

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHENZHEN TUOZHU TECHNOLOGY CO., LTD.,
Petitioner

v.

STRATASYS, INC.
Patent Owner.

IPR2025-00531
U.S. PATENT NO. 9,168,698

PATENT OWNER'S SUR-REPLY

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<i>Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.</i> , 853 F.3d 1272 (Fed. Cir. 2017)	<i>Passim</i>

Other Authorities

37 C.F.R. §§ 42.104(b)(5).....	2, 18, 24, 28
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EXHIBIT LIST

Exhibit No.	Description
2001	Docket Navigator – Judge Rodney Gilstrap Motion Success for Stay Pending IPR and Time to Milestones
2002	United States District Courts — Judicial Caseload Profiles for Eastern District of Texas (Sept. 30, 2024 and Dec. 31, 2024), available at https://www.uscourts.gov/data-news/reports/statistical-reports/federal-court-management-statistics
2003	Minute Entry for proceedings held before District Judge Gilstrap on Nov. 7, 2024, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG (E.D. Tex. Nov. 14, 2024)
2004	Discovery Order, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG, Dkt No. 35 (E.D. Tex. Dec. 2, 2024)
2005	Protective Order, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG, Dkt No. 36 (E.D. Tex. Dec. 3, 2024)
2006	e-Discovery Order, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG, Dkt No. 41 (E.D. Tex. Dec. 19, 2024)
2007	Invalidity and Ineligibility Contentions, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG, (E.D. Tex. Jan. 30, 2025)
2008	Transcript of Hearing on the Nomination of Howard Lutnick, of New York, to be Secretary of Commerce (Jan. 29, 2025)
2009	Order Denying Defendants' Motion to Dismiss for Failure to Join Indispensable Party, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG, Dkt. No. 53 (E.D. Tex. May 29, 2025)
2010	Plaintiff's Unopposed Motion to Consolidate Case No. 2:25-cv-00465-JRG with Case Nos. 2:24-cv-00644-JRG and 2:24-cv-00645-JRG, <i>Stratasys, Inc. v. Shenzhen Tuozhu Technology Co. Ltd.</i> , No. 2:24-cv-00644-JRG, Dkt. No. 54 (E.D. Tex. May 30, 2025)
2011	Lex Machina, Patent Litigation Report 2024 (Feb. 2024)
2012	U.S. District Court, Eastern District of Texas [Live] Calendar Events Set for 6/1/2026-8/1/2026

2013-2019	Reserved
2020	Transcript of the Deposition of Dr. Andrew Wolfe
2021	U.S. Patent No. 7,939,003 to Bonassar, et al. ("Bonassar")
2022	U.S. Patent No. 6,129,872 to Jang ("Jang")
2023	U.S. Patent No. 7,625,198 to Lipson, et al. ("Lipson")
2024	Ashby, M. F. (2011). Chapter 4: Material Property Charts, <i>Materials Selection in Mechanical Design</i> (pp.57–96). Elsevier Inc.
2025	TIM A. OSSWALD & GEORG MENGES, MATERIALS SCIENCE OF POLYMERS FOR ENGINEERS (3d ed. 2010), excerpted.
2026	TIM A. OSSWALD & NATALIE RUDOLPH, POLYMER RHEOLOGY (2015), excerpted.
2027	Declaration of Dr. Tim A. Osswald

I. PETITIONER'S REPLY DOES NOT CURE GROUND 1A'S DEFECTS**A. The Reply Does Not Show A Motivation to Combine Different Embodiments of Warren**

The Petition asserted a combination of Warren's embodiments for vibration sensing and for a through-nozzle dispenser design. Petition, 13-16. Absent a motivation for such a combination, Petitioner cannot show that the challenged claims are unpatentable due to Petitioner's reliance on Warren's through-nozzle design.

Petitioner does not contest that Warren does not invite vibration solutions with a through-nozzle design (POR, 17-18), that capillary designs are controlled by surface tension with the tip also touching the substrate (POR, 19-20), that there is no motivation to modify capillary or quill-pen designs to use a linear actuator (POR, 20), that Warren teaches a combination tool and not combining multiple aspects from one design to another (POR, 20-21), that the Petition relies on impermissible hindsight (POR, 21-22), that there is no motivation to use a through-nozzle design with a vibration solution to avoid damage (POR, 22-23), that Warren discloses specific needs for vibration control (POR, 24), and there is no motivation based on overcoming issues regarding agglomeration and/or sticking (POR, 24-25). Each of these concessions indicates a lack of motivation to combine.

Instead of addressing these issues, Petitioner injects new theories in its Reply that depart from the Petition's combination. It argues that it advanced both the through-nozzle and capillary designs, and that the lack of motivation to combine

Warren's embodiments, as detailed in the Response, overlooks Warren's claims. *See* Reply, 1-3; POR, 10-25. However, Petitioner cannot cure its failure to show a motivation to combine in the Petition by citing previously unidentified portions of Warren (here, Warren's claims) or by asserting a combination/embodiment different than the Petition's combination (Warren's capillary design). *See Ariosa Diagnostics, Inc. v. Verinata Health, Inc.*, 805 F.3d 1359, 1367–68 (Fed. Cir. 2015); *Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.*, 853 F.3d 1272, 1286–87 (Fed. Cir. 2017) (petitioner must adhere to “initial petition” and its supporting evidence); *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1330–31 (Fed. Cir. 2019); 37 C.F.R. §§ 42.104(b)(5); *see also* Petition, 13-16.

