive segments of the consumable filament from container portion **14**, through guide tube **16**, to a liquefier assembly of the print head **18**.

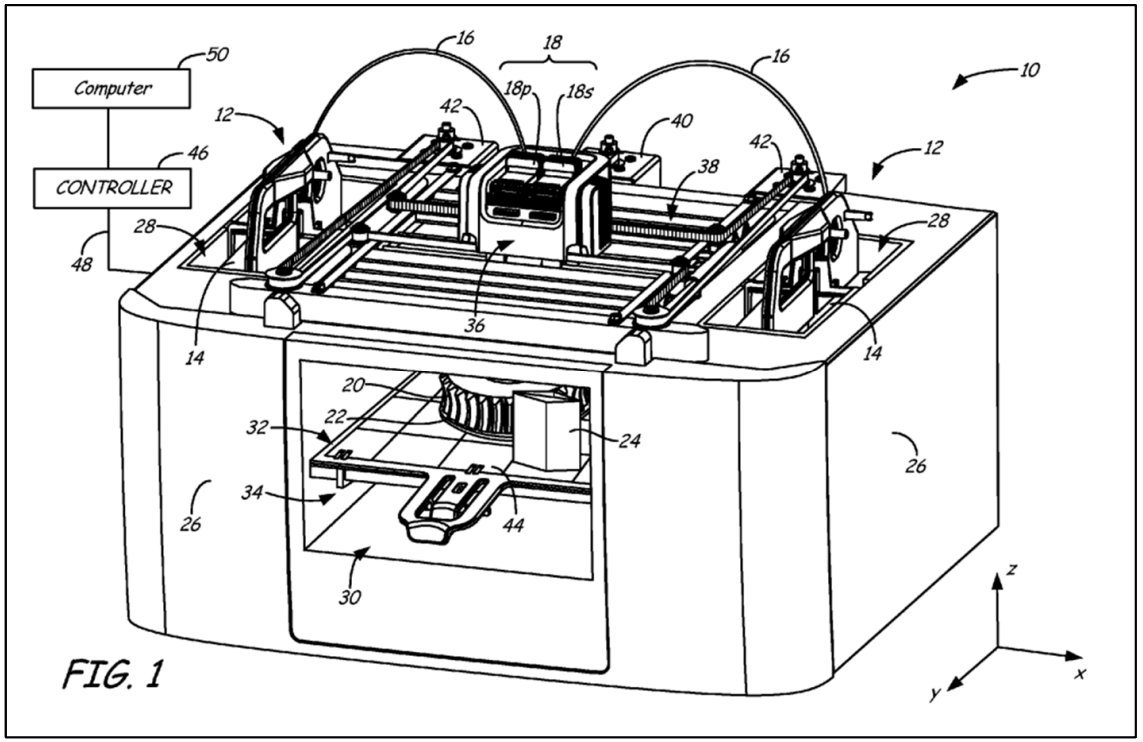


FIG. 1

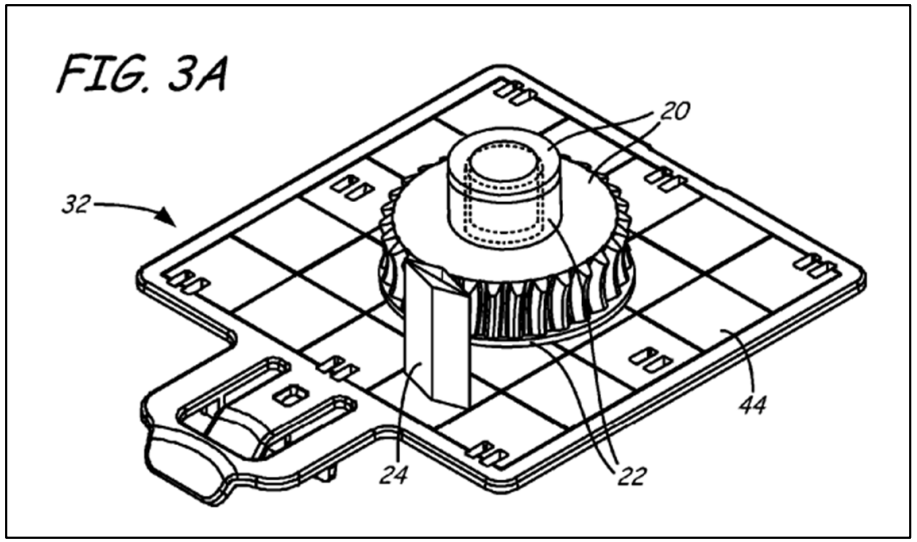
EX1001, 5:7-43, FIG. 1; Pet., 3-4.

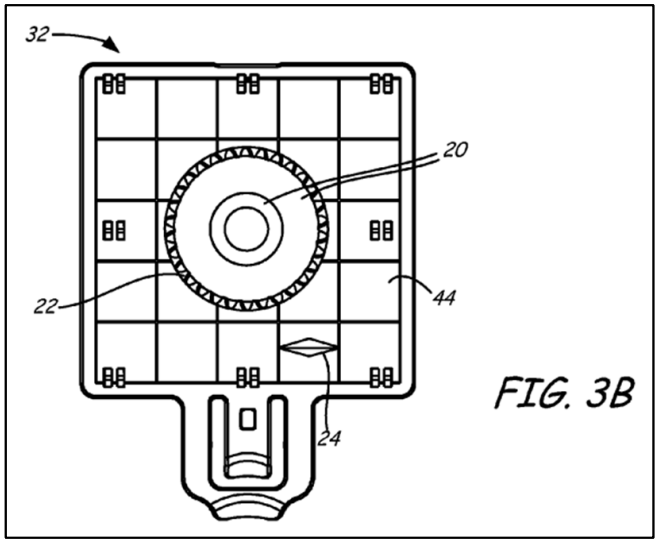
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Overview of the ’713 Patent

’713 Patent

As shown in FIG. **1**, and further shown in FIGS. **3**A and **3**B, purge tower **24** may be printed at any suitable free 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**). As discussed further below, each layer of purge tower **24** is printed by either the part material or by the support material depending on when print heads **18** switch between their operating modes and their stand-by modes and perform the purge operations.





EX1001, 8:30-38, FIG. 1; Pet., 3-4.

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’713 Patent Claims 1 and 16

’713 Patent

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.

16. A method for printing a three-dimensional part with an additive manufacturing system, the method comprising: (a) printing a first layer of a support structure from a support material for the three-dimensional part; (b) printing a first layer of a purge tower from a part material; (c) printing a first layer of the three-dimensional part on at least a portion of the first layer of the support structure from the part material after printing the first layer of the purge tower; (d) printing a second layer of the purge tower from the support material; and (e) printing a second layer of the support structure on at least a portion of the first layer of the three-dimensional part from the support material after printing the second layer of the purge tower.

EX1001, 15:43-58, 17:26-18:11.

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Overview of Grounds Instituted Against ’713 Patent

Ground	Claims	Basis for Rejection
1	1, 2, 5-7, 9, 16, 17	§103 – Obvious based on Leavitt (EX1004) in view of RepRap Article (EX1005) and RepRap Video (EX1006)
2A	1, 2, 6, 7, 9, 16, 17	§103 – Obvious based on Priedeman (EX1007) view of KISSlicer (EX1010)
2B	5	§103 – Obvious based on Priedeman in view of KISSlicer, RepRap Article and RepRap Video
3	1, 2, 6, 7, 9	§102 – Anticipated by Boyer (EX1008)

Pet., 1.

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Claim Construction

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Claim Construction: Elements [1a], [1c], [19.d]

Elements [1a], [1c] (partial): …printing layers of the three-dimensional part and of a support structure…from multiple print heads or deposition lines…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

Petition: "printing a purge tower on the build substrate next to the 3D part (as suggested by RepRap) would have beneficially allowed Leavitt's extruder head to prime such material and prepare the deposition line for operating mode in a prompt and efficient manner and with limited additional movement."

Pet., 13.

Institution Decision: "We are not persuaded, on the present record, that a purge tower must be a structure that is separate from the object being printed, as opposed to encompassing either a separate structure or a structure printed within the interior of the part."

Inst. Dec., 22.

Petitioner's Reply: "The fact that the 'purge tower' is recited independently of the 'three-dimensional part' does not mean that the claims prohibit any physical contact between the two."

Pet. Rep., 2.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Claim Construction: Elements [1a], [1c]

Patent Owner

POR: "A POSITA would not have considered a structure physically connected to the print object…to teach the claimed purge tower."

POR, 63.

Dr. Osswald

Q. I can reframe it.

Does Claim 1 allow for physical contact between the three-dimensional part and the support structure?

A. Yes.

Q. Does Claim 1 allow for contact between the three-dimensional part and the purge tower?

A. No.

EX1025, 106:9-16; Pet. Rep., 2.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Claim Construction: Elements [1a], [1c]

Dr. Hickner

8. Stratasys seeks to improperly inject unclaimed limitations into Element [1c] by demanding that the at least one purge tower ***have no physical contact with*** the three-dimensional part or the support structure. *See e.g.*, POR, 62-63, 92-93. Element [1c] never requires that the at least one purge tower be in physical contact with the three-dimensional part, and and nothing in the claims or specification indicate that importing such a limitation into Element [1c] is proper.

Patent Owner elected to not cross-examine Dr. Hickner after his reply testimony.

9. Stratasys and Dr. Osswald identify no portions of the specification, prosecution history, or any other intrinsic or extrinsic evidence that would support reading such an unrecited limitation into the claims. Nor could they, because such evidence does not exist in the record. The claims simply do not require that the purge tower must have no physical contact with the three-dimensional part, and PO and Dr. Osswald have not indicated any portion of the claims that they consider to provide such a requirement. The mere fact that the "purge tower" is recited independently of the "three-dimensional part" does not mean that the claims prohibit any physical contact between the two. Indeed, the "three-dimensional part" is recited separately from the "support structure" yet Stratasys's expert has stated that those two elements will generally be in physical contact. EX1025, 35:18-36:2; 36:21-37:6; 106:9-13 (admitting that claim 1 does "allow for physical contact between the three-dimensional part and the support structure"). Stratasys and Dr. Osswald have identified no reason for their position that the purge tower cannot have any physical contact with the three-dimensional part or support structure although they concede that the three-dimensional part and support structure often do have physical contact with one another.

EX1023, ¶¶8-9; Pet. Rep., 1-2.

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Claim Construction: Elements [1a], [1c]

'713 Patent

As shown in FIG. **1**, and further shown in FIGS. **3**A and **3**B, purge tower **24** may be printed at any suitable free 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**). As discussed further below, each layer of purge tower **24** is printed by either the part material or by the support material depending on when print heads **18** switch between their operating modes and their stand-by modes and perform the purge operations.

EX1001, 8:30-38, FIG. 1; Pet. Rep., 2.

Patent Owner elected to not cross-examine Dr. Hickner after his reply testimony.

Dr. Hickner

10. The '713 Patent explains that "purge tower 24 may be printed at *any suitable free 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)."[1] EX1001, 8:30-38. There is no disclosure in the specification that the x-y location of the purge tower is prohibited from being adjacent to or otherwise in contact with the three-dimensional part so long as the purge tower *does not overlap with the footprint of the three-dimensional part and support structure*. That is, the '713 Patent's disclosure encompasses an example where the purge tower is immediately adjacent to the three-dimensional part or support structure such that there is physical contact, but the purge tower does not occupy the footprint of the three-dimensional part/support structure and vice versa. Nothing in the '713 Patent's specification precludes the purge tower from being in physical contact with the three-dimensional part or support structure at all. The mere fact that the '713 Patent describes some examples where physical contact is not present does not negate the fact that the '713 Patent does not require no physical contact.

EX1023, ¶10; Pet. Rep., 2.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Petitioner Identified Which Proposed Claim Constructions to Apply to Each Ground

Element [1a]: "printing layers of the three-dimensional part and of a support structure for the three-dimensional part from multiple print heads or deposition lines…"

Petition:

"According to the first construction, the step of printing "from multiple print head**s** [plural] or deposition line**s** [plural]" requires a system having multiple deposition output ports."

"According to the alternative construction, the step of printing "from multiple print head**s** [plural] or deposition line**s** [plural]" encompasses not only the types of systems having multiple deposition output ports described above, but also a single extruder head having a single deposition output port to print different materials *at different times*."

Pet., 6-7.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Petitioner Identified Which Proposed Claim Constructions to Apply to Each Ground

Patent Owner

POR: "Petitioner…improperly proposes two positions as to the scope of the claims, defining those positions by which structures are covered as opposed to an actual construction…Petitioner has failed to satisfy its burden to 'include a statement identifying a proposed construction of the particular term' where it believes a term requires an express construction."

POR, 8.

PTAB

"37 C.F.R. § 42.104(b)(3) 'does not require Petitioner to express its subjective agreement regarding correctness of its proffered claim constructions or to take ownership of those constructions'…Petitioner may satisfy this rule '***by identifying claim constructions it proposes as the basis for requesting review of the challenged claims***.'"

Hologic, Inc. v. Enzo Life Sci., Inc., IPR2018-00019, Paper 21 (P.T.A.B. November 28, 2018); Pet. Rep., 1.

FISH.

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Petitioner Identified Which Proposed Claim Constructions to Apply to Each Ground

Petitioner's Reply

> Petitioner has identified "how the challenged claim is to be construed" for each challenged claim. *See* 37 C.F.R. § 42.104(b)(3). EX1023, ¶7. Petitioner's presentation of alternative constructions for Element [1a] and identification of which grounds apply to which construction satisfies 37 C.F.R. § 42.104(b)(3) and is fully proper. *See Hologic, Inc. v. Enzo Life Sci., Inc.*, IPR2018-00019, Paper 21 (P.T.A.B. November 28, 2018).

Pet. Rep., 1.

Dr. Hickner

> 7. In my first declaration, I identified a "first construction" and an "alternative construction" for the term "printing layers…from multiple print heads or deposition lines" (element [1a]). Pet. 6.; EX1003, ¶¶33-35. I have explained exactly which grounds apply to each construction. Pet. 6. It is clear from my first declaration that if the Board adopts the first construction grounds 1-2B are applicable and if the Board adopts the alternative construction all the grounds are applicable. There is no ambiguity in this position, and I have explained that if the Board decides to use the first construction, ground 3 would fail, but if the Board decides to use the alternative construction, ground 3 should succeed.

EX1023, ¶7; Pet. Rep., 1.

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FISH.

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The ’713 Patent Is Not Entitled To An Earlier Priority Date

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Earlier Priority Date: Legal Standard

POR: "[T]he invention of the '713 Patent was reduced to practice before the critical dates of…Section 102(a) and 102(e) references and thus antedates them.

POR, 9-10.

PO Sur-Reply: "Under the corroborated, contemporaneous record, the inventors implemented and successfully used the claimed purge-tower purge process on the "Solo" prototype by at least November 20, 2011, and the corresponding packed toolpath implementation (Ex. E) existed by July 5, 2011.

PO Sur-Rep., 2.

***Cooper v. Goldfarb*, 154 F.3d 1321, 1327 (Fed. Cir. 1998)**

"[T]o establish an actual reduction to practice, the inventor must prove that: (1) he constructed an embodiment or performed a process that met all the limitations of the interference count; and (2) he determined that the invention would work for its intended purpose."

***UMC Elecs. Co. v. United States*, 816 F.2d 647, 652 (Fed. Cir. 1987)**

Pet. Rep., 3.

"There cannot be a reduction to practice of the invention…without a physical embodiment which includes all limitations of the claim."

Pet. Rep., 3.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

POR: "the inventors with their colleagues ***reduced the invention to practice*** by, among other things, studying the implementation details of the invention, ***creating binary (CBM) files representing the generation of tool path instructions to build*** the three-dimensional part, support structure, and purge tower(s), and creating purge towers during a purge operation to enable the development of the printer…The accompanying declarations explain that ***purge towers were printed in a manner that practiced each of the challenged claims***."

POR, 11.

Mr. Larson (inventor):

6. During research and development of the Solo printer, which was ultimately adapted for release to the public as the Mojo 3-D printer, Bill Swanson, Ronald Schloesser, and I tried to address the disadvantages related to "purge" operations in fused deposition modeling (FDM).

16. The information shown in the following screenshots is from Ex. E (July 5, 2011, packed CMB file). This CMB file was last modified on July 5, 2011 in conjunction with the Solo project. I recognize the shape of purge tower in this CMB file from my involvement in the development of the Solo printer and confirmed the date of this CMB file from its file properties, as shown below.

EX2014, ¶¶6, 16; Pet. Rep., 3, 6-7; POR, 13-14.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

POR: "the inventors with their colleagues ***reduced the invention to practice*** by, among other things, studying the implementation details of the invention, ***creating binary (CBM) files representing the generation of tool path instructions to build*** the three-dimensional part, support structure, and purge tower(s), and creating purge towers during a purge operation to enable the development of the printer…The accompanying declarations explain that ***purge towers were printed in a manner that practiced each of the challenged claims***."

POR, 11.

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Mr. Leavitt (non-inventor witness):

Ex. E (July 5, 2011, packed CMB file) at 2. Notably, the dimensions of the build space in Exhibit E align with the constraints of the Solo printer (5x5x5 inch build space) that was under development at that time. I also note that, as discussed above, the CMB file shows that when the "Extruder index" is set to "1" the "Material" type is "ABS-M30," which is a type of part material.[3] As shown by the screenshot below, the final layer of the three-dimensional part was printed with part material, as indicated by the green lines, on layer 607 (corresponding to height of just over 4 inches (i.e., Z=4.2811)). The packed CMB file shown in Exhibit E was used to print the objects shown therein on a Solo printer in 2011. The printed parts were used to continue the product development of the Solo printer.

EX2015, ¶16; Pet. Rep., 5-6; POR, 13-14.

This is the <u>only</u> statement in a declaration from Mr. Larson or Mr. Leavitt that the CMB file was actually executed on a printer

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

Petitioner

However, the evidence of record fails to demonstrate that the identified CMB file was ever executed on a Solo printer (or other multi-head printer) and Stratasys has not identified any other files that allegedly perform all claim steps. Inventor Gary Larson submitted a declaration in which he discusses both the Solo printer and the CMB file but never alleges that he or either of his co-inventors every actually executed the CMB. Under questioning, he stated that he "could not

Pet. Rep., 3-4.

Because neither witness was able to confirm that they personally executed the CMB file relied upon by Stratasys or witnessed someone execute the CMB file, Stratasys has failed to demonstrate an earlier reduction to practice.

Pet. Rep., 5.

Mr. Larson (inventor):

Q. Did you ever, personally, execute this CMB file on a three-dimensional printer?

A. I could not say for certain.

EX1029, 19:16-18; Pet. Rep., 4.

Q. Can you identify the persons who may have executed this CMB file on a three-dimensional printer?

A. There again, I -- it's possible it could have been Bill Swanson. It could have been Dominic Manilla. And, you know, there's probably other folks, as well, that could have actually executed it on a printer, but I don't recall who all those folks would be.

Q. Do you recall, personally, witnessing anyone execute this CMB file on a three-dimensional printer?

A. No. I mean, not this specific one.

EX1029, 19:24-20:8; Pet. Rep., 4.

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Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

Petitioner

recall" to both questions. EX1030, 22:20-23:7. Mr. Leavitt stated that this file was "in a folder" and that "the test engineer would – print the parts in the folder." *Id.*, 23:5-19. However, Mr. Leavitt did not recall witnessing the test engineer execute the specific CMB file cited in his declaration (the only CMB file that Stratasys's alleges as performing all claimed functions), and also did not personally send the CMB file to the test engineer to execute. *Id.*, 23:3-23. Even if Mr. Leavitt's

Pet. Rep., 3-4.

Because neither witness was able to confirm that they personally executed the CMB file relied upon by Stratasys or witnessed someone execute the CMB file, Stratasys has failed to demonstrate an earlier reduction to practice.

Pet. Rep., 5.

Mr. Leavitt (non-inventor witness):

Q. Did you ever, personally, execute this CMB file on a three-dimensional printer?

A. I do not recall. We -- I -- I did many. This geometry -- I know I printed the purge tower. That, I definitely recognize. The customer geometry, like I said, we have thousands of those. That particular part, I do not recall. I know it was printed. I just don't think I did it.

Q. Did you ever, personally, witness someone execute this CMB file on a three-dimensional printer?

A. I do not recall. I just know that it was in a folder where we printed all the parts, so this was in a test folder --

EX1030, 22:20-23:7; Pet. Rep., 4.

Q. BY MR. BISENIUS: Do you recall, personally, sending this specific CMB file for a test engineer to execute on a three-dimensional printer?