Further, Warren's claims are consistent with the lack of motivation to combine Warren's embodiments. Warren's claims do not teach combining embodiments. Rather, claims 54, 59, 65, and 70 refer to the table-top dispenser in Warren that can include multiple tool designs, including capillary designs and through-nozzle designs. *See* EX1004, at Fig. 23A (below), Figs. 23B-C, ¶¶[0278], [0318] (“multiunit system”); POR, 15-16.

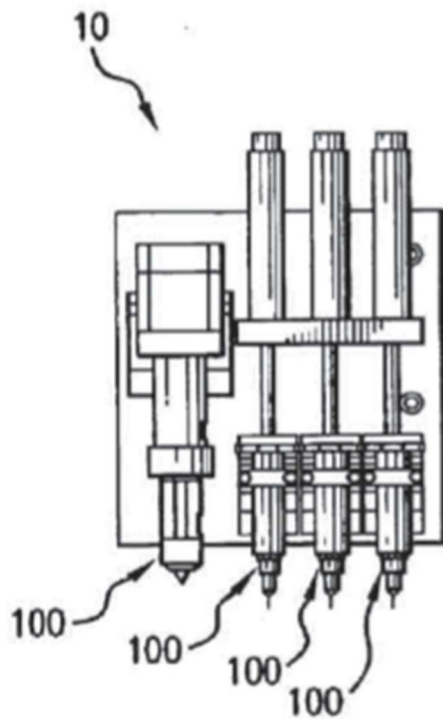


FIG. 23A

This embodiment includes a vibration solution with the capillary designs *and also includes* a through-nozzle design. Thus, Warren's claims do not expressly refute the Response, but rather they support it. POR, 10-25.

Petitioner also argues that "PO mischaracterizes Warren's through-nozzle design as lacking precise deposition." Reply, 2. However, it is irrelevant whether the through-nozzle design has some amount of precision. As explained in the Response, Warren uses a through-nozzle design to fill larger areas, whereas the capillary design is used to achieve smaller details to provide high-detail and high-precision dispensing. POR, 15-16, 18, 24-25; EX1004, ¶¶[0278], Figs. 23A-C; EX2027, ¶¶[126-34, 153-54). Based on Warren's teachings, PO explained that there is no motivation

to use a through-nozzle design to enable precise control. POR, 18-19. Thus, it is Warren (and not PO) that expressly teaches the through-nozzle design provides less-detail and less-precision dispensing than capillary designs. *See* POR, 15-16; EX1004, Figs. 23A-C, ¶[0278] (using “through-nozzle” for “larger areas” whereas “capillary dispenser” for “high-detail and high-precision”). Thus, the Reply fails to cure the Petition’s deficiency in wrongly asserting a motivation to use a through-nozzle design for precise control.

B. No Teaching of Elements 1[b], 1[c], 1[d]

For elements 1[b]-1[d], the Reply continues to rely on Warren’s teaching of a change in vibration amplitude to argue that it teaches calculating a contact force. Reply, 3-9. For element 1[b], the Reply asserts that “the contact force is detectable from the sensed ΔA physical characteristic.” Reply, 3. However, Petitioner fails to address the Response, which details why a contact force is not detectable from the change in amplitude. POR, 25-33.

For elements 1[c] and 1[d], the Reply maintains Petitioner’s assertions that Warren detects a current contact force (Reply, 3-6) and doing so was obvious (Reply, 6-9). Petitioner’s attempt to distinguish calculating a contact force is misplaced. *See* Reply, 4. The Reply overlooks that PO rebutted the Petition’s express assertion that Warren’s “contact force can be readily calculated.” Petition, 20; POR, 25-26.

Further, the Reply mistakes Warren's teaching of a system's precision (in micronewtons) with a detected contact force (which Warren does not teach). Reply, 5-7; EX1004, ¶[0316]. Precision includes many components of Warren's system, including the high precision of the capillary design that Petitioner seeks to replace in its combination. *See* POR, 15-16, 18-19, 21-22, 24-25; EX1004, Figs. 23A-C, ¶¶[0278-79], [0361] (CAD file enables precision); EX2027, ¶¶126-34. As explained in the Response, Warren refers to detecting a change in amplitude of a vibration and not detecting or calculating a contact force. POR, 26-27; EX1004, ¶¶ [0289], [0313], [0315]; EX2027, ¶¶163-70. Indeed, Warren explains that his "desired contact force" is actually "based on the detected change in amplitude." *See id.*; EX1004, ¶¶[0312] ("so that A of the feedback signal is maintained at a constant level, thereby closing the feedback loop"), [0315] ("modulated vibration amplitude ... used as feedback to control the contact force"), [0316] ("sufficiently sensitive to allow for sensing of the contact force"¹), [0317] ("the change in vibration is used as a feedback signal").

¹ Petitioner's argument regarding what Warren "demonstrated" is an improper new argument. *See* Reply, 4-5 (citing Warren ¶[0316]); *Ariosas*, 805 F.3d at 1367-68; *Wasica*, 853 F.3d at 1286-87. That portion of Warren supports Patent Owner's conclusion that Warren teaches detecting a vibration-amplitude change rather than a contact force.

Indeed, contrary to Warren's amplitude-change feedback, Petitioner erroneously concludes that Warren "compare[s] the vibrating force sensor's reading against the desired force." Reply, 5. This misreading of Warren cannot cure the deficiencies in Ground 1A.