A. No.

EX1030, 23:20-23; Pet. Rep., 4.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

Mr. Leavitt (non-inventor witness):

THE WITNESS: Yeah. So this was -- these parts -- so we had a folder with a list of parts where you would pack -- you know, using that control setting, you pack the purge part with the geometry and then the test engineer would -- would print the parts in the folder. And then they would report if anything failed or anything was -- so like I said, there's nothing terribly unique about this particular assembly. So it's not necessarily memorable. The purge tower is, purge part is, but not the -- not the -- not the combination of these two parts.

Q. BY MR. BISENIUS: Do you recall, personally, sending this specific CMB file for a test engineer to execute on a three-dimensional printer?

A. No.

Q. Do you know the name of the test engineer?

A. Amy Enga.

EX1030, 23:9-25; Pet. Rep., 4.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

Mr. Leavitt (non-inventor witness):

16. The information shown in the following screenshots is from Ex. E (July 5, 2011, packed CMB file). This CMB file was last modified on July 5, 2011 in conjunction with the Solo project.

Q. BY MR. BISENIUS: Approximately, when in 2011 was this specific CMB file executed on a Solo printer?

A. Q1.

EX2015, ¶16; EX1030, 23:9-25; Pet. Rep., 5.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

Mr. Larson (inventor):

> Q. What role did Paul Leavitt play in developing the purge feature?
>
> A. Well, he wasn't involved in solo, at all, at that time.

EX1029, 45:13-16; Pet. Rep., 5.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Evidence of Earlier Date of Invention: Legal Standard

***Kolcraft Enters. v. Graco Children's Prods.*, 927 F.3d 1320, 1324 (Fed. Cir., 2019)**

"Inventor testimony of conception must be corroborated by other, independent information."

"All cited evidence of prior conception, however, originated with the inventors of the '970 and '231 patents. The Board, in considering only the redacted Inventor Declaration, found that Exhibits A—H and the Inventor Declaration 'are undated and find identification, if at all, only via the conclusory and uncorroborated testimony of the inventors.'"

Pet. Rep., 7-8.

***Mahurkar v. C.R. Bard, Inc.*, 79 F.3d 1572, 1577 (Fed. Cir. 1996)**

"inventors testifying in patent infringement cases would be tempted to remember facts favorable to their case by the lure of protecting their patent or defeating another's patent."

Pet. Rep., 7-8.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Evidence of Earlier Date of Invention: Legal Standard

***Sandt Tech., Ltd. v. Resco Metal & Plastics Corp.*, 264 F.3d 1344, 1351 (Fed. Cir. 2001)**

Additionally, oral testimony of someone other than the alleged inventor may corroborate an inventor's testimony. *Woodland Trust*, 148 F.3d at 1371, 47 U.S.P.Q.2D (BNA) at 1366. In contrast to contemporaneous documentary evidence, however, post-invention oral testimony is more suspect, as there is more of a risk that the witness may have a litigation-inspired motive to corroborate the inventor's testimony, and that the testimony may be inaccurate. *Id.* at 1373, 47 U.S.P.Q.2D (BNA) at 1367 (noting that testimony from witnesses is often "unsatisfactory" in view of "the forgetfulness of witnesses, their liability to make mistakes, [and] their proneness to recollect things as the party calling them would have them recollect them")

Pet. Rep., 8.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

PO Sur-Reply: "Corroboration may be circumstantial and need only support the credibility of the inventors' account; it need not include an 'over-the-shoulder' witness or documentary proof of the specific act."

PO Sur-Rep., 3.

Mr. Larson (inventor):

Q. Did you ever, personally, execute this CMB file on a three-dimensional printer?

A. I could not say for certain.

EX1029, 19:16-18; Pet. Rep., 4.

Q. Do you recall, personally, witnessing anyone execute this CMB file on a three-dimensional printer?

A. No. I mean, not this specific one.

EX1029, 20:6-8; Pet. Rep., 4.

Petitioner

Inventor Gary Larson submitted a declaration in which he discusses both the Solo printer and the CMB file but never alleges that he or either of his co-inventors every actually executed the CMB. Under questioning, he stated that he "could not

Pet. Rep., 4.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

PO Sur-Reply: "Mr. Leavitt identified the "test folder" and the test engineer…[t]he Board has credited comparable circumstantial corroboration…*See Motorola*" PO Sur-Rep., 4.

Motorola Mobility LLC v. Intellectual Ventures II LLC, IPR2014-00504, Paper 84 at 41-44 (PTAB Mar. 13, 2020)



Next, Mr. LeBlanc testifies that the inventors completed a prototype of the MHS1 and tested it to confirm that it worked for its intended function no later than October 22, 2002. *Id.* ¶ 19. To corroborate Mr. LeBlanc's testimony, Patent Owner offers Exhibit 2012, which comprises three photographs, and Exhibit 2013, which Patent Owner asserts shows that the three photographs were uploaded to the inventors' shared online repository on October 22, 2002. PO Resp. 25. Mr. LeBlanc testifies that the working prototype of the MHS1 was completed at least as earlier as October 22, 2002 because the inventors took the Exhibit 2012 photographs to commemorate the first successful road test of the MHS1. Ex. 2006 ¶ 19. The photographs are reproduced below:

We determine that Exhibit 2012 lends credibility to Mr. LeBlanc's testimony that the inventors conducted a successful road test of the MHS1 prototype. Although they are not direct evidence that the inventors successfully tested an MHS1 prototype, the photographs give credence, under a rule of reason framework, to Mr. LeBlanc's recollection of events. For instance, we credit Mr. LeBlanc's statement that the photographs were taken to commemorate the road test (Ex. 2012 ¶¶ 19, 24). Also, the second

Motorola at 41-44; PO Sur-Rep., 2, 4.

In *Motorola*, the photographs depicted the inventor Mr. LeBlanc <u>on the day of a prototype test, corroborating Mr. LeBlanc's testimony that the test occurred.</u>

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Stratasys Provides No Corroborating Evidence The CMB File Was Executed On A Three-Dimensional Printer By The Asserted Date

Mr. Larson

Q. Can you identify the persons who may have executed this CMB file on a three-dimensional printer?

A. There again, I -- it's possible it could have been Bill Swanson. It could have been Dominic Manilla. And, you know, there's probably other folks, as well, that could have actually executed it on a printer, but I don't recall who all those folks would be.

Q. Do you recall, personally, witnessing anyone execute this CMB file on a three-dimensional printer?

A. No. I mean, not this specific one.

EX1029, 19:24-20:8; Pet. Rep., 4.

Q. What role did Paul Leavitt play in developing the purge feature?

A. Well, he wasn't involved in solo, at all, at that time.

EX1029, 45:13-16; Pet. Rep., 5.

Mr. Leavitt

Q. BY MR. BISENIUS: Do you recall, personally, sending this specific CMB file for a test engineer to execute on a three-dimensional printer?

A. No.

Q. Do you know the name of the test engineer?

A. Amy Enga.

EX1030, 23:20-25; Pet. Rep., 4.

Q. Do you know which model of three-dimensional printer the test engineer executed this specific CMB file on?

A. The Solo printer.

EX1030, 24:5-8; Pet. Rep., 4.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Evidence Fails to Demonstrate That The Solo/Mojo Printer Could Execute CMB Files

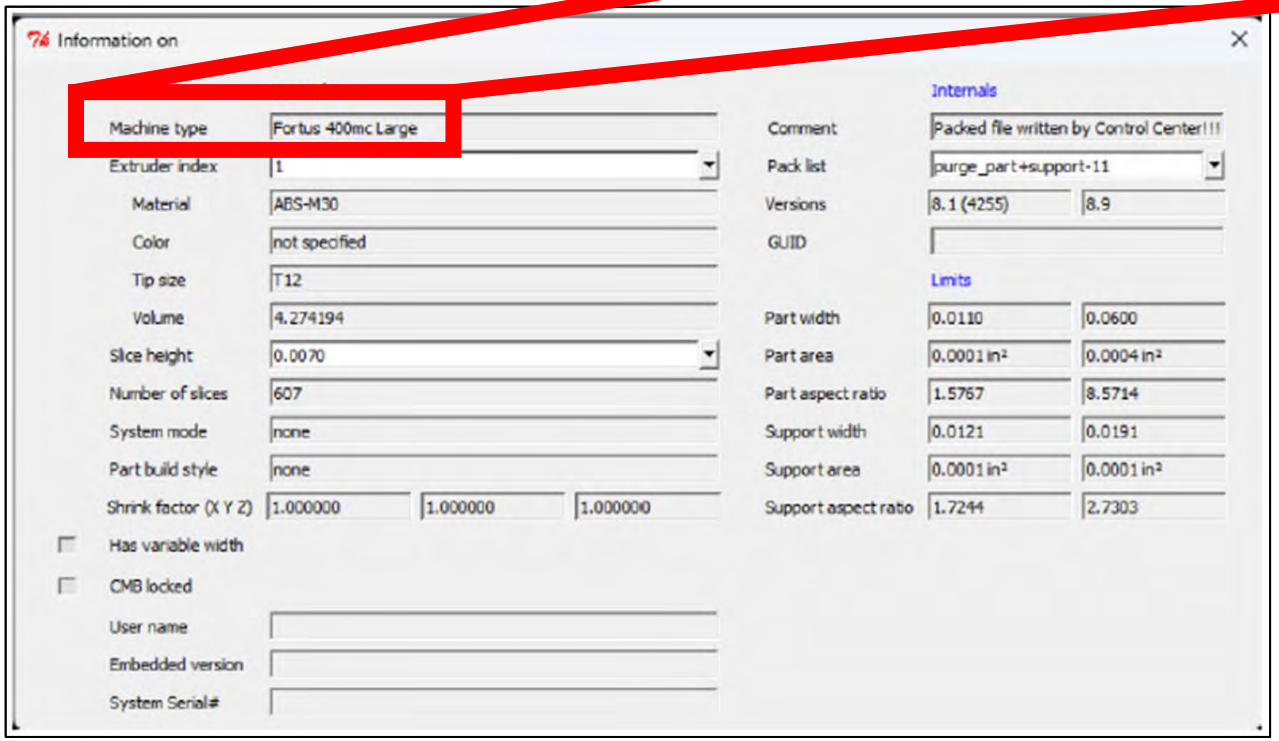
Petitioner

> The evidence of record casts serious doubt on whether the CMB file discussed in the declarations was even compatible with the Solo printer. Larson and Leavitt stated the CMB file was designed for use with a "Fortus 400mc Large" printer:

POR, 5.

Mr. Larson and Mr. Leavitt

Machine type: Fortus 400mc Large



EX2014, ¶16; EX2015, ¶16; Pet. Rep., 6.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Evidence Fails to Demonstrate That The Solo/Mojo Printer Could Execute CMB Files

Mr. Larson and Mr. Leavitt

6. During research and development of the Solo printer, which was ultimately adapted for release to the public as the Mojo 3-D printer, Bill Swanson, Ronald Schloesser, and I tried to address the disadvantages related to "purge" operations in fused deposition modeling (FDM). A

EX2014, ¶6; EX2015, ¶6; Pet. Rep., 6.

Mr. Larson

Q. BY MR. BISENIUS: And would those two files be STL files or would they be CMB files?

A. Well, they would start as STL files, and then once they're processed, they're converted into a CMB file.

EX1029, 17:7-11; Pet. Rep., 6.

Q. How does the Insight software generate the tool path instructions for printing layers from the CMB file?

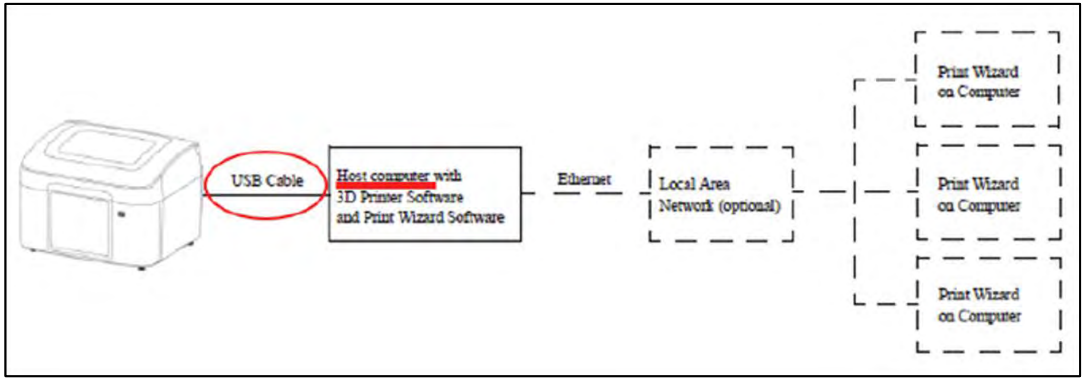
A. The Insight software creates the CMB file.

EX1029, 24:7-11; Pet. Rep., 6.

Mojo 3D Printer User Guide

The Mojo system builds models from CAD STL files that are sent to the system using a USB cable from a dedicated host computer. The printer builds three-dimensional parts by extruding ABS*plus* model material and SR-30 support material through two computer-controlled print heads, producing high quality parts that are ready to use immediately after completion.

EX1027, 8, 21; POR, 6-7.



DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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The Evidence Fails to Demonstrate That The Solo/Mojo Printer Could Execute CMB Files

Mojo 3D Printer User Guide

CUSTOMER SUPPORT

Visit: http://www.stratasys.com for the following:

- Material specifications, MSDS, and environmental documentation.
- Product specifications and guides.
- Applications.
- Best practices.

When contacting technical support please provide the following:

By phone:

- System model.
- System serial number.
- System software build number.
- Mojo 3D Printer software and Print Wizard software version numbers.
- Detailed description of the problem you are experiencing.
- If possible, try to be near the printer for troubleshooting, if possible.

By email:

- System model.
- System serial number.
- Your name.
- Your telephone number.
- Detailed description of the problem you are experiencing.

For advanced troubleshooting (provide by email):

- System CFG file.
- STL and/or CMB files.
- Detailed photographs showing the issue.

EX1027, 58; PO Sur-Reply, 6 (miscited as EX2017 at 58).

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

33

The Evidence Fails to Demonstrate That The Solo/Mojo Printer Could Execute CMB Files

Petitioner

> Stratasys has provided no documentation to establish that the *Solo/Mojo printer* was actually compatible with Insight software or was capable of receiving/executing CMB files rather than STL files. As such, Stratasys relies on the testimony of Larson and Leavitt ***alone*** for the premise that the identified CMB file was compatible with and could be executed on a Solo/Mojo printer. The uncorroborated testimony of Stratasys's employees is insufficient to establish compatibility of the Solo/Mojo printer with the identified CMB file. *Kolcraft*

Pet. Rep., 7-8.

***Sandt Tech., Ltd. v. Resco Metal & Plastics Corp.*, 264 F.3d 1344, 1351 (Fed. Cir. 2001)**

> "[O]ral testimony of someone other than the alleged inventor may corroborate an inventor's testimony…however, ***post-invention oral testimony is more suspect***, as there is more of a risk that the witness may have a litigation-inspired motive to corroborate the inventor's testimony, and that ***the testimony may be inaccurate***"

Pet. Rep., 8.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Earlier Priority Date: Legal Standard

***Cooper v. Goldfarb*, 154 F.3d 1321, 1327 (Fed. Cir. 1998)**

"[T]o establish an actual reduction to practice, the inventor must prove that: (1) he constructed an embodiment or performed a process that met all the limitations of the interference count; and (2) he determined that the invention would work for its intended purpose."

Pet. Rep., 3.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Later Failures Suggest that The CMB File Was Not Successfully Printed

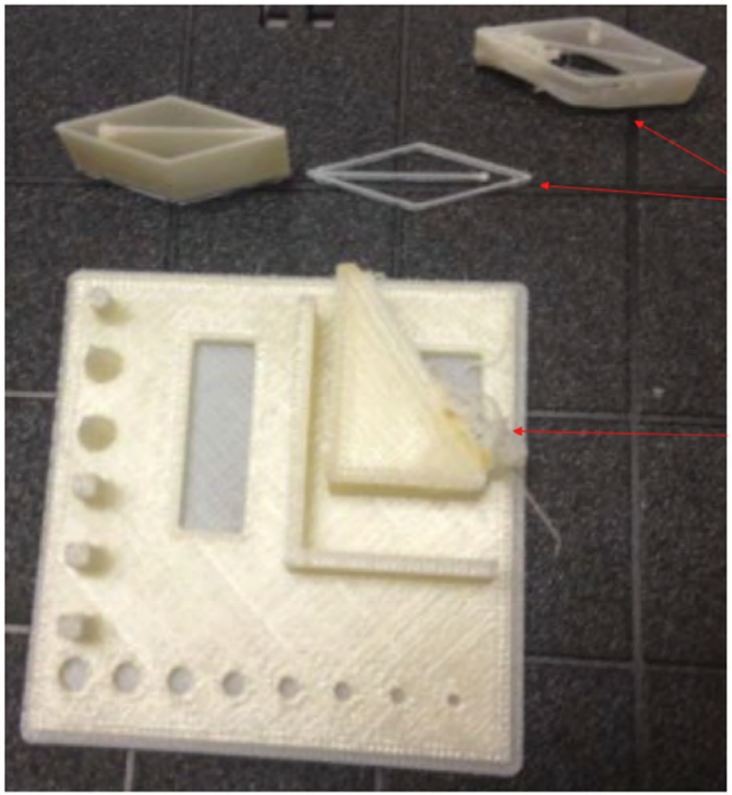
Mr. Larson

> And the purge tower that's not still connected to the platform, the build foundation, would be support material. And once it failed, that -- that purge tower failed, it -- it delaminated from that layer on the -- on the foundation, then that purge material actually ended up in your part. And you can see that there, which is a great example of the challenges with purging. And that's why you purge into a bucket, to get the balance of material out of the way.

EX1029, 76:7-15; Pet. Rep., 8-9.

> And ultimately, this is a great example of why that failed, is particularly where support material -- the SR30, which is a soluble material, it's very hydroscopic. So it loves moisture, so it oozes more.
>
> So as you can see with the part material, we -- we could probably get by without a purge because we were -- we were able to use -- combine the purge and the purge tower into one, and that worked pretty good. But on the support side, we never could. We just could not control that amount of ooze, and you'd need to purge more material and it just didn't work out. And that's

EX1029, 77:7-18; Pet. Rep., 8-9.



EX2014, ¶25; Pet. Rep., 9.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Later Failures Suggest that The CMB File Was Not Successfully Printed

PO Sur-Reply: "Later failures in refining alternative designs do not undo an earlier reduction to practice of a working embodiment meeting the claim limitations."

PO Sur-Rep., 2.

Mr. Larson

Q. Did you ever, personally, execute this CMB file on a three-dimensional printer?

A. I could not say for certain.

EX1029, 19:16-18; Pet. Rep., 4.

Q. Do you recall, personally, witnessing anyone execute this CMB file on a three-dimensional printer?

A. No. I mean, not this specific one.

EX1029, 20:6-8; Pet. Rep., 4.

Mr. Leavitt

Q. Did you ever, personally, execute this CMB file on a three-dimensional printer?

A. I do not recall. We -- I -- I did many. This geometry -- I know I printed the purge tower. That, I definitely recognize. The customer geometry, like I said, we have thousands of those. That particular part, I do not recall. I know it was printed. I just don't think I did it.

Q. Did you ever, personally, witness someone execute this CMB file on a three-dimensional printer?

A. I do not recall. I just know that it was in a

EX1030, 22:20-23:5; Pet. Rep., 4.

Q. BY MR. BISENIUS: Do you recall, personally, sending this specific CMB file for a test engineer to execute on a three-dimensional printer?

A. No.

EX1030, 23:20-23; Pet. Rep., 4.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

THE CMB File Does Not Provide All Functionality of Claim 16

Claim 16

16. A method for printing a three-dimensional part with an additive manufacturing system, the method comprising: (a) printing a first layer of a support structure from a support material for the three-dimensional part; (b) printing a first layer of a purge tower from a part material; (c) printing a first layer of the three-dimensional part on at least a portion of the first layer of the support structure from the part material after printing the first layer of the purge tower; (d) printing a second layer of the purge tower from the support material; and (e) printing a second layer of the support structure on at least a portion of the first layer of the three-dimensional part from the support material after printing the second layer of the purge tower.

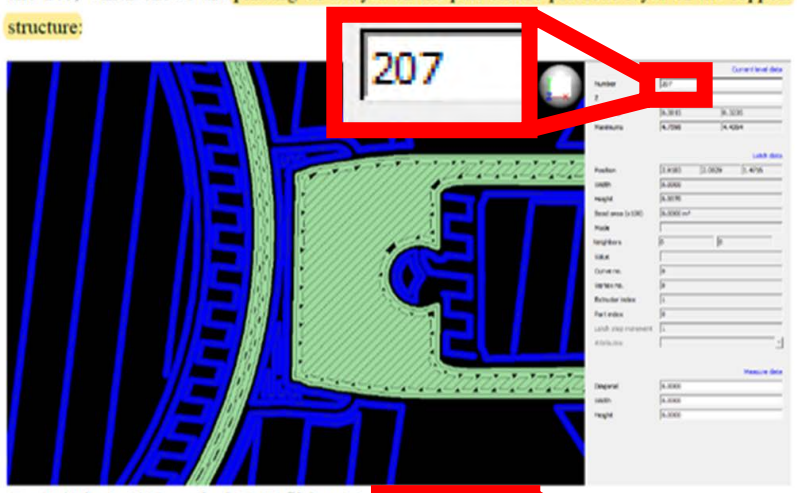
FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

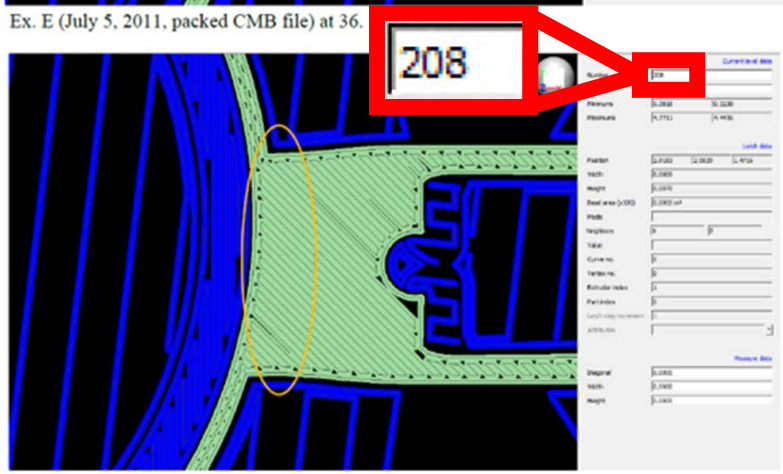
THE CMB File Does Not Provide All Functionality of Claim 16

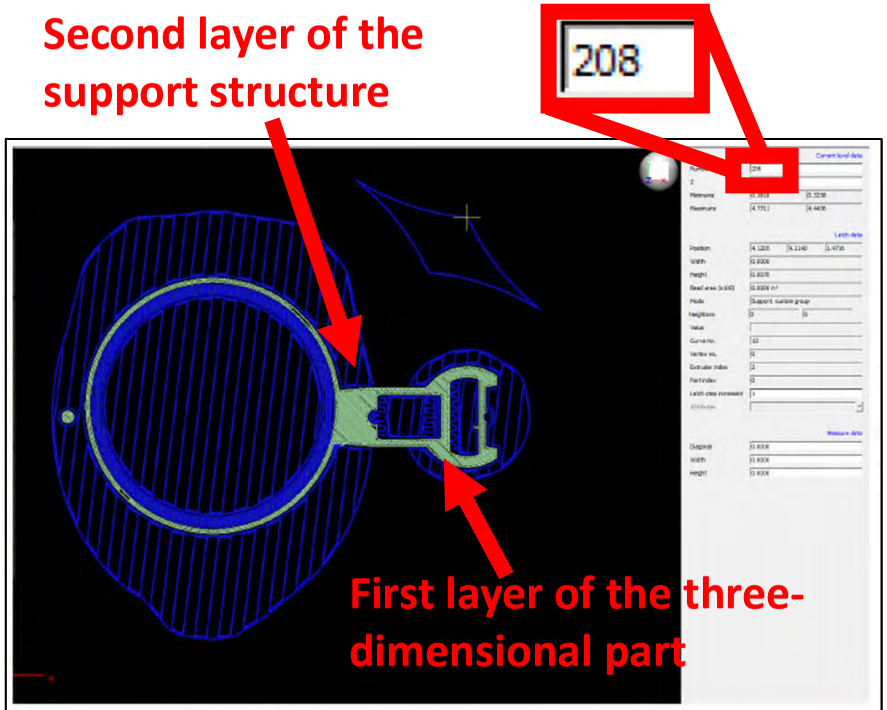
Mr. Larson

Ex. E (July 5, 2011, packed CMB file) at 35. Below is a close-up comparison between layers 207 and 208, which shows the printing of a layer of the part on the previous layer of the support structure:



Ex. E (July 5, 2011, packed CMB file) at 36.





Ex. E (July 5, 2011, packed CMB file) at 38. As also shown in layer 208, the blue lines also indicate tool paths for (e) printing a second layer of the support structure on at least a portion of the first layer of the three-dimensional part from the support material after printing the second layer of the purge tower. The images below show that the layer of the support structure on the right-hand side of the image in layer 208 extends over and is printed on at least a portion of the three-dimensional part in layer 207.

EX2014, ¶22 ; Pet. Rep., 3.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

THE CMB File Does Not Provide All Functionality of Claim 16

PO Sur-Reply: "Petitioner also wrongly conflates the CMB viewer's numbered 'layers' with the claimed layers of the part, support, and purge tower. Furthermore, Petitioner's critique that 'Stratasys would need to identify some portion of the support material of layer 209…,' is inconsequential as Stratasys ***showed the repetition of Claim 16's steps*** across layers 209-210."

PO Sur-Rep., 8.

Petitioner

That is, claim 16 requires a first three-dimensional part layer above/on the first support layer, and a second support layer above/on ***the first*** three-dimensional part layer. Stratasys relies on ***layer 207*** of the CMB file as allegedly providing the "first layer of support structure" (Element [16a]). POR, 29. Stratasys then identifies ***layer 208*** as allegedly providing the "***first layer of the three-dimensional part***" (Element [16c]). *Id.*, 30-32. Because Stratasys relies on layer 208 for Element [16c], in order to demonstrate that the CMB file provides Element [16e], Stratasys would need to identify some portion of the support material of layer 209 printed "on at least a portion of the first layer of the three-dimensional part" that Stratasys identified in layer 208. However, when addressing Element [16e], Stratasys does not discuss layer 209 at all. POR, 33-35. Rather, Stratasys alleges that a separate portion of support structure in layer 208 is deposited over part material of layer 207. *Id.* This analysis from Stratasys fails to demonstrate that the CMB file provides all elements of claim 16 because Stratasys relies on part material in ***layer 208*** to allegedly provide "***a first layer of the three-dimensional part***" with respect to Element [16c] but then relies on part material from ***layer 207*** for "***the first layer of the three-dimensional part***" with respect to Element [16e]. *Id.*, 30-35. Stratasys cannot rely on two different portions of part material from two different layers for providing the same "first layer of the three-dimensional part" in Elements [16c] and [16e].[2] While Stratasys later discuses layer 209 with respect to claim 17, the POR does not attempt to demonstrate that support material in layer 209 is printed on at least a portion of the first layer of the three-dimensional part from layer 208.

Pet. Rep., 10-11.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Larson and Leavitt Declarations Should Be Afforded Little To No Weight

***Ronald Xavier Collins v. United States of America et al*, No. 5:2020cv02582 - Document 63 at 4:27-5:3 (C.D. Cal. 2023)**

> The Court finds that Dr. Stein did not participate in the preparation of the report… The Court will limit his testimony to the opinions disclosed in deposition, and to subjects on which he is qualified to testify, as described in more detail below."

Pet. Rep., 12.

Mr. Larson

Q. In your declaration, what percentage of the words did you write yourself as opposed to words written by someone else that you reused -- that you reviewed and approved?

A. I would say that almost all or all of the words were by counsel.

EX1029, 9:18-23; Pet. Rep., 12.

Q. Your declarations includes long stretches of text that are word for word identical to that -- Mr. Leavitt's declaration.

Can you explain the overlap between the two declarations?

A. No.

EX1029, 10:12-17; Pet. Rep., 12.

Q. Did you write any portion of your declaration yourself?

A. Actually typed the words in, no. I didn't do any typing. I just provided the information. It was typed for me and then I reviewed it --

EX1030, 11:4-8; Pet. Rep., 12.

Q. Your declaration includes long stretches of text that are word-for-word identical of that for Mr. Larson's declaration.

Can you explain the significant overlap between the two declarations?

A. I haven't seen his declaration, so I can't answer that question.

EX1030, 10:22-11:3; Pet. Rep., 12.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

RepRap Video, RepRap Article, and KISSlicer Are Printed Publications

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Public Accessibility: Legal Standard

MPEP § 2128(II)(A)

"An electronic publication, including an online database or Internet publication (e.g., discussion group, forum, digital video, or social media post), is considered to be a "printed publication"…provided the publication was accessible to persons concerned with the art to which the document relates."

Pet. Rep., 13.

***HVLPO2, LLC v. Oxygen Frog, LLC*, 2018 U.S. Dist. LEXIS 245874, *1-4 Case No. 4:16cv336-MW/CAS (N.D. Fla., May 28, 2018)**

"It appears that Plaintiff is unfamiliar with how YouTube works. A familiar user would know that you don't need to search for a particular channel to watch the videos uploaded on it. For example, if you want to watch a video of a cat skateboarding, you can search 'cat skateboarding'; you don't need to know that it might have been 'CatLady8' who uploaded the video you end up watching."

"[T]he effort involved in composing a basic search query and scrolling down the page a few times does not exceed the 'reasonable diligence' that the law expects of a hypothetical prior-art subject."

Pet. Rep., 13.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Public Accessibility: Legal Standard

***Mission Integrated Tech. LLC, v. Joshua Clemente*, IPR2023-01285, Paper 16 at 19, 22-23 (PTAB Feb. 23, 2024)**

> "[T]he ARES 6 Video was uploaded to YouTube, and publicly accessible on October 11, 2017…*see also*…YouTube screenshot containing the date October 11, 2017"

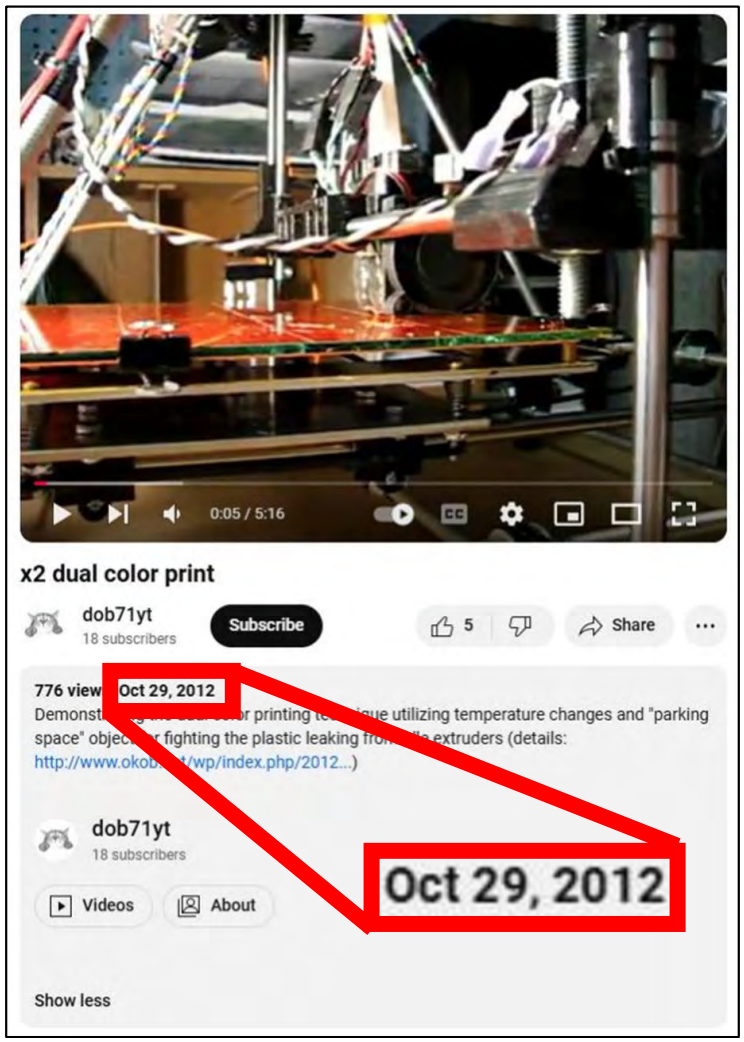
Pet. Rep., 14.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

RepRap Video Is A Printed Publication

Denis Bakin (RepRap author)



EX1016, Exhibit A; Pet., 2; Pet. Rep., 14.

3. Attached hereto as Exhibit A is a true and correct copy of the web page for a YouTube video that I published on October 29, 2012, titled "x2 dual color print."

4. I created this post under the username "dob71yt."

5. This video has been publicly available in its current form, without the need for a login, at https://www.youtube.com/watch?v=ZAafPtKjZSc since October 29, 2012. Both now and at the time that I posted this video, YouTube included search functionality that would have allowed members of the public to search for this video based on the title and the description.

EX1016, ¶¶, 3-5; Pet. 2; Pet. Rep., 15.

Patent Owner elected to never cross-examine Mr. Bakin.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

RepRap Video Is A Printed Publication

Kathryn Talbot (digital media expert)

19. The URL https://www.youtube.com/watch?v=ZAafPtKjZSc points to a webpage including information indicating that the video corresponding to Exhibit EX1006 was uploaded by user dob71yt by Oct. 29, 2012. A screen capture of the webpage containing the video corresponding to Exhibit EX1006 is attached as Appendix B to this declaration and shows the Oct. 29, 2012 upload date for this video. In view of my knowledge of and experience with YouTube going back to at least 2012, as described above, it is my opinion that at least the portions of Exhibit EX1006 currently accessible at the above-referenced URL were accessible at the same URL on Oct. 29, 2018.

20. It is also my opinion that persons interested in and ordinarily skilled in the relevant subject matter would have easily been able at the relevant time to locate the video of Exhibit EX1006 by exercising reasonable diligence. At all relevant times, YouTube videos were searchable by at least their title and description. Anyone interested in and ordinarily skilled in 3D printing would have been able to use keyword searching to search for various terms used in

EX1018, ¶¶19-20; Pet., 2.

Patent Owner elected to never cross-examine Ms. Talbot.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

RepRap Article Is A Printed Publication

Denis Bakin (RepRap author)

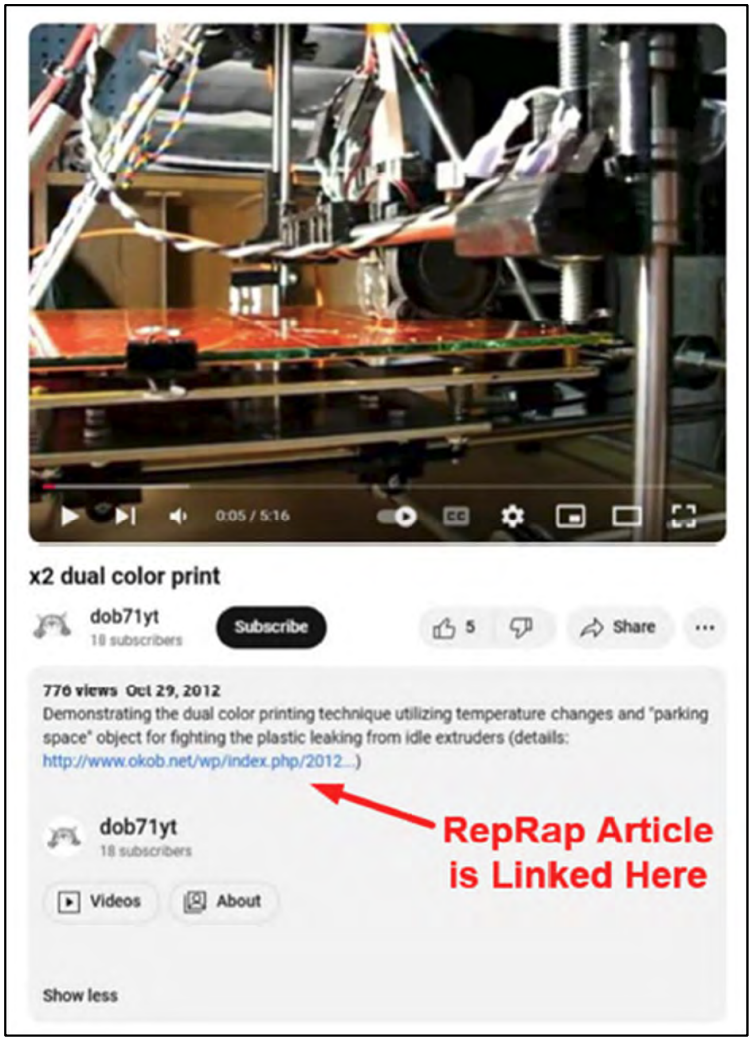
6. Attached hereto as Exhibit B is a true and correct copy of my blog post titled "Dual extruder PLA printing" that I published on October 29, 2012.

7. This blog post has been publicly available in its current form, without the need for a login, at https://www.okob.net/wp/index.php/2012/10/29/dual-extruder-pla-printing since October 29, 2012. Okob.net is my personal website where I post thoughts, discussions, and information about my various interests, including 3D printing. The blog portion of okob.net is not password protected and any member of the public can access my blog posts on the website.

EX1016, ¶¶6-7; Pet., 2; Pet. Rep., 15.

Patent Owner elected to never cross-examine Mr. Bakin.

EX1016, Appendix A



EX1016, Appendix A; Pet. 2, Pet. Rep., 16.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

RepRap Article Is A Printed Publication

Denis Bakin (RepRap author)

The okob.net website allows visitors to browse blog posts by category (including a 3D printing category) or to search for specific blog posts using keyword searching, as shown in the search bar on the right side of Exhibit B. 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. Additionally, the archived forum discussions on okob.net, including discussion threads regarding 3D printing, demonstrate that members of the public were able to access and identify subject matter of interest on the website.

EX1016, ¶7; Pet., 2; Pet. Rep. 15.



Patent Owner elected to never cross-examine Mr. Bakin.

FISH.

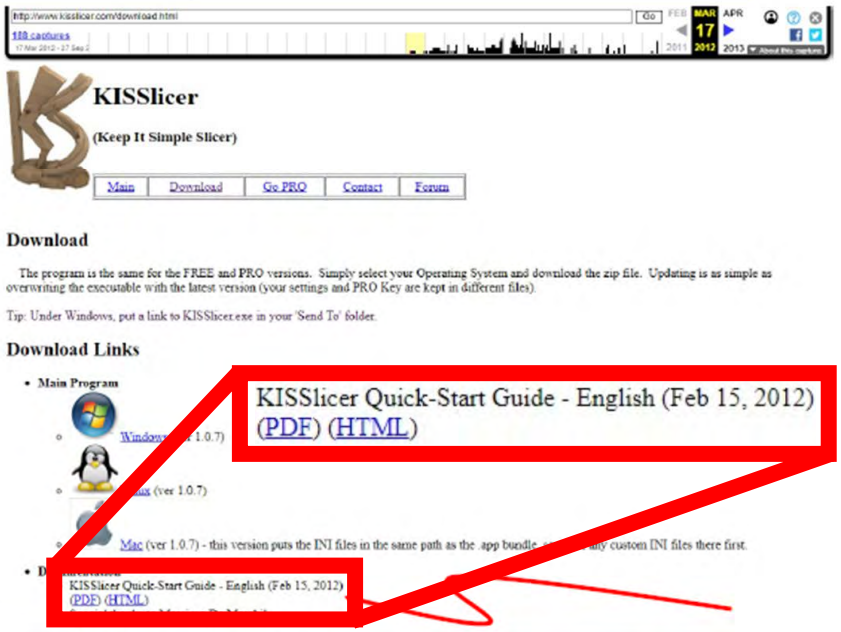
DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

48

KISSlicer Is A Printed Publication

Jonathan Dummer (KISSlicer author)

2. Since January 2012, the KISSlicer software has been available in both free and pro versions at the www.kisslicer.com website, which became popular to many in the 3D printing field by early 2012. *See* Appendix A, p. 1. The free version was and still is freely available and does not require any login credentials or payment to access. Additionally, the website also provided free access for users to also download the "KISSlicer Quick-Start Guide" (Appendix B), which was publicly accessible by interested users no later than February 2012—a fact that is corroborated by the archived version of the www.kisslicer.com website:



Patent Owner elected to never cross-examine Mr. Dummer

EX1017, ¶2; Pet., 2.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

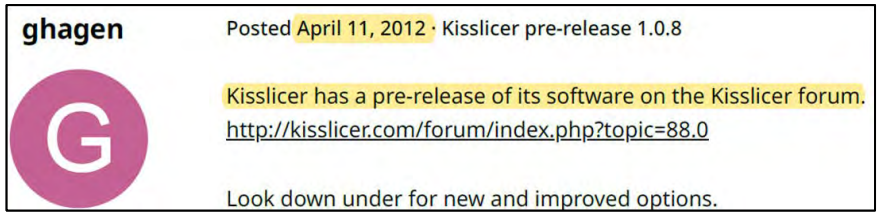
KISSlicer Is A Printed Publication

Mr. Dummer

See Appendix A, p. 1 ("February 15, 2012"). I have personal knowledge that, throughout February 2012, members of the public interested in 3D printing were able to find, access, and download the KISSlicer software and Quick-Start Guide from www.kisslicer.com using publicly available search engines, blog posts, and through word of mouth in the 3D printing community. I recall that, during February 2012, the kisslicer.com forum included many active members discussing topics relevant to the KISSlicer software, and the KISSlicer Quick-Start Guide was a helpful tool for many of those new members who also downloaded the KISSlicer software.