Petitioner also presents an improper new argument about the "necessity" of Warren detecting a contact force. Reply, 5-6; *see Ariosa*, 805 F.3d at 1367-68; *Wasica*, 853 F.3d at 1286-87. Petitioner's suggestion of amplitude-to-force conversion (or vice versa) is a false dichotomy. Warren's vibration-amplitude-change feedback teaching is clear. Substrate contact is detected if there is an amplitude change and contact is maintained if the "feedback signal [amplitude] is maintained at a constant level." *See* POR, 26-27; EX1004, ¶¶[0289], [0312], [0313], Fig. 22A. If contact is not detected, the relative substrate position is varied to cause a vibration-amplitude change. *See id.* Thus, Warren teaches detecting and maintaining contact using the amplitude change and not by detecting or converting to a contact force (or vice versa).

Petitioner also argues that detecting the current contact force is obvious. Reply, 6-9. It repeats its flawed necessity argument ("one would need to know the difference" in forces). It also erroneously argues that Warren expressly provides a motivation for detecting the contact force. Reply, 6-7. What Petitioner deems "quantitative" is merely a correspondence or proportionality between the amplitude

change² and contact force. Warren does not teach, much less provide an express motivation for, detecting a contact force.

Recognizing this deficiency, Petitioner presents attorney argument about “force intensity” purportedly being a “magnitude component” of a “force vector quantity” measured with “micronewton precision.” Reply, 7. But as discussed above, the precision of Warren’s system is a wholly different concept than detecting a contact force. A system’s precision (whether to a high degree or not) does not suggest which measurement or detected value is relied upon in operation while depositing material during the build. Nor does it suggest that a POSITA would contradict Warren’s teaching to calculate or detect the amplitude change for feedback.

Petitioner also asserts that the contact force “can be [] determined.” Reply, 7-8. But obviousness requires more. What *can* or *could be* done is insufficient. *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015); *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014); *Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017); *In re Magnum Oil Tools*

² Warren calculates an amplitude change; it does not detect it directly. It senses a vibration signal that must be amplified to generate a change in amplitude for feedback. See EX1004, ¶[0302].

Int'l, Ltd., 829 F.3d 1364, 1380–81 (Fed. Cir. 2016) (petitioner must articulate specific reasoning grounded in evidence); *DSS Tech. Mgmt., Inc. v. Apple Inc.*, 885 F.3d 1367, 1374–76 (Fed. Cir. 2018).

As the Response explains, it would not have been obvious to detect a contact force from Warren's amplitude change with a reasonable expectation of success. POR, 27-33; EX2027, ¶¶156-191. Petitioner asserts that a POSITA would simply look up material properties or run measurement/calibration experiments, and that detecting a contact force from an amplitude change was purportedly common. Reply, 8-9. But Petitioner overlooks the fact that Dr. Osswald explained Warren's system cannot rely on simple look ups or experiments. He explained that viscoelastic behaviors are strongly frequency dependent and also depend on deformation amplitude, temperature, time, storage modulus, and loss modulus. *See* EX2027, ¶¶178-180. However, Warren's system operates at frequencies "several orders of magnitude higher than" frequencies of "conventional material characterization techniques. EX2027, ¶181 (also noting that Warren does not report a specific range of amplitudes); EX1004, Fig. 21. Moreover, there "is no established method or device to characterize viscoelastic properties *at the frequencies and amplitudes of Warren's system.*" *Id.*, ¶168; *see also id.*, ¶181, 188 (discussing specific materials in Warren). Thus, simple look ups or experiments do not apply to Warren's system.

Further, Petitioner's bare assertion that the calculation was commonplace is fundamentally flawed. Dr. Wolfe does not testify that such a calculation was "rudimentary engineering, commonplace and typical," nor does the Petition address the topic on page 23. Reply, 9 (erroneously citing EX1003, ¶95; Petition, 23).

Nor can Petitioner cast aside its failure to show whether Warren teaches detecting the current contact force by relying on a presumption of enablement. Reply, 8. Warren does not discuss detecting a contact force and thus the issue of enablement is irrelevant to whether Petitioner has met its burden to show obviousness beyond what Warren discloses.

C. No Teaching of Claims 3 and 9

Claims 3 and 9 depend from claim 2, which depends from claim 1. Among other things, claim 1 recites "creating a control signal to control at least one component of the three-dimensional printer in response to the current contact force." Claim 3 limits the same component to one that "controls a feed rate" for a build material, and Claim 9 limits the same control signal to one that includes a signal "to change a feed rate" of a build material. The Petition failed to show obviousness for claims 3 and 9. POR, 33-37. There was no motivation to use Warren's through-nozzle dispenser with his vibration sensing solution (POR, 34-35) and the synchronization of xyz motion in Warren is not responsive to a current contact force. (POR, 35-37). Indeed, Dr. Osswald explained why a POSITA would not have

understood such a synchronization. EX2027, ¶¶201-05. The Reply fails to cure the deficiencies of the Petition by not rebutting PO's explanation and only referring back to the same arguments. Reply, 9-10.

Moreover, Petitioner wrongly asserts that the feed rate control is independent of the current contact force. Claims 3 and 9 recite the same control signal / component that is responsive to claim 1's current contact force.

D. No Teaching of Claims 5, 6, and 12

Claims 5, 6, and 12 relate to particular contact forces. Claim 5 recites “comparing the current contact force to an expected contact force,” claim 6 reduces a difference between those forces, and claim 12 recites “at least one instruction for achieving a specified contact force.” Warren does not teach a “measured contact force” for claim 5, nor does it teach reducing the difference between two forces for claim 6, nor does it teach a specified contact force or instruction for achieving such a force for claim 12. POR, 37-38, 42-43; EX2027, ¶¶206-211, 221-226; EX1004, Fig. 22A, ¶¶ [0289], [0313], [0305], [0311], [0316]; EX1001, 11:25-28; Petition, 27-29, 35-36. Warren teaches he desires no change in the vibration-amplitude and not a specified contact force. EX1004, ¶[0312]. The Reply fails to cure the Petition's deficiencies, does not address the Response, and only refers back to Petitioner's arguments for claim 1. Reply, 9-10.

E. No Teaching of Claims 10 and 11

Claim 10 recites “detecting a planarity ... based upon a number of contact force measurements across a surface” and claim 11, which depends from claim 10, recites “fabricating a layer on the surface ... that decreases one or more irregularities.” As the Response explained, Warren does not teach: 1) detecting a planarity, much less doing so based on contact-force measurements; 2) detecting planarity before printing, as the Petition asserts; and 3) decreasing irregularities by depositing cells into porous scaffolds. POR, 38-41. The Reply improperly introduces an implicit claim construction for detecting planarity, without actually proposing Petitioner’s interpretation. Reply, 11-12. It is Petitioner’s responsibility to present any claim constructions in the Petition, not for the first time in a Reply. Further, the Reply fails to address Dr. Osswald’s explanation that Warren does not teach making a number of contact-force measurements *that collectively* form the basis for detecting planarity. EX2027, ¶216. That is, what Warren detects is for a given point and not across a surface for a plane. *See* POR, 39.

The Reply also fails to address PO’s argument that Warren does not teach decreasing irregularities in claim 11 by depositing cells into porous scaffolds. Thus, claims 10 and 11 are non-obvious.

II. PETITIONER'S REPLY DOES NOT CURE GROUND 1B'S DEFECTS

A. The Reply Does Not Show A Motivation to Combine Warren and Eshed and No Teaching of Claims 3, 7, and 9

The Reply fails to rebut the Response. Namely, Petitioner fails to meaningfully address the Response's points that a POSITA would not have been motivated to: 1) look for teachings from Eshed to explain collision detection and response; and 2) apply Warren's technique to Eshed detection system. The Reply mischaracterizes these arguments as bodily incorporation. The Response followed the flawed rationales presented in the Petition; it did not suggest bodily incorporation. POR, 44-45; Petition, 38-40. Notably, the Response asserted that Warren already avoids damage and thus "a POSITA would not have desired to prevent further damage" by looking to Eshed. POR, 44; EX2027; ¶¶230-231. Petitioner merely repeats Dr. Wolfe's conclusory assertions without addressing this deficiency in the combination.

For claims 3, 7, and 9, the Reply only refers to the discussion for Ground 1A and thus, those claims are also non-obvious.

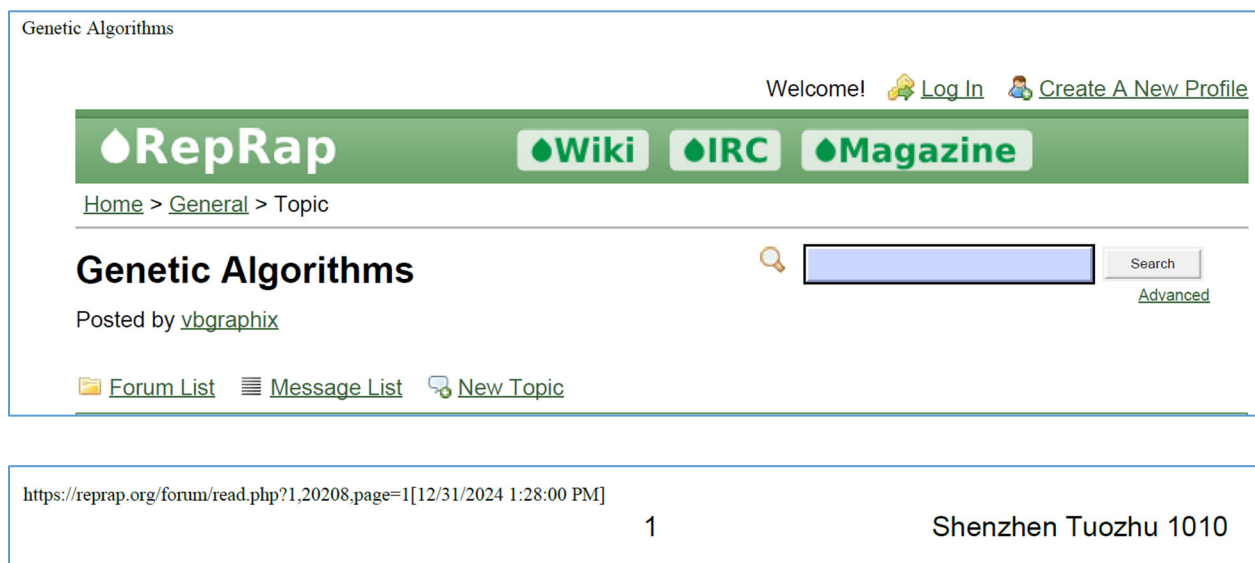
III. PETITIONER'S REPLY DOES NOT CURE GROUND 2A'S DEFECTS

A. Petitioner Still Fails to Show that RepRap20208 Qualifies as a "Printed Publication" Under § 102

The Reply (26-28) tries to supply a public-accessibility case, but Petitioner still has failed to show that RepRap20208 was publicly accessible before the challenged patent's effective filing date.