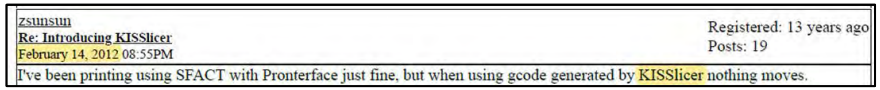
EX1017, ¶2; Pet., 2; Pet. Rep., 16.

EX1028



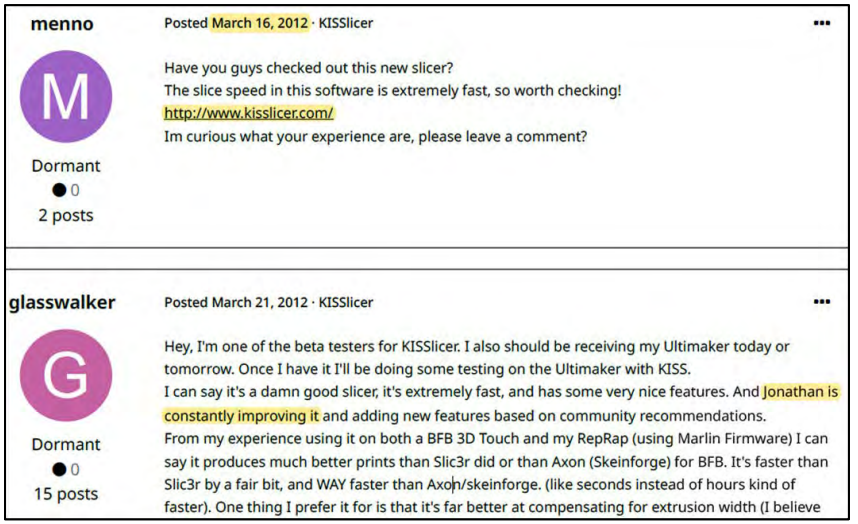
EX1028, 1; Pet. Rep., 17.

EX1032



EX1029, 20:6-8; Pet. Rep., 4.

EX1031



EX1031, 1; Pet. Rep., 17.

50

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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EX1009

Polygonhell
Re: KickStarter Campaign For Dual Extruder
June 14, 2012 07:10PM

Registered: 12 years ago
Posts: 939

KisSlicer has a setting for it, and though I've never seen it run, what it appears to do is draw a cylinder next to the model retract and wipe the nozzle on the cylinder on color/material changes.
I agree though, unless you have a very high pressure nozzle, it's still going to leak on things, plus your dragging a second hotend over the part while printing.

EX1009, 2; EX1003, ¶83; Pet. 28.

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Mr. Dummer

> 3. Appendix A is a true and correct copy of an archive.org capture of the Download page of www.kisslicer.com (http://www.kisslicer.com/download.html) as it appeared in February and March of 2012 (and for some time thereafter). This page included links for downloading the KISSlicer Quick-Start Guide (Appendix B). Appendix B is a true and correct copy of the KISSlicer Quick-Start Guide as published on www.kisslicer.com on February 15, 2012. This Quick-Start Guide (Appendix B) was publicly accessed by members of the 3D printing community in February 2012 and was available in both PDF and HTML format. No password or access credentials were required to download this Quick-Start Guide.

EX1017, ¶3; Pet., 2.

Patent Owner elected
to never cross-examine
Mr. Dummer

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination (Ground 1)

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination

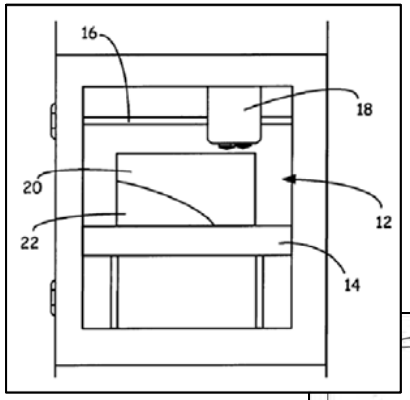
Leavitt (EX1004)

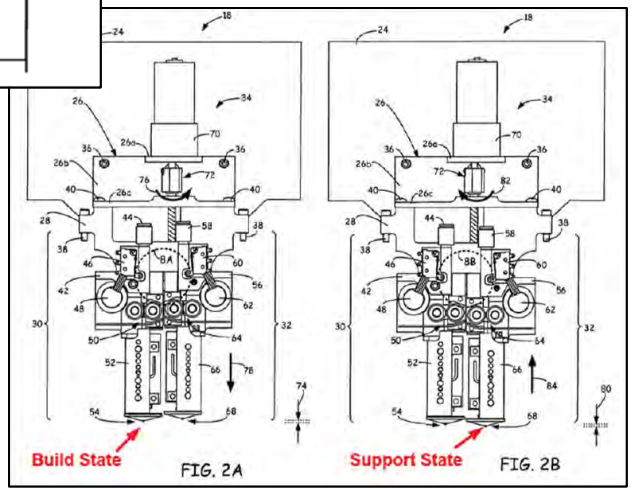
[0022] Extrusion head **18** is a dual-tip extrusion head supported by gantry **16** for building 3D object **20** and support structure **22** on substrate **14** in a layer-by-layer manner. As discussed below, extrusion head **18** is configured to toggle between a "build state" and a "support state", 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. In a preferred embodiment, the build

[0023] During a build operation, extrusion head **18** is initially positioned in the build state, which allows extrusion head **18** to deposit the build material in a sequence of roads to form a layer of 3D object **20**. After the layer of 3D object **20** is complete, extrusion head **18** then toggles to the support state, which allows extrusion head **18** to deposit the support material in a sequence of roads to form a layer of support structure **22**. The layer of support structure **22** may then be used to vertically support subsequent layers of deposited build and/or support materials. After the layer of support structure **22** is complete, substrate **14** is lowered along the z-axis by a single layer increment, and extrusion head **18** toggles back to the build state to form a subsequent layer of 3D object **20**. This process may be repeated until each layer of 3D object **20** and support structure **22** are complete. In an

[0032] During a build operation to form a layer of 3D object **20**, extrusion head **18** is disposed in the build state, where toggle mechanism **34** retains support liquefier pump **32** in a raised position (as shown in FIG. **2**A). In the raised position,

[0035] FIG. **2**B shows extrusion head **18** is disposed in the support state, where toggle mechanism **34** retains support liquefier pump **32** in the lowered position. In the lowered





EX1004, [0022]-[0023], [0032], [0035], FIGS. 1-2B 1; Pet., 7-9, 16.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination

RepRap Article (EX1005)

One of the most annoying problems with the dual extruder printing is the plastic leaking from the idle extruder. It is especially noticeable with PLA that flows easier than ABS. Lowering 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 helps to deal with leaking. It is tricky though since leaking has to be prevented during the teperature changes.

The technique being used with the current generation of the RepRap X2 printers (S/N: 020*) is to print a "parking space" besides the actual object. That "parking space" serves two purposes, one is to plug the nozzles while the temperature changes and the other is to "prime" the extruders (i.e. establish the consistent flow of plastic) before printing the actual object after the temperature change.

EX1005, 1; Pet., 10.

RepRap Video (EX1006)



EX1006, 5:04; Pet., 12

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Hickner

1. Indeed, Multiple reasons would have motivated a POSITA to make this combination.

53. As a ***first*** reason, a POSITA would have been prompted to implement Leavitt's system with the purge tower suggestion of RepRap because doing so would result in Leavitt's deposition lines 30 and 32 "priming" their nozzles before printing the layers of 3D object 20 and support structure 22 to establish a "consistent flow of plastic" in a way that prepares the nozzles for printing. EX1005, 1. It is apparent from Leavitt's teachings that the material at the nozzle tip of the idle liquefier pump would have an inconsistent texture, especially if a portion of the material slightly oozes from the tip of the nozzle. EX1004, [0032] ("may potentially ooze")). It is apparent that a POSITA would have recognized from each of RepRap Article and RepRap Video that the "priming" of such material into the suggested purge tower would have advantageously avoided uneven deposition or defects imposed upon the 3D part.

EX1003, ¶53; Pet., 12-13.

Leavitt (EX1004)

in 3D object **20**. While extrusion head **18** is disposed in the build state, residual amounts of support material may potentially ooze from support liquefier pump **32**. However, positioning support tip **68** higher than build tip **54** by raised offset distance **74** reduces the risk that the residual support material comes into contact with the layer of 3D object **20** being formed.

EX1004, [0032]; Pet., 13.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

POR: "[A] POSITA would not understand that the material at the nozzle tip would 'have an inconsistent texture' or that Leavitt's system would result in 'uneven deposition or defects imposed upon the 3D part.'"

POR, 54.

Dr. Hickner

nozzle. POR, 53-54; EX2013, ¶¶86-88. To be clear, material that oozes from an idle nozzle in Leavitt's printer and material extruded from an active nozzle *would not have the same texture* because the oozed material outside of the nozzle cannot maintain or be reheated to the same temperature as material extruded when the nozzle is active. Dr. Osswald testified that this oozed material would remain on the exterior of the extruder tip, further away from the heat source as compared with material that remains within the nozzle close to the heat source. EX1025, 21:23-22:10 ("It stays there on the tip."). I agree with Dr. Osswald's opinion here and submit that because the oozed material is more removed from the heat source than material within the nozzle, the oozed material does not maintain the same temperature as the material within the nozzle, leading to inconsistent texture. Applying RepRap's suggestion to prime the nozzles would prevent the oozed material of inconsistent temperature from being deposited on the part and ensure that only material actively being extruded is deposited. This would provide greater consistency as compared with depositing oozed material directly onto the part.

EX1023, ¶12; Pet. Rep., 19.

Dr. Osswald

Q. Then where does the ooze material go?

A. It stays there on the tip. It's -- the viscosity is pretty high, and there's also surface tension effects that -- that will contain it, on the tip.

Q. So it would be attached to the outside of the support tip 68; is that correct?

A. Yes.

EX1025, 22:3-10; Pet., Rep., 19.

57

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

POR: "Paragraph 32 of Leavitt (cited by Petitioner for support), specifically describes how Leavitt's method of raising the extruder head solves the problem of 'defects imposed upon the 3D part'…A POSITA would not be motivated to combine Leavitt with RepRap to solve the issue already resolved by Leavitt

POR, 54-55; EX2013 ¶88.

Dr. Hickner

13. Dr. Osswald also claimed that Leavitt's technique for raising and lowering the deposition lines "solves the problem" relating to the oozed material so that a POSITA would not have looked to RepRap for a solution. POR, 54-55; EX2013, ¶88. I disagree with Dr. Osswald's opinion here. Leavitt would actually result in a POSITA seeking ***additional solutions*** to the oozing problem. For example, Leavitt makes it clear that raising an inactive nozzle "***reduces*** the risk that the residual support material comes into contact with the layer" of the three-dimensional part, but that raising the inactive nozzle ***does not eliminate the risk***. EX1004, [0032]; EX1025, 26:13-17. What's more, Leavitt's process of raising an idle deposition line ***does absolutely nothing to prevent oozing*** from occurring in the first place. Raising an idle deposition line does not prevent material from oozing from the nozzle at all, but does reduce a likelihood of the oozed material contacting the three-dimensional part because the idle nozzle is raised above a level at which the active nozzle is extruding material onto the part. Raising the idle nozzle as disclosed by Leavitt therefore manages the consequences of oozing without addressing the root cause of these consequences—the oozing itself.

EX1023, ¶13; Pet. Rep., 19.

Leavitt (EX1004)

in 3D object **20**. While extrusion head **18** is disposed in the build state, residual amounts of support material may potentially ooze from support liquefier pump **32**. However, positioning support tip **68** higher than build tip **54** by raised offset distance **74** reduces the risk that the residual support material comes into contact with the layer of 3D object **20** being formed.

EX1004, [0032]; Pet., 13.

Dr. Osswald

Q. This portion of Leavitt states that the act of raising the support tip 68 reduces but does not eliminate the risk of residual support material coming in contact with the 3D layer; is that correct?

A. That's what it says there, yes.

EX1025, 26:13-17; EX1023, ¶13; Pet., Rep., 19.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Hickner

14. Because Leavitt's raised nozzle (1) does not prevent oozing from occurring at all, and (2) reduces but does not eliminate the risk of oozed material coming into contact with a layer of the three-dimensional part or support structure, a POSITA would be even more motivated to look to other references that describe additional solutions for managing the oozed material. These include solutions for preventing oozing in the first place (which Leavitt does not provide) and solutions for decreasing even more the likelihood of oozed material coming into contact with the three-dimensional part or support structure. RepRap Article and RepRap Video are two such references that a POSITA would look to. RepRap Article, for example, explains that "[l]owering the temperature of the idle extruder while it is not needed…helps to deal with leaking." EX1005, 1. This solution disclosed by RepRap Article would prevent oozing from occurring or decrease an extent of oozing that occurs, because the lowered temperature would result in a lower likelihood that residual material leaks out of the nozzle. As such, Leavitt does not teach away from considering solutions in other references because even though Leavitt's printer reduced the risk of defects, application of RepRap's purge tower teachings to Leavitt would have reduced the risks of defects even more. EX1003, ¶53.

EX1023, ¶14; Pet. Rep., 19.

RepRap Article (EX1005)

One of the most annoying problems with the dual extruder printing is the plastic leaking from the idle extruder. It is especially noticeable with PLA that flows easier than ABS. Lowering 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 helps to deal with leaking. It is tricky though since leaking has to be prevented during the teperature changes.

EX1005, 1; Pet. Rep., 19.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

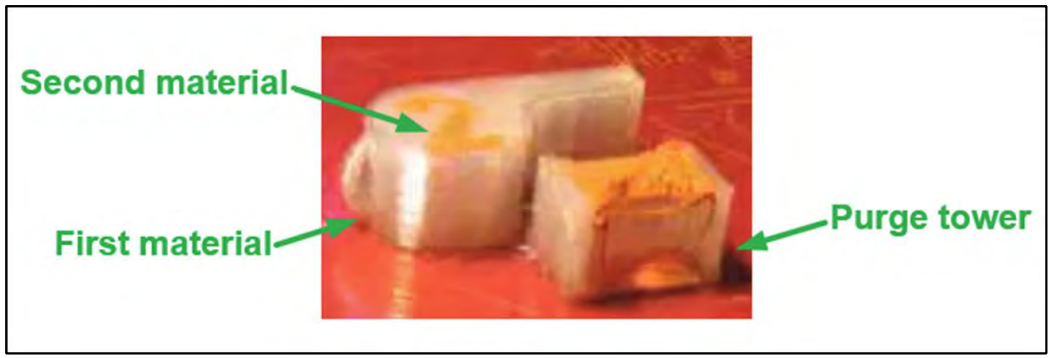
The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Hickner

54. As a ***second*** reason, RepRap's suggestion to print a purge tower on the build substrate next to the 3D part would have beneficially allowed Leavitt's extruder head to prime such material and prepare the deposition line for operating mode in a prompt and efficient manner, while limiting additional movement of the extruder head for the purpose of printing the purge tower. Because the suggested purge tower can be close to the 3D part on the build substrate, it is clear that Leavitt's extrusion head 18 would not need to travel as far to perform the purge operation as compared with a distance required for other purging methods involving, for example, a purge bucket located outside the periphery of the build substrate. This means that printing a purge tower can reduce an amount of time required to complete a multi-material build as compared with other purge methods that require the extrusion head to repeatedly travel outside of the periphery of the build substrate.

EX1003, ¶53; Pet.,13.

RepRap Video (EX1006)



EX1006, 5:04; Pet., 12

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Hickner

16. In RepRap, it is apparent that printing the "parking space" is not inherently what "slows down the print," but rather the *act of switching extruders* creates a need for a purge operation and causes the slowdown. EX1005, 1. This means that *any printer* that switches between two different extruders to deposit two different materials would exhibit the same slowness described in RepRap, due to the fact that switching between materials creates a need for a purge operation to prime the extruders and establish a consistent flow of material before printing again.

three-dimensional printing, and a POSITA would consider implementing features that improve an overall finished quality of the build even if those features create inconveniences in other areas. For example, a purge operation that involves cooling an idle extruder and priming an extruder when it heats back up again before printing the part (as disclosed in RepRap Article and RepRap Video) would be a perfectly reasonable solution to a POSITA even if this purge operation adds time to the build process. This is because preventing oozing and priming to establish consistent flow would result in a significantly improved build quality, which a POSITA would value highly. Even if these techniques add some time to the build process, a POSITA would consider implementing these steps because of the significant quality improvements that would result.

EX1023, ¶16; Pet. Rep., 20.

POR: "[A] POSITA would not have been motivated to combine Leavitt and RepRap for…'time savings'" because "RepRap Article…states that 'the time needed to adjust the temperatures [] slows down the print substantially when there are a lot of layers requiring extruder switching'."

POR, 55.

Dr. Osswald

Q. So it's the act of switching between materials that slows down the build process; is that correct?

A. Well, when there are a lot of layers required, yes; when there's a lot of switching required, that would add a lot of time.

Q. So if the printer were fabricating an object where there was a minimal amount of switching, there would be a minimal amount of slowing down due to the switching; is that correct?

A. Well, if that's what that sentence says. It says that it's -- it's probably -- it's good when you are only having minimal amount of switching.

EX1025, 49:5-16; Pet., Rep., 20.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Hickner First Declaration

55. As a ***third*** reason, a POSITA would have understood that implementing Leavitt's system with RepRap Article's suggestion to lower the temperature of an idle extruder would provide an improved approach for preventing the idle extruder from leaking oozed material onto the 3D part while positioned over the 3D part. For

EX1003, ¶55; Pet., 13-14.

Dr. Hickner Second Declaration

21:23-22:2. In other words, Dr. Osswald flatly rejected the idea that leaking and dripping from idle extruder would be a concern at all. Dr. Osswald acknowledged that the Priedeman reference discloses a scenario where material drains "uncontrollably from the liquefier into the build envelope," but insisted that this scenario disclosed by Priedeman is not "something that is gonna happen." EX2025, 25:9-26:3. But Dr. Osswald did not offer any explanation for why Stratasys' own patent describes oozing in this way (which he claims is not possible). Such an

EX1023, ¶17; Pet., Rep., 20.

Dr. Osswald

92. I disagree with Petitioner and Dr. Hickner that a POSITA would have been motivated to combine *Leavitt* and *RepRap* to address issues of "leaking" or "dripping" of "oozed material." A POSITA would have understood that polymers melts would not "leak" or "drip" from the extruder head onto the part because of their high viscosity and surface tension. A POSITA would recognize that inertial

EX2013, ¶92; POR, 56

Q. Paragraph 22 Priedeman states, quote, "In the case of a filament pump extruder that has no positive cut-off mechanism, the materials will drain uncontrollably from the liquefier into the build envelope, a condition referred to as 'ooze,'" end quote.

So isn't it true that this paragraph of Priedeman is defining ooze as material dripping from the nozzle onto the build plane?

A. I mean, he defines it there. I disagree with that. I don't think that's something that is gonna happen. It's impossible, actually, for the material. I mean, the way he defines it there -- what is he saying? Dripping uncontrollably, or something like that. I disagree with that. That doesn't happen. Or drain uncontrollably. No. That's -- I mean, it's basically almost like draining a container of water. No, that doesn't happen.

EX1025, 25:9-24; Pet., Rep., 20.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Hickner Second Declaration

patent describes oozing in this way (which he claims is not possible). Such an explanation does not appear to exist, because multiple references in the record and additional references from around the time of the '713 Patent reveal that not only was leaking from idle extruders a problem, but it was a ***common problem*** that many in the industry pursued solutions to address.

EX1023, ¶17 49:5-16; Pet., Rep., 20.

EX1007

[0022] The modeling material A and support material B must have a melt viscosity suitable for the modeling process. Ideally, materials used for fused deposition modeling have low melt viscosity. The melt viscosity must be low enough at the extrusion temperature so that it can be extruded as a generally continuous road or bead. Also, the melt viscosity at the extrusion temperature must be low enough so that deposited roads or beads of material have little melt strength, allowing them to lay flat rather than curl up. Melt viscosity is lowered by increasing the temperature at which the material is extruded. Too high an extrusion temperature, however, can cause heated material sitting idle in the extruder to decompose. If decomposed, in the case of a filament-pump extruder that has no positive cut-off mechanism, the materials will drain uncontrollably from the liquifier into the build envelope, a condition referred to as "ooze". Further, a lower extrusion temperature reduces energy consumption, reduces heat generation and reduces the opportunity to degrade polymeric material.

EX1007, [0022]; EX1023, ¶17; Pet., Rep., 20.