Petitioner argues that RepRap20208 is a printed publication because (1) users can search the RepRap forums for the contents of particular posts, (2) the particular thread in the forum, RepRap20208, has multiple posters, (3) the title of the thread adjusted as the topics evolved, (4) the RepRap website linked generally to the forums. Reply, 26-28. None of these rationales establish public accessibility of this particular thread.

On its face, RepRap20208 is not a printed publication. It was printed in 2024 and is a thread entitled "Genetic Algorithms" in a "General" forum.



EX1010, 1.

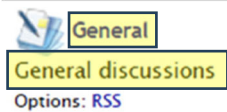
The question is whether the RepRap20208 thread was publicly accessible such that a POSITA, “exercising reasonable diligence, [could] locate it.” *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016). Petitioner suggests there were two ways to potentially access the reference: 1) navigating through a website, or 2) performing a search. As a whole, this evidence amounts at best to technical accessibility, which is insufficient.

Regarding Petitioner's website-navigation approach, there is no explanation of why or how a skilled artisan would arrive at a “Genetic Algorithms” thread in a “General” forum. *See* Reply, 28; EX1004, ¶6, 33 (Ex. B-1). Mr. Bowyer did not provide any facts of how to navigate to the particular RepRap20208 forum thread. Exhibits B-1 to B3 provide an example of the “Mechanics” forum to “Discuss any sort of mechanical stuff.”



EX1014, ¶9; *see also id.*, ¶¶8, 10. But RepRap20208 is not in the “Mechanics” forum. Rather, it is in a “General” forum. EX1010, 1. Petitioner offers no evidence of how to locate the RepRap20208 thread in the “General” forum. Nor is there any

explanation of why a POSITA interested in contact-force sensor techniques would navigate to a “General” forum, which is merely about “General discussions.”



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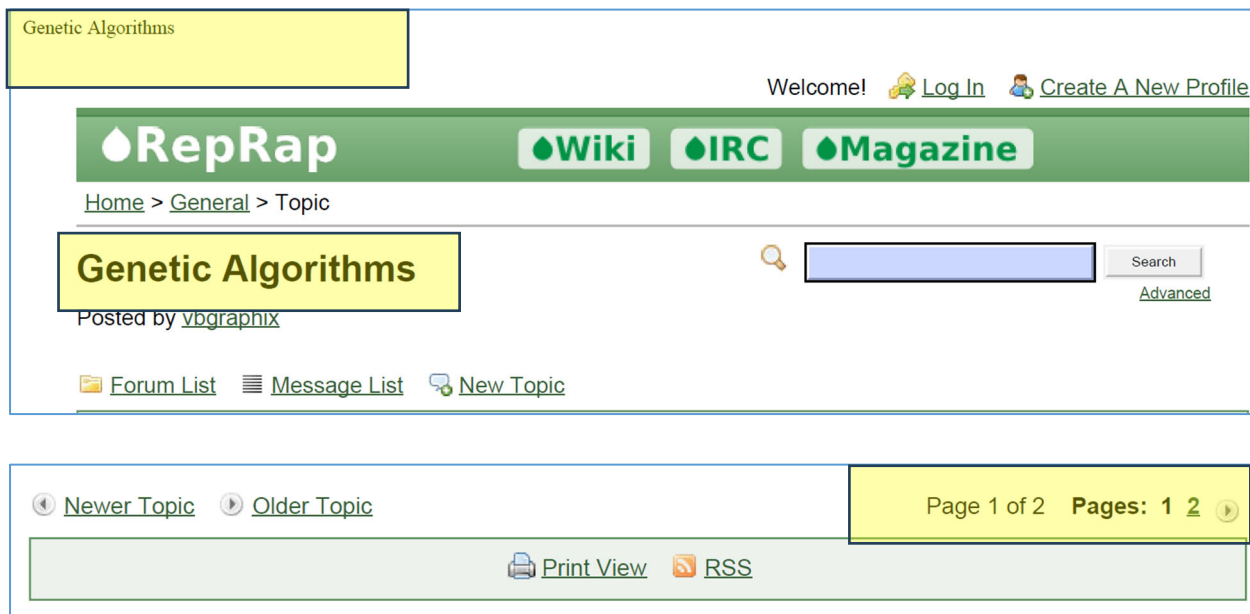
December 21, 2008 03:06AM

EX1014, ¶9.