EX1034

Consider, for example, a 3D fused-deposition modeling (FDM) printer having two print heads, each print head having different-colored filament material. As is often the case, the two print heads are mechanically attached together, with one of the print heads being active and the other inactive. Unheated filament is provided to a print head and through a heated nozzle, where the filament is then melted and applied to build a 3D object. When an active print head is made inactive, the filament in the heated nozzle continues to flow, drip, hang, or otherwise accumulate at the print head even though the unheated filament is no longer being provided to the print head.

EX1034, 2:43-54; EX1023, ¶17; Pet., Rep., 20.

EX1033

At step **1130**, the second extruder nozzle head is pre-heated to a selected temperature prior to use in order to pre-heat the material of the second color. Thus, at a selected time prior to use of extruder nozzle head **439**-E, computer **180** causes extruder nozzle head **439**-E to be pre-heated to a selected temperature (less than the temperature that melts the material, to avoid dripping).

EX1033, 8:33-39; EX1023, ¶17; Pet., Rep., 20.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Osswald

their high viscosity and surface tension. A POSITA would recognize that inertial effects contributing to flow are negligible in polymer melt behavior. In my textbook *Understanding Polymer Processing*[1], which is used in a required undergraduate plastics processing course, I emphasize that inertial effects can be disregarded in nearly all polymer processing operations. The '713 Patent itself acknowledges that

EX2013, ¶92; POR, 56.

Dr. Hickner

19. The only evidence that Dr. Osswald cites in support of his opinions regarding leaking and dripping from 3D printer nozzles includes his own textbook, *Understanding Polymer Processing*. *See* EX2018. In his declaration, Dr. Osswald referred to several pages of this text as allegedly supporting that "inertial effects contributing to flow are negligible." EX2013, ¶92 (citing EX2018 at 192, 193, 199, 226, and 260). Dr. Osswald's text describes inertia, viscosity, and their relation to each other but no part of this text explains that it is impossible for material to leak or drip from an idle extruder on a 3D printer. The text never mentions the terms "three-dimensional printer," "3D printer," or "deposition line." Beyond providing cursory cites to pages of the text, Dr. Osswald offered no explanation for why his text supports his position that dripping and leaking from a 3D printer nozzle is impossible. Nor could he, because as described above it is clear that leakage and dripping are common problems that were described by multiple different players in the 3D printing industry around the time of the '713 Patent.

EX1023, ¶19; Pet., Rep., 20.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Renders Obvious The Challenged Independent Claims

Dr. Osswald

94. I disagree with Petitioner and Dr. Hickner that "provid[ing] an efficient way to concentrate waste material for rapid disposal," would have motivated a POSITA to combine *Leavitt* and *RepRap*. First, I note that *Leavitt* describes no such issues with disposing waste material. *See generally* EX1004. Second, Petitioner and Dr. Hickner ignore that the conventional methods of conducting purge operations, such as using a purge bucket, already "provid[ed] an efficient way to concentrate waste material for rapid disposal." Pet. at 14; *see* EX1001 at 4:42-45, 4:62–5:3 (describing use of purge buckets in the art). As such, a POSITA would not have been motivated to combine *Leavitt* with *RepRap*, as the combination would not result in a more "efficient way to concreate waste material for rapid disposal" than already conventional in the art.

EX2013, ¶94; POR, 57.

Dr. Hickner

20. A POSITA would have applied RepRap's purge operation to Leavitt to properly ready nozzles for printing by "establish[ing] the consistent flow of plastic." EX1005, 1; Pet., 14; EX1003, ¶56. It does not matter that other purging options such as purge buckets existed (POR, 56-57) at the Critical Date of the '713 Patent. This would not have dissuaded a POSITA from implementing Leavitt's printer with RepRap's suggested purge operation. Just because other possible solutions exist does not mean that it would not have been obvious to pursue a given solution.

EX1023, ¶20; Pet., Rep., 20.

65

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Leavitt-RepRap Renders Obvious Element [1c]

(Ground 1)

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

'713 Patent

The invention claimed is:

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.

EX1001, 15:43-58; Pet., Rep., 27.

Leavitt (EX1004)

in 3D object **20**. While extrusion head **18** is disposed in the build state, residual amounts of support material may potentially ooze from support liquefier pump **32**. However, positioning support tip **68** higher than build tip **54** by raised offset distance **74** reduces the risk that the residual support material comes into contact with the layer of 3D object **20** being formed.

EX1004, [0032]; Pet., 26.

RepRap Article (EX1005)

One of the most annoying problems with the dual extruder printing is the plastic leaking from the idle extruder. It is especially noticeable with PLA that flows easier than ABS. Lowering 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 helps to deal with leaking. It is tricky though since leaking has to be prevented during the teperature changes.

EX1005, 1; Pet., 26.

Dr. Hickner

77. As I described above in §VII.A of my declaration, Leavitt explains that transitioning the ***deposition lines*** between actively extruding material and sitting idle presents an issue where excess material can leak from the idle ***deposition line*** and mix with material recently printed by the active ***deposition line***. EX1004, [0032], [0035]. For example, Leavitt discloses that support liquefier pump 32 in the ***stand-by mode*** can "ooze" residual support material so that support material drips onto a recently printed layer of 3D object 20. EX1004, [0032]. It is clear that the same issue can arise when build liquefier pump 30 occupies the ***stand-by mode***, with residual build material potentially becoming "embedded" in support structure 22. EX1004, [0035]. Leavitt fully acknowledges this problem and explains that positioning the idle pump above the active pump "reduces the risk" of leakage. EX1004, [0032], [0035].

EX1003, ¶77; Pet., 24.

79. RepRap explains that the temperature of an idle extruder can be lowered to prevent leaking. EX1005, 1. According to RepRap Article, this leaking issue is "[o]ne of the most annoying problems with [] dual extruder printing." EX1005, 1. Leavitt likewise acknowledges that such leaking is an issue, as residual material oozing from an idle nozzle can drip onto a recently printed layer of the part or support structure. EX1004, [0032], [0035]. This means that by moving the extruder head over the purge tower (away from the 3D part) and lowering the temperature within an idle extruder, RepRap Article addresses a problem that Leavitt expressly acknowledges and decreases a probability of dripping from idle extruders. EX1004, [0032], EX1005, 1.

EX1003, ¶79; Pet., 26.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

POR: "Contrary to Petitioner's assertions, RepRap discloses a parking space used to address temperature changes rather than a layer-by-layer purge tower."

POR, 59; EX2013, ¶21.

Dr. Hickner

16-28, EX1003, ¶¶60-84. Stratasys argued on numerous occasions in the POR that Ground 1 should fail because RepRap Article and RepRap Video fail to disclose a limitation of Element [1c], without considering Leavitt at all. POR, 59 ("There is no

parking space, to teach the claimed purge tower."). In so doing, Stratasys completely ignores the fact that the *combination* of Leavitt, RepRap Article, and RepRap Video provides all the elements of claim 1, and Petitioner does not rely only on the purge tower as depicted and described in RepRap.

EX1023, ¶21; Pet. Rep., 21.

Leavitt (EX1004)

[0022] Extrusion head **18** is a dual-tip extrusion head supported by gantry **16** for building 3D object **20** and support structure **22** on substrate **14** in a layer-by-layer manner. As

EX1004, [0022]; Pet. Rep., 21.

RepRap Article (EX1005)

The technique being used with the current generation of the RepRap X2 printers (S/N: 020*) is to print a "parking space" besides the actual object. That "parking space" serves two purposes, one is to plug the nozzles while the temperature changes and the other is to "prime" the extruders (i.e. establish the consistent flow of plastic) before printing the actual object after the temperature change.

EX1005, 1; Pet. Rep., 21.

EX1005, 1; Pet., 26.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Osswald

97. It is my opinion that *RepRap* discloses a parking space used to address temperature changes, rather than a layer-by-layer purge tower as asserted by Petitioner. I first note that there is no disclosure or teaching in the *RepRap Article* that the parking space is printed in a layer-by-layer manner, in which the layers are printed from the print head or deposition line switched to the operating mode. The

EX2013, ¶97; POR, 59.

Dr. Hickner

switched to the operating mode." EX2013, ¶97. POR, 59. I strongly disagree with Dr. Osswald's opinion here. RepRap Article describes a "dual extruder printing"

0 sits idle while extruder 1 is actively printing, and vice versa. RepRap Article explains that the temperature of an idle extruder is lowered while it is not needed and restored "when it is time to start printing with that extruder again," an action that "helps deal with leaking." *Id*. To manage the effects of changing temperatures, the printer described by RepRap Article prints a "parking space" to prime an extruder "after the temperature change" and "before printing the actual object." This means that the printer of RepRap does print the parking space in a layer-by-layer manner where the layers are printed from the extruder that is switched to the operating mode.

EX1023, ¶23; Pet. Rep., 21.

RepRap Article (EX1005)

The technique being used with the current generation of the RepRap X2 printers (S/N: 020*) is to print a "parking space" besides the actual object. That "parking space" serves two purposes, one is to plug the nozzles while the temperature changes and the other is to "prime" the extruders (i.e. establish the consistent flow of plastic) before printing the actual object after the temperature change.

The video demostrates the RepRap X2 S/N 0203 (find it on eBay) printing a dual color whistle (pictured above) using the described technique during the tune-up procedure. The STL files used for the print with the parking space object are here:
1. The whistle body ("BASE", for printing with the extruder 0): Whistle X2 body
2. The text ("INSERT", for printing with the extruder 1): Whistle X2 text

EX1005, 1; Pet. Rep., 22.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Hickner

24. In addition to the clear disclosure provided by RepRap Article that the parking space is printed "layer-by-layer," it is apparent that the parking space would need to be printed in a layer-by-layer manner because of how three-dimensional printing works in practice. Three-dimensional printing is accomplished by depositing build material. To build a three-dimensional part, multiple layers of build material need to be deposited on one another in many cases to ensure that the object has an appropriate height. As the object grows in height, it follows that the height of the purge tower grows as well. This makes it so that a nozzle does not have to adjust its position on the z-axis to perform a purge operation and then proceed to print the three-dimensional part or support structure. My opinion here is supported by the fact that RepRap's parking space is depicted as having a height that is similar to the height of the three-dimensional part being printed. This ensures that at any point when an extruder comes online to print the three-dimensional part, the extruder can first perform a purge operation without adjusting its z-axis position.

EX1023, ¶22; Pet. Rep., 21.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Leavitt (EX1004)

[0023] During a build operation, extrusion head **18** is initially positioned in the build state, which allows extrusion head **18** to deposit the build material in a sequence of roads to form a layer of 3D object **20**. After the layer of 3D object **20**



form a layer of 3D object **20**. After the layer of 3D object **20** is complete, extrusion head **18** then toggles to the support state, which allows extrusion head **18** to deposit the support material in a sequence of roads to form a layer of support structure **22**. The layer of support structure **22** may then be



3D object **20**. This process may be repeated until each layer of 3D object **20** and support structure **22** are complete. In an

EX1004, [0023], Pet. Rep., 21.

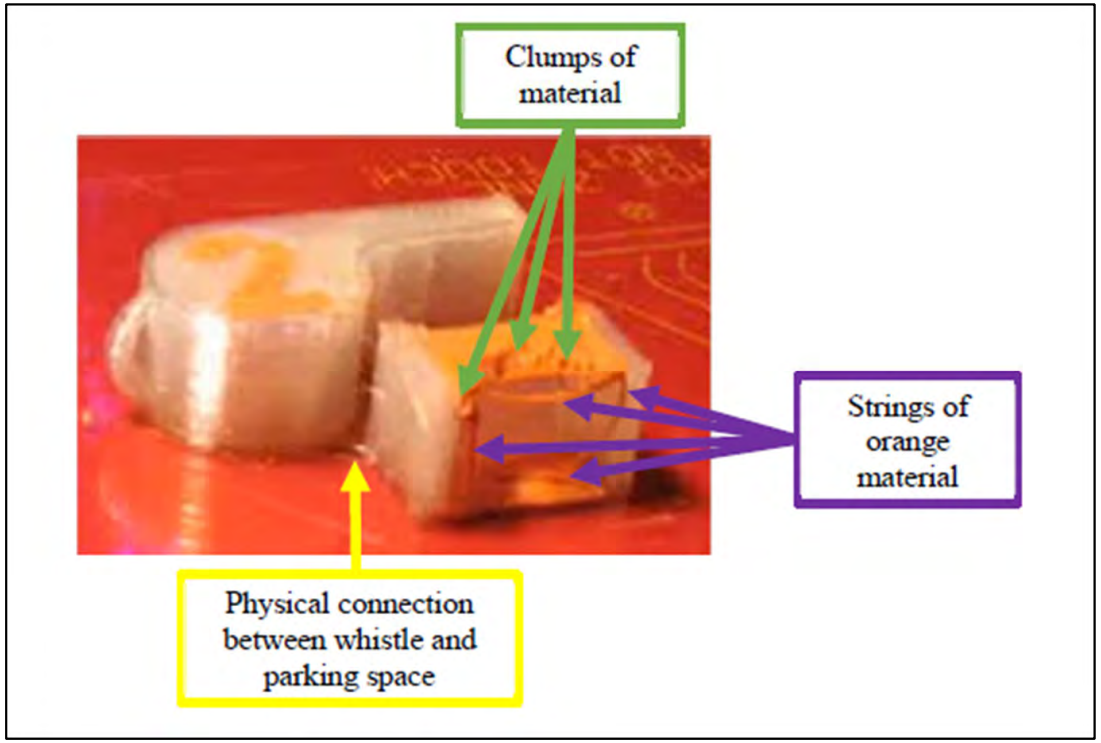
FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

71

The Leavitt-RepRap Combination Provides Element [1c]

Patent Owner Response:



POR, 62.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

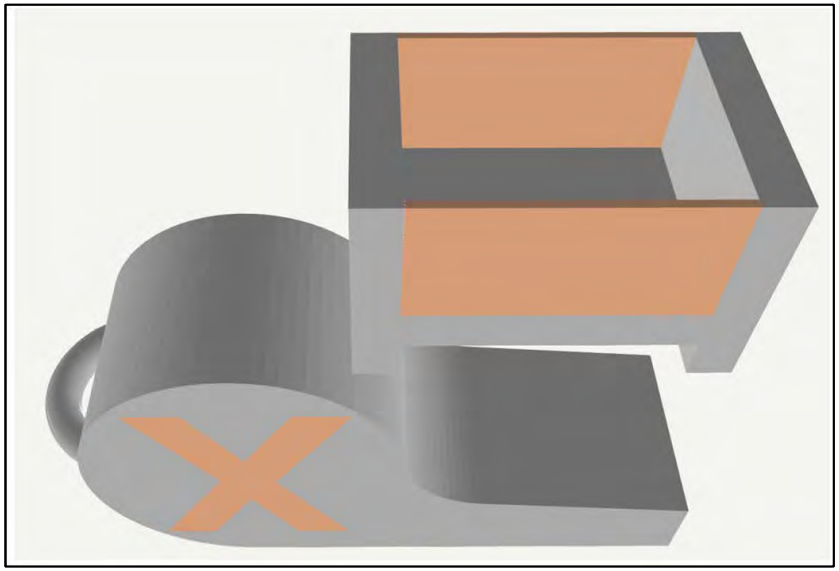
Dr. Hickner

For instance, Dr. Osswald noted that in the parking space depicted in RepRap Video, "clumps of material" exist on the top layer of the parking space and "strings of orange material" are located near areas of white material. *Id.* Neither of these features prevent the Leavitt-RepRap combination from providing "at least one purge tower in a layer-by-layer manner…printed from the print head or deposition line switched to the operating mode" as recited by Element [1c], because clumps, strings, and other imperfections in a final printed purge tower are not inconsistent with printing the purge tower in a "layer-by-layer" manner. Imperfections are common in 3D printing, especially on parts such as a purge tower that are meant to be sacrificed after the build is complete. RepRap Article plainly discloses techniques to "prime" an extruder "after a temperature change" to transition the extruder to the operating mode. When Leavitt's extrusion head 18 is implemented with RepRap's suggestion to purge, the extrusion head prints a purge tower in a layer-by-layer manner as described in claim 1, regardless of whether clumps and strings are present on the purge tower after the print is complete.

EX1023, ¶26; Pet. Rep., 21.

a layer-by-layer manner. POR, 62; EX2013, ¶101. These alleged "clumps" and "strings" of material are simply the result of a layer of orange material being printed over an area of the parking space that is not supported by other layers of material.

EX1023, ¶28; Pet. Rep., 22.



POR, 60.

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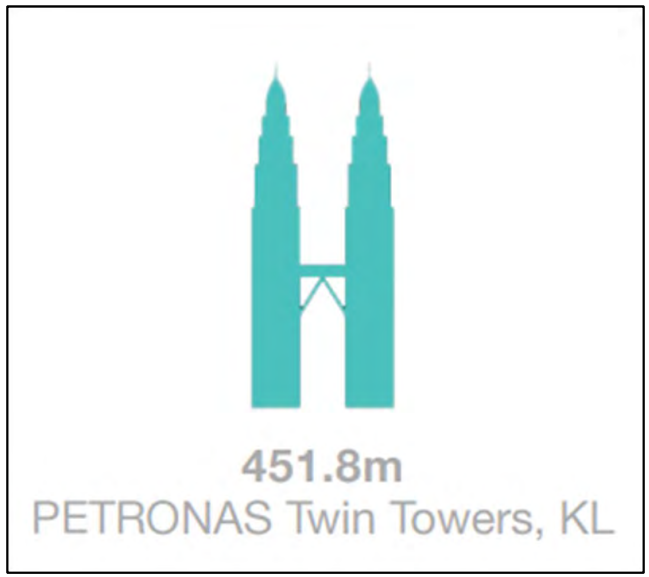
DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Hickner

30. Many arguments of Dr. Osswald and Stratasys depend on an assertion that a "physical connection between whistle and parking space" exists, and this connection disqualifies the parking space as a purge tower. Stratasys argued that the RepRap does not providing the claimed parking space because of the alleged contact between the parking space and the object. POR, 62-64; EX2013, ¶¶101-103. As an initial matter, there is no requirement in claim 1 that the purge tower and three-dimensional part have no physical contact with one another. *Supra*, §IV.B. It is possible for two objects to be distinct but have physical contact with one another. This occurs in numerous contexts that I can think of. For example, Kuala Lumpur's Petronas Towers have *two separate towers*, even though a skybridge exists between the towers 170 meters above the ground. EX1036, 1. The fact that the skybridge exists does not negate the fact that the towers are separate and distinct from one another. For two objects to be distinct does not require the objects to have no physical contact.

EX1023, ¶30; Pet. Rep., 23.



EX1036, 1; Pet. Rep., 23.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Hickner

with other objects on the build surface. Neither the word "purge" nor the word "tower" imputes a requirement that the purge tower cannot have physical contact with other structures described in the claims. It is undisputed that a support structure and a three-dimensional part can be in contact with one another on the build plane, the support structure being separated from the three-dimensional part after the build is complete. EX1025, 35:18-36:2. A purge tower is no different. Nothing in claim 1 excludes an embodiment where a purge tower has physical contact with a three-dimensional part and support structure, the purge tower to be separated from the other components after the build is complete.

EX1023, ¶31; Pet. Rep., 23.

Patent Owner elected to not cross-examine Dr. Hickner after his reply testimony.

Dr. Osswald

Q. And even though the support structure would be in contact with the three-dimensional part, a POSITA would be able to distinguish between the three-dimensional part and the support structure; is that correct?

A. Yeah. Yeah.

EX1025, 37:1-6; Pet. Rep., 34.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Hickner

32. I was also disappointed to read that Stratasys mischaracterized my testimony to support its implausible reading of a no physical contact limitation into claim 1. I did testify that "a purge tower is a separate physical object," but this testimony is consistent with my opinion—which I stand by—that physical objects can be separate while having some physical contact with one another. Also, for clarity, I explained in my deposition that RepRap's parking space *is an example of a purge tower*, which Stratasys completely neglected to mention in their briefings. EX2016, 64:3-65:3. I maintain my opinion that the RepRap's parking space provides the claimed purge tower, even if there is some physical contact between the purge tower and the object.

EX1023, ¶32; Pet. Rep., 23.

Q My question to you is, what is a purge tower?

A Figure 3A, 3B, Figure 8, and Figure 9 in patent '713 give examples of purge towers. And also the RepRap reference that I have in my declaration, that gives an example of a purge tower. Even though RepRap calls it a parking space, that's a purge tower as an example.

EX2016, 64:18-65:3; EX1023, ¶32; Pet. Rep., 23.

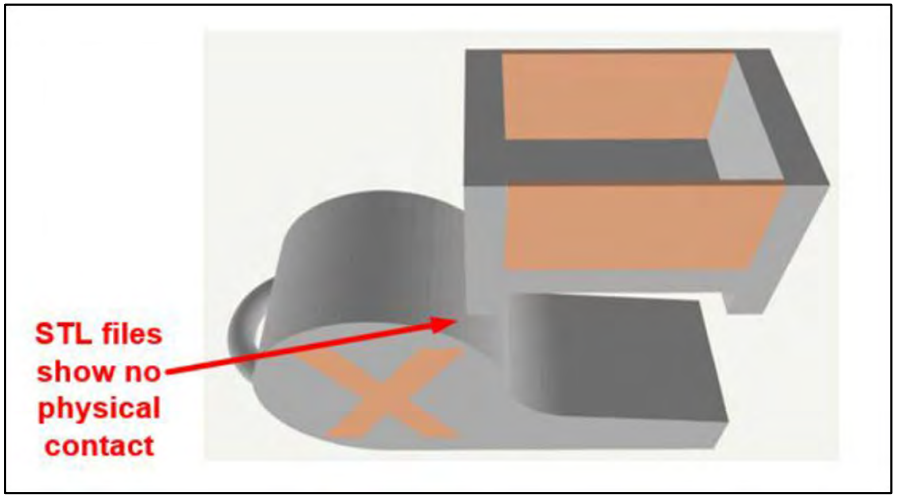
Patent Owner elected to not cross-examine Dr. Hickner after his reply testimony.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Hickner

33. Even if there were a requirement of physical contact involving the purge tower (which there is not), the merged RepRap STL files provided by Stratasys and Dr. Osswald indicate clearly that RepRap contemplated a separate purge tower that had no physical connection with the three-dimensional part. POR, 60; EX2013, ¶99. This lack of a connection between the parking space and the object further supports my position that the purge tower and the object are distinct from one another. A POSITA would have been motivated to implement the extrusion head of Leavitt to print a purge tower that has no physical contact with the three-dimensional part and support structure, especially in view of the fact that the STL files depict two separate parts with no physical contact.



EX1023, ¶33; EX2013, ¶99; Pet. Rep., 25.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

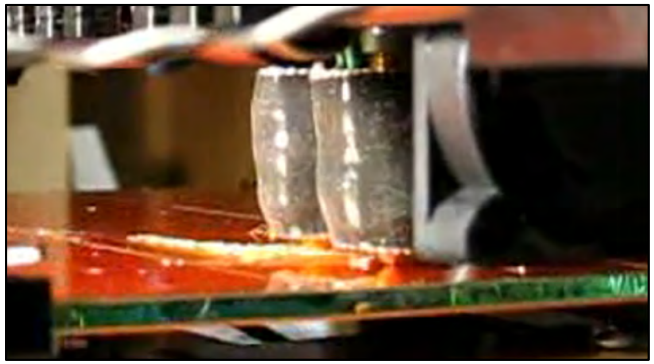
The Leavitt-RepRap Combination Provides Element [1c]

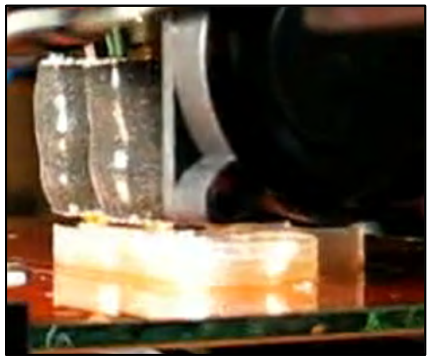
POR: "In fact, when the RepRap STL files represented by EX1014 and EX1015 are merged together, it becomes clear that multiple layers contain multiple materials and that RepRap does not print the parking space in the layer-by-layer manner required by the claims."

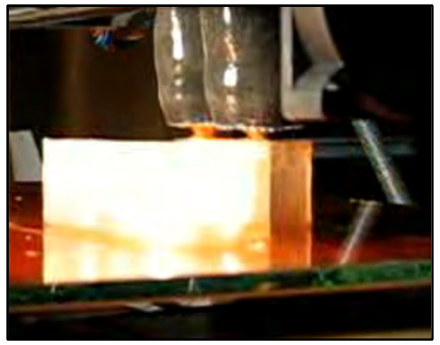
POR, 59.

Dr. Hickner

¶106. Again, Stratasys asserts that RepRap *alone* "does not print the parking space in the layer-by-layer manner required by the claims" while completely ignoring the *combination* of Leavitt with RepRap. *Id.* When the *combination* is properly considered, a POSITA would be motivated to implement the extrusion head of Leavitt with RepRap's teaching to print a purge tower in a layer-by-layer manner. It is evident that the purge tower is printed in a layer-by-layer manner because Leavitt discloses alternating between printing layers of part and support material and RepRap discloses that, *in the combination*, the printer prints a layer of the purge tower ("parking space") "before printing the actual object" for every switch of material. EX1004, [0022]-[0024]; EX1005, 1. Moreover, it is clear that the parking space of RepRap is printed "layer-by-layer" because RepRap Video depicts layer-by-layer deposition of build material. *See* EX1006. The video depicts the extruders moving across the part in multiple passes, indicating that material is deposited in layers as the part grows in height from the build surface. Id.







EX1023, ¶34; EX1006; Pet. Rep., 25.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Claim 1

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.

Leavitt (EX1004)

[0022] Extrusion head **18** is a dual-tip extrusion head supported by gantry **16** for building 3D object **20** and support structure **22** on substrate **14** in a layer-by-layer manner. As discussed below, extrusion head **18** 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. In a preferred embodiment, the build material and the support material are each provided to extrusion head **18** as a continuous filament. Examples of suitable filaments, and suitable assemblies for supplying filaments to system **10**, are disclosed in Swanson et al., U.S. Pat. No. 6,923,634 and Comb et al., U.S. Pat. No. 7,122,246. While the materials of are discussed herein as being build materials and support materials, suitable materials for use with extrusion head **18** include any type of extrudable material (e.g., thermoplastic materials).

[0023] During a build operation, extrusion head **18** is initially positioned in the build state, which allows extrusion head **18** to deposit the build material in a sequence of roads to form a layer of 3D object **20**. After the layer of 3D object **20** is complete, extrusion head **18** then toggles to the support state, which allows extrusion head **18** to deposit the support material in a sequence of roads to form a layer of support structure **22**. The layer of support structure **22** may then be

EX1004, [0022]-[0023]; Pet., 7, 16, 21; Pet. Rep., 25.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Element [1c]

Dr. Hickner

35. Furthermore, it is undisputed that RepRap's printer uses an STL file as a model for the three-dimensional part and the parking space. STL files include models that indicate the dimensions of one or more objects in three dimensions. The STL files in RepRap are used to generate instructions for printing the three-dimensional part and support structure. This involves "slicing" the STL file into layers and generating tool path instructions for each layer. EX1005, 1; EX1006, 1. RepRap Article refers to these tool path instructions as "G-Code." RepRap Article also explains that the G-code for each layer is "merged layer-by-layer," providing further confirmation that the printing of the parking space and the three-dimensional part are printed layer-by-layer. *Id.* Therefore, it is clear that the STL file of RepRap is sliced and merged into layers like is common in the 3D printer industry, resulting in too lath instructions that cause the printer to print the parking space and the three-dimensional part in a layer-by-layer manner.

EX1023, ¶35; Pet. Rep., 25.

Rep-Rap Article

The "x2Merge" application merges together the G-code generated for the body and the text STLs. It is merged layer-by-layer. The content from the chosen alteration files for extruder switching is inserted in the places where there is a need to change the extruder. The inserted G-code positions the nozzles above the "parking space" object and changes the active extruder while lowering the temperature of the idle and restoring it for the active hotend before letting the printing continue.

EX1005, 1; Pet. Rep., 25.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Claim 16

Claim 16

16. A method for printing a three-dimensional part with an additive manufacturing system, the method comprising: (a) printing a first layer of a support structure from a support material for the three-dimensional part; (b) printing a first layer of a purge tower from a part material; (c) printing a first layer of the three-dimensional part on at least a portion of the first layer of the support structure from the part material after printing the first layer of the purge tower; (d) printing a second layer of the purge tower from the support material; and (e) printing a second layer of the support structure on at least a portion of the first layer of the three-dimensional part from the support material after printing the second layer of the purge tower.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Claim 16

POR: "the combination also does not teach printing a first layer of a purge tower from part material after a first layer of a support structure is printed from a support material."

POR, 65

Leavitt (EX1004)

[0022] Extrusion head **18** is a dual-tip extrusion head supported by gantry **16** for building 3D object **20** and support structure **22** on substrate **14** in a layer-by-layer manner. As discussed below, extrusion head **18** 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. In a preferred embodiment, the build material and the support material are each provided to extrusion head **18** as a continuous filament. Examples of suitable filaments, and suitable assemblies for supplying filaments to system **10**, are disclosed in Swanson et al., U.S. Pat. No. 6,923,634 and Comb et al., U.S. Pat. No. 7,122,246. While the materials of are discussed herein as being build materials and support materials, suitable materials for use with extrusion head **18** include any type of extrudable material (e.g., thermoplastic materials).

[0023] During a build operation, extrusion head **18** is initially positioned in the build state, which allows extrusion head **18** to deposit the build material in a sequence of roads to form a layer of 3D object **20**. After the layer of 3D object **20** form a layer of 3D object **20**. After the layer of 3D object **20** is complete, extrusion head **18** then toggles to the support state, which allows extrusion head **18** to deposit the support material in a sequence of roads to form a layer of support structure **22**. The layer of support structure **22** may then be 3D object **20**. This process may be repeated until each layer of 3D object **20** and support structure **22** are complete. In an alternative arrangement, extrusion head **18** may initially be positioned in the support state for forming a layer of support structure **22**, and then toggle to the build state to form a layer of 3D object **20**.

EX1004, [0022]-[0023]; EX1023, ¶37; Pet., 7, 16, 21; Pet. Rep., 25.

Rep-Rap Article

The technique being used with the current generation of the RepRap X2 printers (S/N: 020*) is to print a "parking space" besides the actual object. That "parking space" serves two purposes, one is to plug the nozzles while the temperature changes and the other is to "prime" the extruders (i.e. establish the consistent flow of plastic) before printing the actual object after the temperature change.

EX1005, 1; Pet. Rep., 25.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

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The Leavitt-RepRap Combination Provides Claim 16

Dr. Hickner

RepRap Article describes a purge operation where an extruder is primed before printing an "actual object," meaning that the priming of the extruder would proceed in the order that the part and support structure are printed. EX1005, 1. When applied to Leavitt, this would result in a system that prints a part purge tower layer before every part layer disclosed by Leavitt and prints a support purge tower layer before every support layer disclosed by Leavitt to "prime" the extruder prior to "printing the actual object." *Id.*. The combination therefore provides "printing a first layer of a purge tower from a part material" and "printing a first layer of the three-dimensional part…*after* printing the first layer of the purge tower" as recited by claim 16.

EX1023, ¶38; Pet. Rep., 25.

39. In its analysis of claim 16, Stratasys continued to fixate on features of the purge tower depicted in RepRap Video without considering the Leavitt-RepRap combination. POR, 66-67; EX2013, ¶106. Stratasys pointed to various deformities in RepRap's purge tower—i.e., "[c]lumps of material," "[s]trings of orange material"—claiming falsely that these features obscure the order that purging occurs relative to printing. *Id.* This is plainly false. RepRap Article discloses unequivocally that the temperature of an extruder is lowered when "it is not needed" and restored "when it is time to start printing," and RepRap explains that the extruder is primed "after the temperature change" and "before printing the actual object." EX1005, 1. There is no question that RepRap's purge tower is printed by an extruder that transitions to the operating model *before that extruder prints the object*. The deformities that Stratasys references are typical defects that are common in three-dimensional printing. The fact that these defects are visible in RepRap video does not negate the fact that RepRap discloses the purge tower limitations of claim 1.

EX1023, ¶¶38-39; Pet. Rep., 25.

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FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Claim 5

POR: "Petitioner contends that RepRap's parking space []has cross-sectional areas that differ between a first cross-sectional position…Petitioner ignores that the cross-sectional area of RepRap's parking space increases again

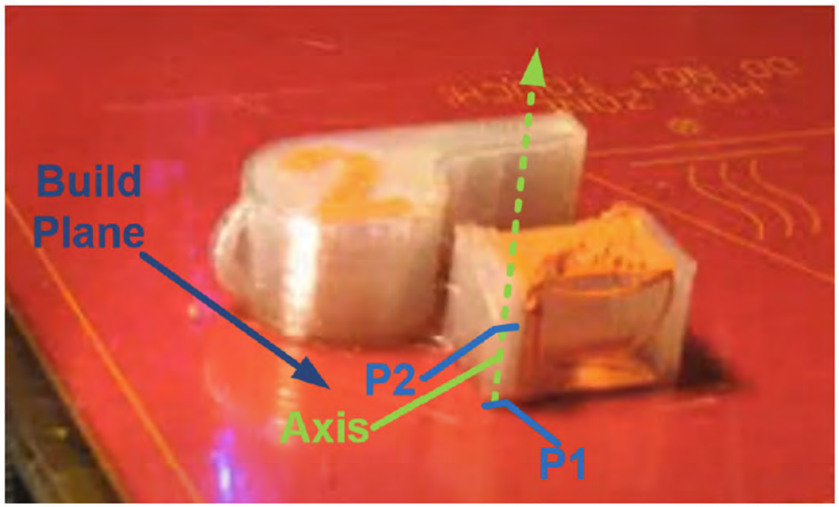
POR, 65; EX2013, ¶112

Dr. Hickner

I disagree with Dr. Osswald, and submit that a purge tower meets the limitation of claim 5 *if at any point along the axis* the cross-sectional area of the purge tower reduces. The purge tower would meet this limitation *even if the cross-sectional area increases at another point along the axis*. It is simply irrelevant that RepRap's parking space later increases in cross-sectional area after earlier decreasing in cross-sectional area. Claim 5 does not require that the cross-sectional area reduce at every point along the axis, and I disagree with Dr. Osswald's opinion that claim 5 has such a limitation.

EX1023, ¶40; Pet. Rep., 25.

95. RepRap teaches that the ***purge tower*** can be printed next to a three-dimensional part such that a ***cross-sectional area*** of the ***purge tower*** reduces in height along an ***axis*** that is ***perpendicular*** to a ***build plane*** . EX1005, 1; EX1006, 5:01-5:05. As depicted below, it is apparent from RepRap Video that the ***purge tower*** has cross-sectional areas that differ between a first cross-sectional position (P1) at a base of the purge tower and a second cross-sectional position (P2) above P1 relative to the build plane:



EX1003, ¶95; Pet., 31-32.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Leavitt-RepRap Combination Provides Claim 17

POR: "RepRap teaches away from this repeated alternation between printing part and support material because its method 'slows down the print substantially when there are a lot of layers requiring extruder switching.'"

POR, 73; EX2013, ¶¶113-114

Dr. Hickner

42. Leavitt is clear that the printer "toggle[s] between a 'build state' and a 'support state'" to repetitively print "subsequent layers of deposited build and/or support materials" and that "[t]his process may be repeated until each layer of 3D object 20 and support structure 22 are complete." EX1004, [0022]-[0024]. In the combination, the printer "print[s]" a layer of parking space after each change of material to "'prime' the extruders…before printing" a layer with the new material, per RepRap's teaching. EX1005, 1. The proposed combination therefore provides repeating steps (b)-(e) of claim 16. Pet., 41-42; EX1003, ¶138-141.

EX1023, ¶40; Pet. Rep., 25.

Leavitt (EX1004)

[0022] Extrusion head **18** is a dual-tip extrusion head supported by gantry **16** for building 3D object **20** and support structure **22** on substrate **14** in a layer-by-layer manner. As discussed below, extrusion head **18** is configured to toggle between a "build state" and a "support state", where extrusion

[0023] During a build operation, extrusion head **18** is initially positioned in the build state, which allows extrusion head **18** to deposit the build material in a sequence of roads to form a layer of 3D object **20**. After the layer of 3D object **20** is complete, extrusion head **18** then toggles to the support state, which allows extrusion head **18** to deposit the support material in a sequence of roads to form a layer of support structure **22**. The layer of support structure **22** may then be

3D object **20**. This process may be repeated until each layer of 3D object **20** and support structure **22** are complete. In an

EX1004, [0022]-[0023]; Pet. Rep., 26

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination (Ground 2A)

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination

Priedeman (EX1007)

[0016] The present invention is described with reference to a deposition modeling system of the type shown in **FIG. 1**. **FIG. 1** shows an extrusion apparatus **10** building a model **26** supported by a support structure **28** according to the

[0018] A modeling material A is dispensed to form the model **26**, and a support material B is dispensed in coordination with the dispensing of modeling material A to form the support structure **28**. For convenience, the extrusion apparatus **10** is shown with only one material supply **18**. It should be understood, however, that in the practice of the present invention, the modeling material A and the support material B are provided to the extrusion apparatus **10** as separate feedstocks of material from separate material supplies. The extrusion apparatus **10** may then accommodate the dispensing of two different materials by: (1) providing two extrusion heads **12**, one supplied with modeling material A and one supplied with support material B (such as is disclosed in the Batchelder '561 patent); (2) providing a single extrusion head supplied with both the modeling material A and the support material B, with a single nozzle for dispensing both materials (such as is shown in FIG. 6 of the Crump '329 patent); or (3) providing a single extrusion head supplied with both materials, with each material dispensed through a separate nozzle (such as shown in FIG. 6 of the Crump '785 patent).

extruder to decompose. If decomposed, in the case of a filament-pump extruder that has no positive cut-off mechanism, the materials will drain uncontrollably from the liquifier into the build envelope, a condition referred to as "ooze". Further, a lower extrusion temperature reduces

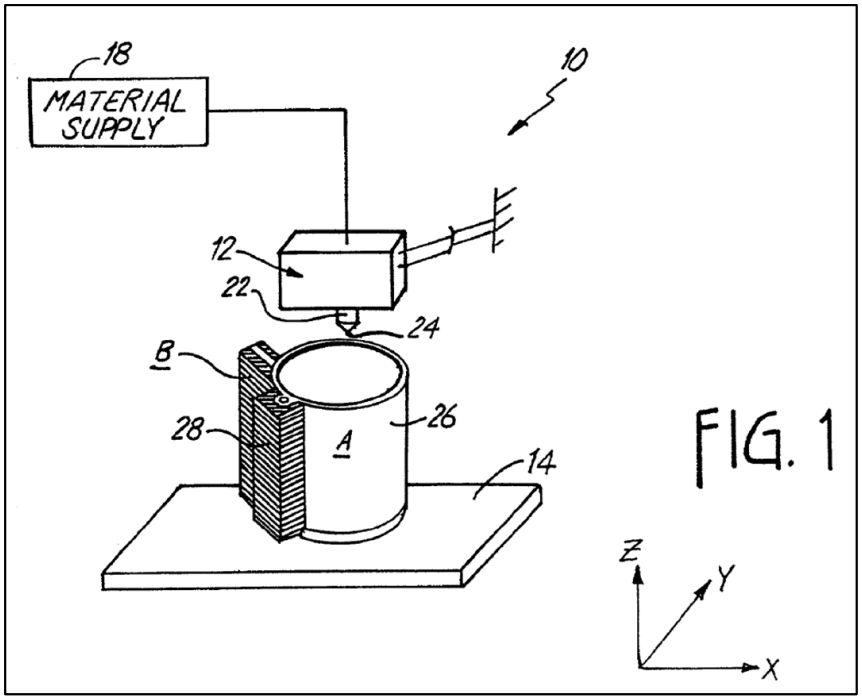


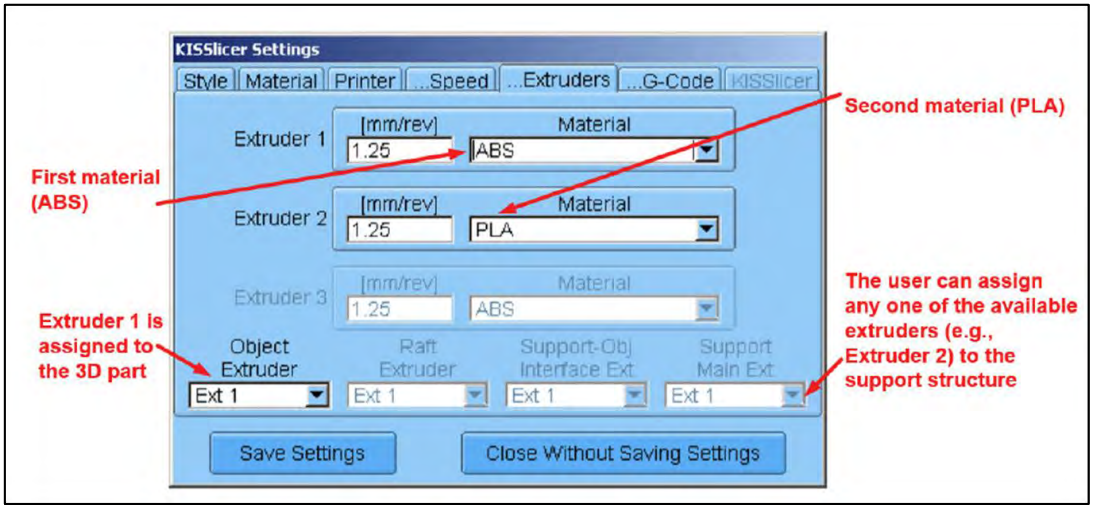
FIG. 1

EX1007, [0016], [0018], [0022], FIG. 1; Pet., 43.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination

KISSlicer (EX1010)



Menu Settings->Material:

Fan: will switch on/off the fan during the print, or only when printing the external layers (loops)
Color: sets the color of the material for print review
Extruder RPM, Min/Max: sets a range of print speed. When using the speed slider the program will use the two values as axtremes
Destring, Suck/Prime: sets the mm of filament to be sucked and pushed forward (prime) if destring option is on.
Min Layer Time [s]: if a layer prints in less than this min value the printer will waste some time to reach this minimum value. Useful for reducing overheating in slender/thin parts
Wipe [mm]: after a warm up the printer will push (prime) this amount of filament to ensure the printer is ready.