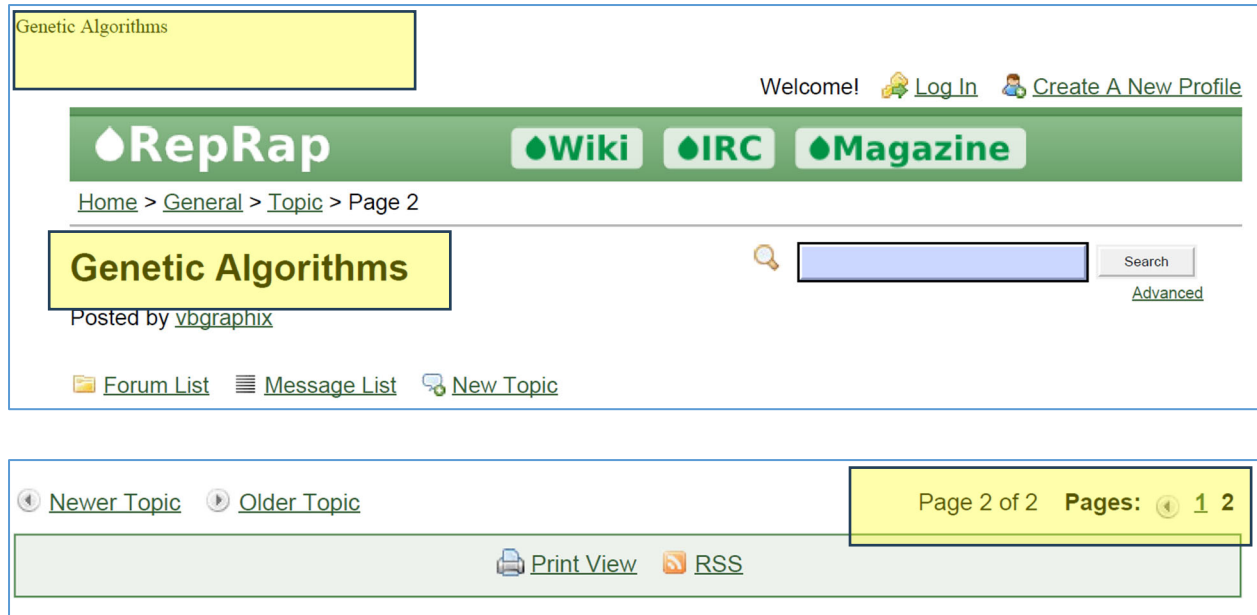
Petitioner’s search approach is also deficient. For the first time in the Reply, Petitioner provides several keywords (“collision,” “collision detection,” “calibration,” “sensor,” “force,” and “measurement”) and states that the RepRap20208 thread title (“Genetic Algorithms”) somehow “undoubtedly pertain[s] to algorithms for 3D printers.” Reply, 26-27. But Petitioner’s contentions are precisely the type of “technical accessibility” theory rejected in *Blue Calypso*. There, the Federal Circuit held it was not enough to argue that an internet search engine “would have been able to locate” a webpage; the record must contain evidence that pre-critical-date searches (with relevant queries) would have returned the reference. *Blue Calypso*, 815 F.3d at 1350. Petitioner offers no evidence of any search performed, no evidence of what search terms a POSITA would have used beyond its attorney-supplied keywords, and no evidence that any query—before the critical date—would have surfaced the RepRap20208 forum entitled “Genetic Algorithms,” a title that is not itself a conventional technical term a POSITA would naturally use when searching for contact-force sensor techniques.

Petitioner's evidence is likewise conclusory. Mr. Bowyer only states that the RepRap forums generally had search functionality. Reply, 26-27; EX1014, ¶6. That again is merely a "technical accessibility" theory, which is insufficient to establish public accessibility of a particular forum thread.

Petitioner also contends that "title of the thread was adjusted as the topics evolved." Reply, 27; EX1010, 16. But Petitioner offers no evidence of how, by whom, or even when the title "was adjusted." *See* EX1010, 1 (reference was printed on December 31, 2024). Petitioner also misrepresents the facts regarding RepRap20208. The title of the thread ("Genetic Algorithms") did not adjust or evolve; rather, it remained the same.



EX1010, 1, 15.



EX1010, 16, 23.

While some individual posts may have different variations of titles, those titles did not “evolve” as Petitioner contends. Page 16 shows a post with the title “Re: Genetic Algorithms (now instrumented bolts/load cells),” but then Pages 17, 18, 20, 21, 22 recite posts with the title “Re: Genetic Algorithms.” EX1010, 16-18, 20-22. There is no explanation of how such a forum thread with varying titles in posts would have been located with reasonable diligence. Again, Petitioner offers no evidence of how, by whom, or even when the title of the post “was adjusted.”

Accordingly, RepRap20208 is not a printed publication.

B. The Reply Does Not Show A Motivation to Combine Calderon and RepRap20208

Petitioner's Reply attempts to abandon the proposed modification presented in the Petition, which is that “a POSITA would have found it obvious to apply a

‘strain gauge on the extruder mount’ from RepRap20208 as the ‘sensing means’ of Calderon, *rather than following Calderon’s suggestion of ‘monitoring a change in the servo drive current’* (EX1009, 10:1-8) and implement collision detection using that same strain gauge.” Petition, 56 (summarizing combination described in Petition at 48-56). Petitioner now argues that Calderon’s servo drive monitoring is “only in the specific use-case of” a servo motor and that Calderon discloses monitoring more generally. Reply, 13-14 (misrepresenting Example 3, which includes servos), 16-17. However, Petitioner cannot cure its failure to show a motivation to combine in the Petition by changing its motivation theory in the Reply—specifically, from applying RepRap20208’s strain gauges rather than Calderon’s servo drive monitoring to merely “using a strain gauge with Calderon.” *Compare* Petition, 56 *with* Reply, 12; *see Ariosa*, 805 F.3d at 1367–68; 37 C.F.R. § 42.104(b)(5).