Wipe pillar

The wipe pillar is a cylinder printed before every layer to clean the extruder tip. It reduces hairing and it is extremely important in dual head prints. Can be switched off, or the position with respect to the main part can be chosen.

FISH.

EX1010, 3, 9, 10; Pet., 43-44. 88

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

POR: KISSlicer "discloses a 'wipe pillar,' which a POSITA would understand from KISSlicer's teachings is used to 'clean the extruder tip' to 'reduce[] hairing,' which is unrelated to a purge operation"

POR, 75-76; EX2013, ¶118.

KISSlicer (EX1010)

Wipe pillar

The wipe pillar is a cylinder printed before every layer to clean the extruder tip. It reduces hairing and it is extremely important in dual head prints. Can be switched off, or the position with respect to the main part can be chosen.

Wipe [mm]: after a warm up the printer will push (prime) this amount of filament to ensure the printer is ready.
Fiber Dia [mm]: Sets the diameter of the filament. Use a caliper to measure it.
Flow tweak: can adjust the amount of material being pushed, to tailor the print. This is material and supplier dependent.
Temperature: sets the temperature of the material for the main part
Keep Warm: when printing with multiple materials sets the idle temperature

EX1010, 9, 10; Pet., 43-44; Pet. Rep., 26-27.

68

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

PO's Sur-Reply : "Petitioner's entire argument boils down to the fact that both settings use the term "wipe" so they must be related to the same thing. That conclusion is untethered from any disclosure of KISSlicer."

PO's Sur-Reply, 21

KISSlicer (EX1010)

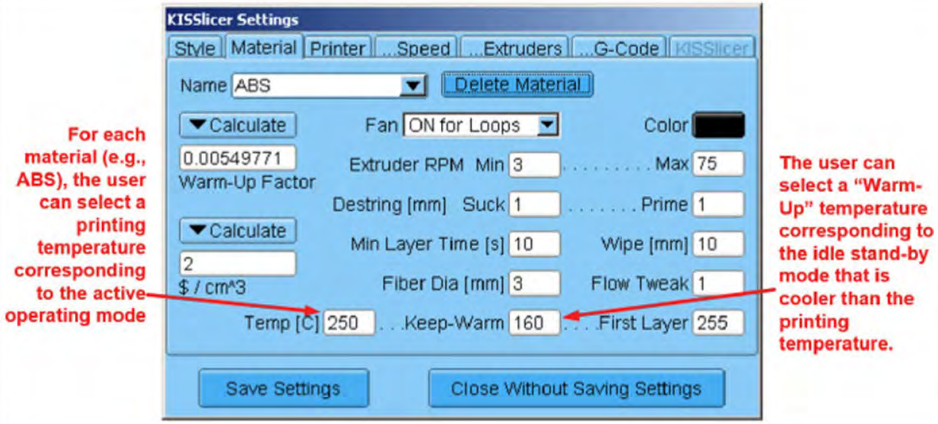
Wipe pillar

The wipe pillar is a cylinder printed before every layer to clean the extruder tip. It reduces hairing and it is extremely important in dual head prints. Can be switched off, or the position with respect to the main part can be chosen.

Wipe [mm]: after a warm up the printer will push (prime) this amount of filament to ensure the printer is ready.

EX1010, 9, 10; Pet., 50.

Dr. Hickner



EX1003, ¶160; Pet., 50.

161. KISSlicer explains ***switching*** multiple extruders between the ***operating mode*** and the ***stand-by mode*** in detail. For example, KISSlicer explains that each of the extruders transitions out of the ***stand-by mode*** and into the ***operating mode*** to prepare the extruder for printing one or more layers of the ***three-dimensional part*** or ***support structure***. EX1010, 10 ("***after a warm up*** the printer will…prime…to ensure the printer is ready"). According to KISSlicer, this priming occurs "before every layer to clean the extruder tip." EX1010, 9. Because priming follows an increase in temperature representing a ***switch*** from the ***stand-by mode*** to the ***operating mode***, such a ***switch*** occurs before each layer printed by either one of "Extruder 1" or "Extruder 2."

EX1003, ¶161; Pet., 50.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

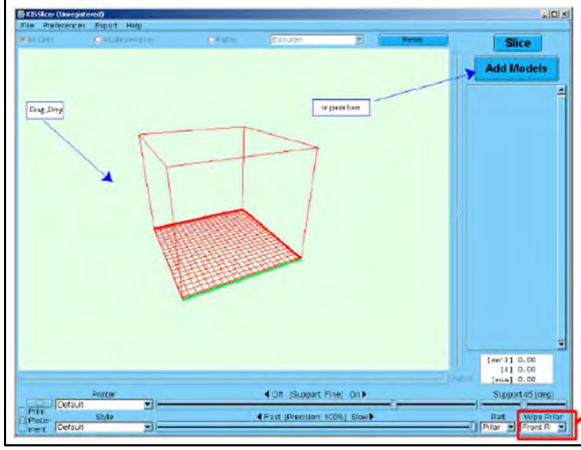
The Priedeman-KISSlicer Combination Provides Claims 1 and 16

POR AND DR. OSSWALD : "KISSlicer does not describe its wipe setting as being related to its wipe pillar."

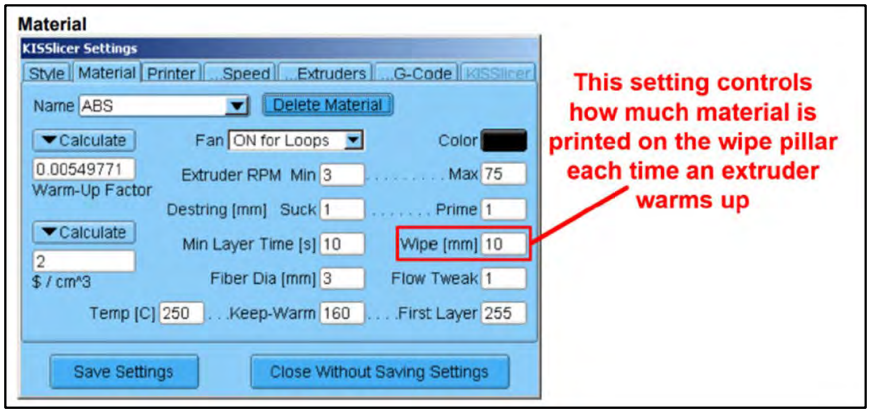
POR, 78; EX2013, ¶120

Dr. Hickner

merit. The KISSlicer disclosure reveals that there are at least two settings on the interface of KISSlicer relating to the wipe pillar. One setting is a "Wipe Pillar" setting that specifies where on the build plane the "Wipe pillar" will be printed.



50. The "Wipe [mm]" setting states exactly how much material the extruder will "prime" in printing the wipe pillar *after the extruder warms up*, which indicates that this setting controls how much material is purged before printing the object.



EX1023, ¶¶49-50; Pet. Rep., 29.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

POR & DR. OSSWALD: The '713 Patent "teaches that 'tip-wipe operation[s]' are distinct and optional processes that could be performed after purging."

POR, 76; EX2013, ¶118.

'713 Patent

Optionally, as shown, stop vertex **64** may alternatively function as another corner vertex, and tool path **58** may be directed across the top of layer **24***a*, such as illustrated by tool path segment **58***f* to a subsequent stop vertex **66** located outside of purge tower **24**. However, when following tool path segment **58***f*, controller **46** preferably directs the print head **18** not to extrude any material. Instead, the movement of the print head along tool path segment **58***f* (or any other similar tool path segment) allows nozzle **18***e* of the print head **18** to wipe along perimeter wall **52** at tool path segment **58***c*. As such, purge tower **24** may also function as a tip wipe device, which further precludes the need for a separate purge station.

EX1001, 9:47-59, 10; Pet. Rep., 26.

Dr. Hickner

and submit that the '713 Patent teaches just the opposite. For example, the '713 Patent teaches that "purge tower 24 *may also function as a tip wipe device*, which further *precludes the need for a separate purge station*." EX1001, 9:57-59. This means that contrary to Dr. Osswald's testimony, the '713 Patent clearly discloses that a purge tower can serve two concurrent purposes—purging and tip wiping—such that these purposes are *indistinct*. Kisslicer provides highly similar disclosure

EX1023, ¶43; Pet. Rep., 26.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

POR & DR. OSSWALD: "[A] POSITA would understand that in Petitioner's proposed combination the wipe pillar is printed after—not before—that print head prints the part or support structure

Dr. Hickner

POR, 76; EX2013, ¶119

44. Dr. Osswald insists that Kisslicer's print heads print the wipe pillar *after* printing the part or support structure, but KISSLicer's disclosure is clear that the opposite is true. POR, 76; EX2013, ¶119. KISSlicer discloses that "[t]he wipe pillar is a cylinder printed *before* every layer to clean the extruder tip"— and not after the layer us printed. EX1010, 9. What's more, KISSlicer explains that the "wipe" feature is performed to prime an extruder "to ensure the printer is ready"—indicating that priming occurs *before* printing. EX1010, 10. It appears that Stratasys and Dr. Osswald want the Board to believe that KISSlicer's wipe pillar disclosure is meaningless, which it is not. KISSlicer unambiguously explains that the wipe pillar is printed *before* printing the part or support structure, and not *after* printing the part or support structure

45. Much of Dr. Osswald's opinion here rests on the KISSlicer's use of the term "hairing." Dr. Osswald claims that a tip wipe operation to reduce "hairing" can only done after the extruder has finished printing and cannot be done before the extruder starts printing. POR, 76; EX2013, ¶119. I disagree. Hairing can just as easily be reduced by performing a purge operation prior to the first use of a print head to remove hairing from a previous print or eliminate hairing prior to subsequent uses of the print head to remove hairing from a prior use. Because Kisslicer discloses a "Wipe [mm]" setting for controlling the wipe pillar and discloses that "*after* a warm up the printer will push (prime) this amount of filament *to ensure the printer is ready*," this provides further confirmation that the wipe pillar is printed as part of a warm up sequence to ensure that the printer is ready. EX1010, 10. The wipe pillar disclosed by KISSlicer is clearly printed after every layer. In other words, priming or preparing the nozzle for printing the part involves printing the wipe pillar.

EX1023, ¶¶44-45; Pet. Rep., 27.

KISSlicer (EX1010)

The wipe pillar is a cylinder printed before every layer to clean the extruder tip. It reduces hairing and it is extremely important in dual head prints. Can be switched off, or the position with respect to the main part can be chosen.

EX1010, 9, 10; Pet., 27.

Wipe [mm]: after a warm up the printer will push (prime) this amount of filament to ensure the printer is ready.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

Dr. Osswald

A POSITA would understand that one way to deal with the problem of hairs on the extruder tip is by taking the extruder that has just ***finished printing*** the part/support structure and printing a "wipe pillar" to capture these hairs off the end of the extruder. While *KISSlicer* states that the "wipe pillar" is printed "before every layer to clean the extruder tip," a POSITA would understand that this refers to the case of a single extruder and that, in that circumstance, printing the wipe pillar "before every layer" is the same as printing the wipe pillar at the conclusion of every layer. In the context of "dual head prints," a POSITA would understand that the extruder that just completed its print operation would print its wipe pillar before the other extruder begins printing on the same layer. Doing so removes the hairs on the tip of the

EX2013, ¶119; POR, 77.

Dr. Hickner

the dual head print embodiment. Stratasys and Dr. Osswald point to no disclosure in KISSlicer explaining that the wipe printer is printed after the part or support structure *only in single head prints*. Nor could they, because KISSlicer never even mentions the wipe pillar in the context of single head prints at all.

EX1023, ¶46; Pet. Rep., 27.

KISSlicer (EX1010)

The wipe pillar is a cylinder printed before every layer to clean the extruder tip. It reduces hairing and it is extremely important in dual head prints. Can be switched off, or the position with respect to the main part can be chosen.

EX1010, 9, 10; Pet. Rep., 27.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

Dr. Hickner

47. Moreover, wiping and purging are commonly performed *before* printing a layer of the three-dimensional part, and *not after* printing a layer of the three-dimensional part. The '713 Patent itself explains that a print head "preferably undergoes a purge operation prior to printing the next layer," the purge operation optionally being followed by a "tip wipe operation." EX1001, 4:39-45. Thus, the '713 Patent acknowledges that purge operations and tip wipe operations commonly occur *before* printing a layer, and *not after*. There is no support for Dr. Osswald's insistence that tip wiping must occur after printing and cannot occur before, because there is none. Purging and wiping can and often do occur before printing.

EX1023, ¶47; Pet. Rep., 27.

'713 Patent

When each print head is brought to its operating mode, it preferably undergoes a purge operation prior to printing the next layer. As discussed in Turley et al., U.S. Pat. No. 7,744,364, a purge operation conventionally involves moving the given print head to a purge station, where it extrudes a strand of the part or support material into a purge bucket, optionally followed by a tip wipe operation.

EX1001, 4:39-45; Pet. Rep., 27.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

EX1009

Polygonhell **Re: KickStarter Campaign For Dual Extruder** June 14, 2012 07:10PM	Registered: 12 years ago Posts: 939
KisSlicer has a setting for it, and though I've never seen it run, what it appears to do is draw a cylinder next to the model retract and wipe the nozzle on the cylinder on color/material changes. I agree though, unless you have a very high pressure nozzle, it's still going to leak on things, plus your dragging a second hotend over the part while printing.	

EX1009, 2; EX1003, ¶83; Pet. 28.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

POR : "KISSlicer teaches that an entire structure ("a cylinder") is printed before every layer, which suggests that many cylinders are printed as layers are printed, not a structure printed in a layer-by-layer manner as claimed."

POR, 78; EX2013, ¶119.

Dr. Hickner

its full disclosure, I do not believe that this reading is accurate. If the logic of Stratasys and Dr. Osswald were applied to the '713 Patent, claim 1 would require printing an *entire purge tower* every time that a print head or deposition line is switched to the operating mode. EX1001, 15:53-58 ("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*"). But Stratasys does not argue that claim 1 is limited in this way. It is clear that KISSlicer's description of "a wipe pillar…printed before every layer to clean the extruder tip" refers to a single purge tower printer layer-by-layer, just like the purge tower of the '713 Patent.

KISSlicer's depiction of the "Wipe[mm]" also supports my position here, because the wipe setting indicates an "amount" of filament that the printer "will push," which aligns with layer-based deposition as opposed to a command to print an entire purge tower. What's more, I do not even believe it would be feasible to print an entire wipe pillar between every layer. This would require altering the z-axis position of the extruder to build a tower and restore the position to print the next layer of the part or support structure. This would be cumbersome at best and potentially unworkable. Purge towers that are taller than the part would interfere with the movement of the extruder in the x-y plane.

EX1023, ¶48; Pet. Rep., 28.

KISSlicer (EX1010)

Wipe [mm]: after a warm up the printer will push (prime) this amount of filament to ensure the printer is ready.

EX1010, 10; Pet. Rep., 28.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

POR : "KISSlicer teaches that an entire structure ("a cylinder") is printed before every layer, which suggests that many cylinders are printed as layers are printed, not a structure printed in a layer-by-layer manner as claimed."

POR, 78; EX2013, ¶119.

Claim 1

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.

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FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claims 1 and 16

Dr. Hickner

51. The word "wipe" is only used by KISSlicer to describe the wipe pillar and the settings relating to the Wipe pillar, and nothing suggests that wipe pillar description is unrelated to any of the wipe settings. EX1010, 3, 7, 9, 10. Again, KISSlicer explains that "[t]he wipe pillar is…printed before every layer to clean the extruder tip" and "is extremely important in dual head prints." EX1010, 9. KISSlicer's description of the "Wipe [mm]" setting is fully consistent with the description of the wipe pillar, as the setting is described to "prime" to "ensure the printer is ready" meaning that the priming occurs before every layer just as the wipe pillar is described. EX1010, 10. The wipe pillar is clearly the result of the "Wipe [mm]" setting being set so the extruder primes material when an extruder warms up to transition to the operating mode in a dual head print. Nothing in KISSlicer suggests that the "Wipe [mm]" setting is unrelated to the wipe pillar description in that same document. All the evidence in the KISSlicer document points to these two features referring to the same purge operation.

EX1023, ¶51; Pet. Rep., 29.

66

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claim 6

Dr. Hickner

52. KISSlicer expressly discloses that when an extruder transitions from idle to active which involves a temperature increasing from a "Keep Warm" idle temperature to an active temperature, the wipe pillar is printed "after" the warm up occurs. EX1010, 9. KISSlicer also makes clear that the wipe pillar is printed "to ensure the printer is ready," providing further confirmation that the printing is done before printing the object. A POSITA would understand KISSlicer's explanation that "[t]he wipe pillar is a cylinder printed before every layer," to mean a "layer" includes everything that is printed by the extruder after it comes online and until the extruder goes idle again. This is true even if the extruder even if the extruder prints material at multiple different heights after coming online (e.g., printing two consecutive layers with the same material) and before going offline again. Indeed, it is clear that the entire mass of material printed by an extruder in one online session would form a "layer" on the part. KISSlicer explains unambiguously that the wipe pillar is printed in a purge operation "before every layer." EX1010, 9.

53. When the Priedeman-KISSlicer combination is considered fully, it is clear that the at least one purge tower is stopped at a highest layer at which there is a material change. Becasue KISSlicer explains that the purge tower is printed "before every layer" that represents all material printed by an extruder that comes online, this means that the Priedeman-KISSlicer combination prints a purge tower that stops at the highest layer where an extruder switches to the operating mode and therefore stops at the highest layer in which there is a material change. Based on KISSlicer's teachings, there would be no reason to continue printing the purge tower above the highest layer at which there is a material change because there would not be a need to "prime" an idle extruder because that idle extruder would not be needed again to print a layer.

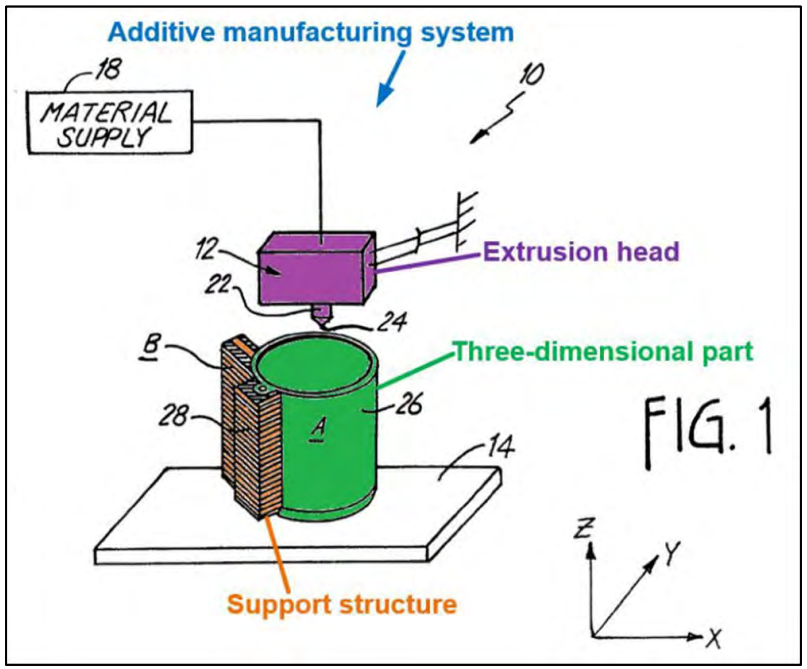
EX1023, ¶¶52-53; Pet. Rep., 29-31.

100

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer Combination Provides Claim 6

Dr. Hickner



55. As such, when Kisslicer's purge operation is applied to this example in Priedeman, the wipe pillar "is stopped at a highest layer at which there is a material change." This is because the highest layer at which there is a material change in Priedeman appears to be the final layer where the extrusion head prints the highest layer of three-dimensional part and support structure. There would be no need to continue printing the purge tower after printing this highest layer, so it follows that the purge tower is stopped at the highest layer at which there is a material change.

EX1023, ¶55; Pet. Rep., 29-31.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

101

The Priedeman-KISSlicer-RepRap Combination

(Ground 2B)

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

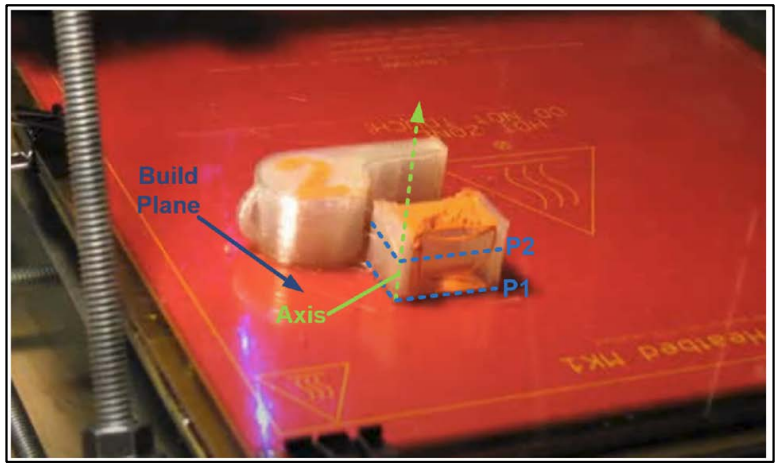
The Priedeman-KISSlicer-RepRap Combination Renders Obvious Claim 5

Dr. Hickner

Kisslicer with RepRap Article and RepRap video for at least the reasons I discussed above my analysis of the motivations to combine in Ground 1. *Supra*, §V.A. It is also clear that a POSITA would have been motivated to implement KISSlicer's purge tower with a purge tower having a cross-sectional area that decreases moving up from the build plane. This would provide a more stable purge tower, as seen in the example of KISSlicer where the part of the tower closest to the build plane has a much higher cross-section than parts of the purge tower immediately above the part closest to the build plane. In general, decreasing the cross-section of the purge tower moving up the axis and away from the build plane makes the purge tower less top-heavy.

57. Stratasys disagrees with my position, arguing that the top of the KISSlicer parking space exhibits instability when the cross-sectional area increases near the top of the purge tower. POR, 80-81. A POSITA would be even more motivated to ensure that the purge tower's cross sectional area decreases because of this, especially considering that the top layer of the purge tower in RepRap is partially suspended over midair and appears to be unstable. Petitioner does not rely on RepRap alone but instead relies on the Priedeman-KISSlicer-RepRap combination. A POSITA would have been motivated to implement the purge operation of Priedeman-KISSlicer with a purge tower having a decreasing cross-section as suggested by RepRap to promote stability.

EX1023, ¶¶56-57; Pet. Rep., 29-31.



EX1003, ¶215; Pet., 63.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Priedeman-KISSlicer-RepRap Combination Renders Obvious Claim 5

Dr. Hickner

58. The Priedeman-Kisslicer-RepRap combination provides claim 5 for at least the reasons that I described above in connection with Ground 1. *Supra*, §V.D. As I discussed in my analysis of the Leavitt-RepRap combination §V.A, *supra*, the act of switching materials is inherently what "slows down the print" rather than the act of printing the purge tower. EX1005, 1. The act of switching materials is already present in Priedeman's system, so the problem described in RepRap is already exhibited by Priedeman's extrusion head. As discussed in §V.D, *supra*, RepRap's purge tower has a cross-sectional area that reduces in height along the axis and there is no requirement in claim 5 that the purge tower never again increase in cross-sectional area.

EX1023, ¶58; Pet. Rep., 31.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Boyer Ground
(Ground 3)

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

The Boyer Reference

Boyer (EX1008)

[0013] FIG. **1** is a block diagram of a three-dimensional printer. In general, the printer **100** may include a build platform **102**, an extruder **106**, an x-y-z positioning assembly **108**, and a controller **110** that cooperate to fabricate an object **112** within a working volume **114** of the printer **100**.

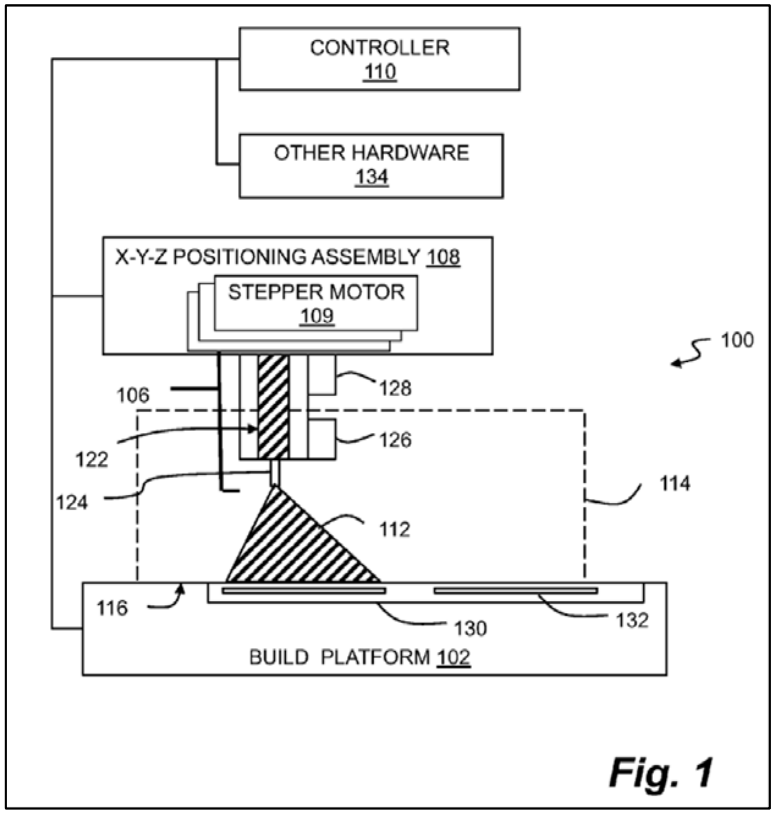


Fig. 1

[0025] FIG. **2** depicts an extruder for multiple build materials. In general, an extruder **200** of a three-dimensional printer may include an extrusion head **202** with a feed **204** and a nozzle **206**, along with any suitable heating elements or the like as described above, along with a filament changer **208** and a processor such as any of the controllers described above.

[0026] The filament changer **208** may, for example include a first feed **210** and a second feed **212** that receive a first build material **214** and a second build material **216** respectively. The filament changer **208** may, for example slide horizontally over a blade or other cutting edge to cut one of the build materials **214**, **216** that is being moved away from the feed **204** of the extruder **200** while moving the other one of the build materials **214**, **216** into the feed **204** of the extruder **200**.

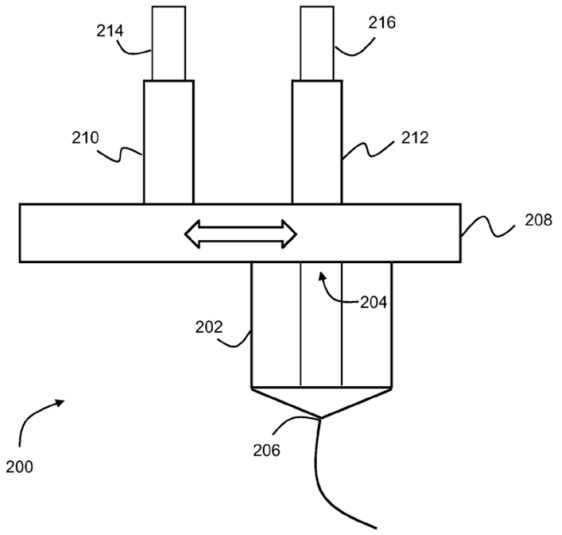


Fig. 2

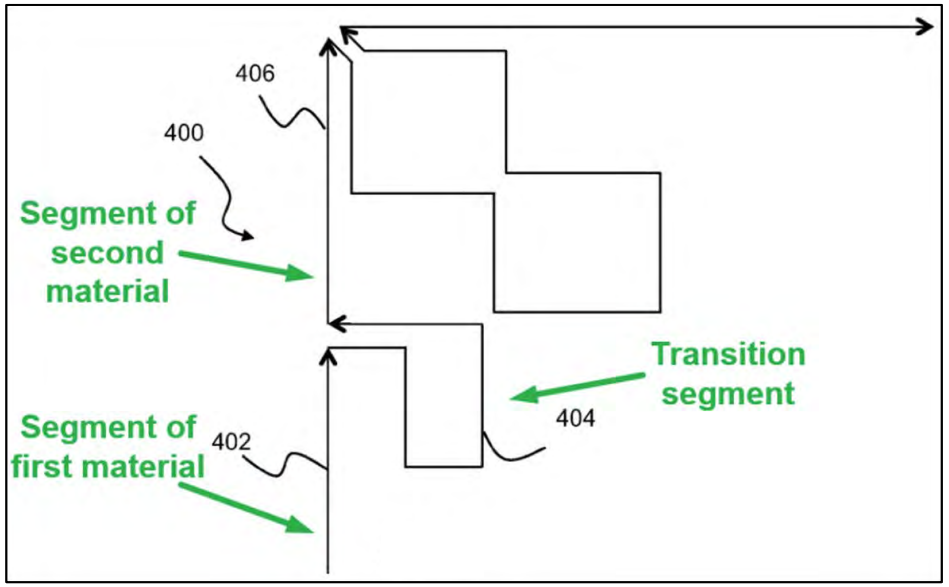
EX1008, [0013], [0025]-[0026], FIGS. 1-2; Pet., 63-65.

106

The Boyer Reference

Boyer (EX1008)

[0032] FIG. **4** depicts a cross section of a multi-material build. More particularly, FIG. **4** depicts a portion of a tool path using multiple build materials to obtain different colors on an exterior of an object. A first segment **402** of a tool path **400** may traverse a portion of an exterior surface of an object with a first color, such as red. 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. 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 and the tool path **400** may provide a third segment **406** traversing a different portion of the exterior with the second color.



[0034] The representation of FIG. **4** is provided for purposes of illustration only, and it will be readily appreciated that the tool path may include any number of excursions from the exterior surface, including excursions into the interior (which may follow an existing infill pattern—the geometric pattern used to fill the interior of an object—or depart from an existing infill pattern to deposit, e.g., within void spaces between infilling boundaries) or outside the exterior of the object where sacrificial build material may be extruded during transitions from on color (or material) to the next. It will also be understood that the term "tool path" may refer to either tool instructions in digital form or to the physical path of a tool during a build, and both meanings are generally intended unless a more specific meaning is explicitly pro-

[0044] In this general manner, predetermined patterns of colors or other build materials may be deposited in an object to achieve all forms of interesting results. Aesthetic effects such as multi-color images can be rendered on objects. Functional results can also be achieved. For example, sacrificial support structures may be fabricated from materials that are lower in cost, or that dissolve or break away easily from the main structure of an object. Similarly, highly elastic materials

EX1008, [0032], [0034], [0044], FIG. 1; Pet., 63-65.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Boyer Provides Element [1a]

Dr. Hickner

59. Boyer describes a printer that can "accommodate multi-material builds," leaving no question that Boyer contemplates using two different materials. EX1008, [0024], *see also id.*, [0025] ("extruder for multiple build materials"). Boyer also explains that its printer can deposit a layer of a "transition segment" (purge tower) when switching between materials and that such techniques are applicable to "any such muti-material models" including those having both "object" and "support structure[]" material. EX1008, [0032]-[0033], [0029], [0044]; *see also* Inst. Dec., 19, 24, 25. Although Boyer describes a multi-color build as a prominent embodiment, Boyer unambiguously explains that the printer can perform *many different* multi-material builds including a three-dimensional part and support structure. EX1008, [0029] ("techniques described herein may be usefully employed

EX1023, ¶59; Pet. Rep., 32.

Boyer (EX1008)

[0032] FIG. **4** depicts a cross section of a multi-material build. More particularly, FIG. **4** depicts a portion of a tool path

[0029] While 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.

[0044] In this general manner, predetermined patterns of colors or other build materials may be deposited in an object to achieve all forms of interesting results. Aesthetic effects such as multi-color images can be rendered on objects. Functional results can also be achieved. For example, sacrificial support structures may be fabricated from materials that are lower in cost, or that dissolve or break away easily from the main structure of an object. Similarly, highly elastic materials

EX1008, [0029], [0032], [0044]; Pet. Rep., 32.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Boyer Provides Element [1a]

POR : "a POSITA would understand from *Boyer* itself that the exterior segments in Figure 4 of *Boyer* (including 406) form the outside or 'main structure of the object,' and that such exterior segments cannot be made from sacrificial support structures that 'dissolve or break away easily'…Doing so would compromise the object's structural integrity and expose the internal infill."

POR, 87; EX2013, ¶134.

Boyer (EX1008)

[0034] The representation of FIG. **4** is provided for purposes of illustration only, and it will be readily appreciated that the tool path may include any number of excursions from the exterior surface, including excursions into the interior (which may follow an existing infill pattern—the geometric pattern used to fill the interior of an object—or depart from an existing infill pattern to deposit, e.g., within void spaces between infilling boundaries) or outside the exterior of the object where sacrificial build material may be extruded during transitions from on color (or material) to the next. It will

EX1008, [0034]; Pet. Rep., 32.

Dr. Hickner

be extruded during transitions" between materials. EX1008, [0034]. In such cases where there is no infill, the concern of exposing infill is eliminated. Second, it is

EX1023, ¶60; Pet. Rep., 32.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Boyer Provides Element [1a]

Dr. Hickner

61. Rather than analyzing Boyer's disclosure as a whole, Stratasys seemed to focus largely on the geometric shape and other characteristics of the example shown in FIG. 4 to the point of ignoring facts that are important to the analysis. For example, it clear that Boyer discloses printing a purge tower by depositing a "transition segment" when switching materials. EX1008, [0032]-[0035], [0037]-[0043], FIG. 4. Boyer is also clear that the materials used in printing can include object and support material in some implementations. EX1008, [0044]. Boyer's printer also "deposit[s] successive layers of material" to form the disclosed structures, and therefore prints the transition segment purge towers in a layer-by-layer manner. EX1008, [0018], [0022]. Even if Stratasys's assertions that the

EX1023, ¶61; Pet. Rep., 32.

Boyer (EX1008)

[0018] The x-y-z positioning assembly **108** may generally be adapted to three-dimensionally position the extruder **106** and the extrusion tip **124** within the working volume **114**. Thus by controlling the volumetric rate of delivery for the build material and the x, y, z position of the extrusion tip **124**, the object **112** may be fabricated in three dimensions by depositing successive layers of material in two-dimensional patterns derived, for example, from cross-sections of a computer model or other computerized representation of the object **112**. A variety of arrangements and techniques are

[0032] FIG. **4** depicts a cross section of a multi-material build. More particularly, FIG. **4** depicts a portion of a tool path using multiple build materials to obtain different colors on an exterior of an object. A first segment **402** of a tool path **400** may traverse a portion of an exterior surface of an object with a first color, such as red. 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. 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 and the tool path **400** may provide a third segment **406** traversing a different portion of the exterior with the second color.

[0034] The representation of FIG. **4** is provided for purposes of illustration only, and it will be readily appreciated that the tool path may include any number of excursions from the exterior surface, including excursions into the interior (which may follow an existing infill pattern—the geometric pattern used to fill the interior of an object—or depart from an existing infill pattern to deposit, e.g., within void spaces between infilling boundaries) or outside the exterior of the object where sacrificial build material may be extruded during transitions from on color (or material) to the next. It will

EX1008, [0018], [0032], [0034]; Pet. Rep., 32.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Boyer Provides Element [1a]

Dr. Hickner

62. FIG. 1 of Boyer, which depicts a different shaped object than FIG. 4, further emphasizes that Boyer's disclosures are not restricted to the specific geometry depicted in FIG. 4.

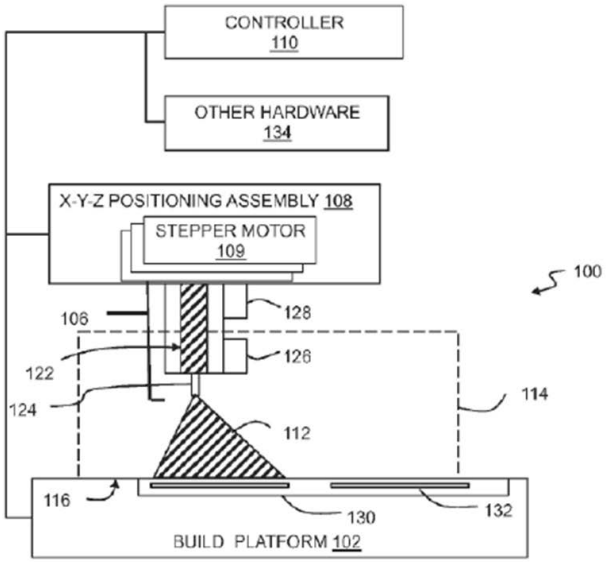


Fig. 1

EX1023, ¶60; Pet. Rep., 32.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Boyer Provides Element [1a]

PO's Sur-Reply : "Boyer still must disclose the claimed arrangement, not merely ingredients that could be combined. Petitioner's Reply ignores this fact."

PO's Sur-Reply, 26.

Dr. Hickner

63. Stratasys contended that Boyer does not disclose the elements of claim 1 "arranged as in the claim." POR, 83-86. This is false. Boyer explains clearly that the printer can deposit "layers of a three-dimensional part and of a support structure" as recited in Element [1a] using the same techniques disclosed for a multi-color print. Based on Boyer's clear disclosure that "[t]he techniques described herein may be usefully employed to enable switching of build materials in any such multi-material models," a POSITA would understand that Boyer discloses the exact embodiment depicted in the annotated version of FIG. 4 below.

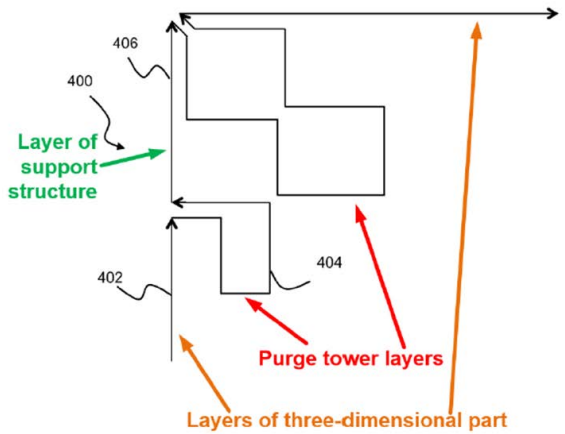


Fig. 4

64. Boyer discloses that "FIG. 4 depicts a cross section of a multi-material build," clearly indicating that additional layers could exist above or below the layer depicted in Fig. 4. EX1008, [0032]. Not every layer of the multi-material build needs to be identical. The layer above FIG. 4 could, for example, include a layer of the three-dimensional part printed directly onto the layer of support structure represented by segment 406. This would mean that segment 406 supports the three-dimensional part. Changing successive layers of the multi-material build would not prevent "layer-by-layer construction of a purge tower," as Stratasys suggests. POR, 88. Purge tower layers could alternate between support material and part material, or purge towers could lean, grow in cross-sectional area, or shrink in cross-sectional area.

EX1023, ¶63-64; Pet. Rep., 32.

Boyer (EX1008)

[0032] FIG. **4** depicts a cross section of a multi-material build. More particularly, FIG. **4** depicts a portion of a tool path

EX1008, [0032]; Pet. Rep., 32.

FISH.

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Boyer Provides Element [1c]

PO: "Dr. Hickner agreed during deposition that a POSITA would understand the "purge tower" is a "separate physical object" from the three-dimensional part."

POR, 92; EX2013, ¶139.

Dr. Hickner

the institution decision was correct. ID, 22. There is simply no requirement that the purge tower and the object being printed must be separate structures that have no physical contact with each other.

EX1023, ¶66; Pet. Rep., 33.

dimensional part and the support structure"). Boyer's disclosure that the transition segments (purge towers) are "*sacrificial material deposited outside the exterior of the object*" reveals that they are separate components that may or may not contact the object itself. EX1008, [0043].

EX1023, ¶69; Pet. Rep., 34.

Q My question to you is, what is a purge tower?

A Figure 3A, 3B, Figure 8, and Figure 9 in patent '713 give examples of purge towers. And also the RepRap reference that I have in my declaration, that gives an example of a purge tower. Even though RepRap calls it a parking space, that's a purge tower as an example.

EX2016, 64:18-65:3; Pet. Rep., 33.

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

THANK YOU

DEMONSTRATIVE EXHIBIT – NOT EVIDENCE