While the example Calderon provides is a servo drive motor, nothing limits Calderon’s drive-current monitoring solution to servo drive motors, as Petitioner argues. EX1009, 10:1-8; Reply, 13. The drive-current monitoring solution is introduced as part of Calderon’s Example 3. EX1009, 9:63-10:22. Unlike Calderon’s other embodiments that used a plunger to find z-axis positions, Example 3 uses the tip of the nozzle as the “plunging means.” EX1009, 9:63-65. This enables drive-current monitoring “without [the] need for any special purpose sensing means” to detect contact. *Id.*, 10:5-8. Thus, Calderon predominantly teaches embodiments that

use a plunger and an alternative embodiment that uses the tip of the nozzle with drive-current monitoring for detecting contact.

In addition, the Reply fails to address the fact that Calderon teaches away from special-purpose sensors and instead asserts erroneously that “Calderon does not restrict the type of sensor it uses.” Reply, 14, 16; POR, 48-50. It remains undisputed that Calderon teaches that “his [current-monitoring] solution has a distinct advantage over discouraged solutions that need ‘special purpose sensing means.’” POR, 48-49; EX1009, 10:7-8, 9:63-10:5, 10:26-47. Petitioner’s flawed motivation to combine ignores Calderon’s teaching and improperly introduces a special-purpose sensing means in the form of a strain gauge. Calderon teaches a current-monitoring solution that monitors a drive current to detect contact without special-purpose sensors. *See id.* For example, Calderon teaches that monitoring the servo drive-current does not require a special-purpose sensing means because the servo motor already provides the drive current for monitoring. *See* EX1009, 10:1-8; EX2027, ¶¶109-110; POR, 47-48. By contrast, using a strain gauge requires dedicated, special-purpose hardware to sense strain. POR, 50; EX2027, ¶250; *see also* EX1018, 302-304 (cited by Petition, 56). Thus, Calderon teaches away from Petitioner’s combination with a special-purpose sensing means.

Further, the Reply introduces an improper new argument that RepRap20208 and Calderon have the “same problem.” Reply, 14. Contrary to Petitioner’s

arguments in Reply, the Petition attempted to argue that Calderon has problems that RepRap20208 purportedly solved. *See* Petition, 52 (“RepRap20208 ... would not suffer”), 54 (“a strain gauge ... would not be influenced by these factors”).

Petitioner argues that its modification would have improved Calderon's collision detection by enabling collision detection after initialization, but this ignores the fact that Calderon already has a collision-detection solution that is used after initialization. EX1009, 10:5-8; *see also id.*, 9:63-10:5, 10:26-47, 10:57-64; POR, 48-50, 56-57; Reply, 14-15, 18 (erroneously alleging that RepRap20208 would improve Calderon's collision detection after initialization). As such, there is no advantage to RepRap20208's collision detection discussion.

Petitioner's Reply also attempts to shift the burden in showing obviousness to Patent Owner. It asserts that Calderon prints at or below the surface of substrates and suggests that Patent Owner did not address printing at the surface of some substrates. Reply, 15, 20-21. But the fact that Calderon prints below the surface of some substrates (which is uncontested by the Reply) only undermines Petitioner's argument that the combination with RepRap20208 prevents damage—a conclusion that contradicts Calderon's own teachings to bury layers of printed material in the substrate. *See* POR, 52; EX1009, 2:44-50; EX2027, ¶244. Even if Calderon can use other substrates, Calderon already has his own solution for preventing damage to the substrate and nozzle by monitoring drive-current. *See, e.g.*, POR, 48-49; EX2027,

¶247; EX1009, 10:5-8, 9:63-10:5, 10:26-47; *see also* Reply, 20-21 (ignoring Calderon's teachings and Patent Owner's Response).

Petitioner also attempts to salvage the lack of a motivation by providing new analysis of RepRap20208. The Reply presents attorney argument suggesting that "strain gauges" would work "well over long periods of time." Reply, 15. There is no evidence of that.

Finally, the Reply fails to rebut several arguments in the Response³ addressing problems that undermine the combination. First, Petitioner proposes the opposite of what Calderon expressly teaches to not use special purpose sensing means. POR, 48-50. Second, RepRap20208 (at 20) only mentions "backlash" and not "slop" and that a strain gauge is not closer to the contact than Calderon's z-axis drive motor monitoring. POR, 50-51. Third, RepRap20208 (at 20) refers to a sensor different than Calderon's constant current monitoring solution. POR, 50-51. Fourth,

³ Indeed, Petitioner again presents an improper new argument about the utility of strain gauges to provide constant measurement. Reply, 19. The Petition did not present such a theory. *See* Petition, 53. Further, Calderon's solution already provides constant drive-current monitoring. *See* POR, 50-51; EX2027, ¶251.

RepRap20208's surrounding context (at 19-20) indicates that it is referring to another type of sensor IESP-12⁴ and not Calderon's solution. POR, 50-51.

C. The Reply Does Not Cure the Failure to Teach Element 1[a]

The Response detailed why the combination does not teach identifying build instructions for object fabrication. POR, 53-54. The Reply contends that Calderon's file and volume elements teach such build instructions. Reply, 18 (citing EX1009, 4:19-33). However, Petitioner fails to rebut the Response. Figure 1 of Calderon shows that the file and volume elements represent the model of the object and are not build instructions. POR, 53-54; EX1009, Fig. 1; EX2027, ¶¶256-260. Thus, Petitioner's mapping remains deficient.

D. The Reply Does Not Cure the Failure to Teach Elements 1[b]-[d]

The Reply still identifies no teaching of detecting the current contact force for claim 1. Petitioner repeats its assertions from the Petition, but its Reply remains deficient. Indeed, the Reply does not directly address Patent Owner's Response as to claim 1. *See* Reply, 18-22 (only citing to POR, 49-50); POR, 53-57 (addressing claim 1).

⁴ The Reply's assertion of backlash in the "entire system" is also deficient. Reply, 17. The "entire system" is the same system with the same sensor addressed in the Response. POR, 51; EX1010, 19-20.

First, Petitioner concedes that RepRap20208 does not detect the current contact force. Reply, 18-19. RepRap20208 teaches a “constant measurement of the force” that includes weight of the head (force of gravity). EX1010, 19-20; POR, 56. Petitioner asserts that a POSITA would not be stymied by math, but Petitioner is limited to the theories it presented in its Petition. Petitioner and Dr. Wolfe do not discuss accounting for the weight of the head, nor does Petitioner present such a theory. *See* Petition, 57. That a detection *could be* performed is not the standard for obviousness. Petitioner must show that a POSITA would have detected a contact force in the combination. Here, RepRap20208 teaches constant force measurement that includes the force of gravity. It does not teach detecting a contact force, which would not include the force of gravity.

Second, Petitioner misrepresents the Response in asserting that it did not address the lack of damage providing a motivation. Reply, 19-20. As discussed in the Response and above, Calderon already protects his nozzle by monitoring drive-current changes and provides for collision detection, including after initialization. POR, 48-49; EX2027, ¶247; EX1009, 10:5-8, 9:63-10:5, 10:26-47, 10:57-64. Similarly, Petitioner's use-case argument for substrate damage misses the mark. As discussed, it was Petitioner's theory that Calderon would have been modified in combination with RepRap20208 to use strain gauges to prevent substrate damage.

Petition, 54-55; POR, 52. But Calderon's own teachings undermine Petitioner's rationale irrespective of whether non-foam substrates could also be used. *See id.*

The Reply attempts to introduce new arguments about the benefits of "determining the force." Reply, 20-21. Petitioner's new argument is improper. *Ariosas*, 805 F.3d at 1367–68; *Wasica*, 853 F.3d at 1286–87; 37 C.F.R. § 42.104(b)(5). The Petition did not describe the benefits of determining a contact force when printing below the surface of the substrate, thereby damaging it. Rather, it asserted that the combination does not damage the foam substrate, which is contrary to Calderon's teaching. *See* Petition 55 ("not to damage 'foam substrates'"), 54 ("prevent damaging ... foam substrates"). POR, 52; EX2027, ¶254.

Third, the Reply introduces another new argument about Calderon's z-axis "starting point." Reply, 21 (citing EX1009, 8:10-37). Again, Petitioner's new argument is improper. *Ariosas*, 805 F.3d at 1367–68; *Wasica*, 853 F.3d at 1286–87; 37 C.F.R. § 42.104(b)(5). The mere thought of forces or measuring a pressure⁵ does not teach determining a contact force. Again, Petitioner is merely arguing that a current contact force *could be* determined, not that it *would have been*.

⁵ The Reply refers to "upwards pressure" but that discussion in RepRap20208 concerns a sensor IESP-12 and not a strain gauge. *See* Reply, 21; EX1010, 19.

Finally, the Reply fails to address Petitioner's bare assertions about collision detection. POR, 57. As the Response explained, those assertions are not supported by any evidence and the Petition failed to explain why a control signal would be created in response to the current contact force.

E. No Teaching of Claim 4

For claim 4, the Response detailed why the Petition does not teach controlling the z-distances as part of printer shut-down. POR, 57-58 (referring to Petition's theory of "stopping any change" in z-distance); Petition, 64-65. The Reply introduces a new argument that controlling the z-direction is necessary to have "some clearance" to clear Calderon's build envelope. Reply, 23. Not only is this attorney argument unsupported by evidence, Petitioner misrepresents Dr. Wolfe's testimony by suggesting that it supports Petitioner's new assertion. *See id.* (citing EX1003, ¶¶200-202). As Dr. Osswald explained, there is no teaching or suggestion that z-distances would need to be changed or controlled as part of shutdown. EX2027, ¶277; POR, 58.

F. No Teaching of Claims 5 and 7

For claims 5 and 7, the Response explained that there is no teaching of introducing a threshold force into the combination or detecting a current contact force. POR, 58-59. The Reply departs from the Petition by making improper, new assertions about the combination. Petitioner tacitly admits to this by citing to

Calderon, which is never cited to in the Petition when addressing claims 5 and 7. *Compare* Reply, 23 *with* Petition, 65-66. Thus, the Reply fails to cure the Petition's deficiencies.

G. No Teaching of Claim 10

For claim 10, the Reply contends that planarization is achieved using z-axis positions. However, attorney argument cannot supplant Calderon's teachings. Calderon does not state that "Example 3 is like Example 1, except that the nozzle tip is used," as Petitioner asserts. Reply, 24. Calderon teaches that two steps of the algorithm are skipped in Example 3, not merely that the nozzle tip is used instead of a plunger. EX1009, 10:11-15; POR, 60-61. Calderon expressly states that "this approach eliminates the variables X and Y." EX1009, 10:14-15. Those very variables are used to find a plane in Calderon's Example 2 (that the Petition does not rely upon), but Calderon does not teach an alternative plane-finding technique for Example 3. POR, 61. Although the Reply introduces an improper, new discussion about step H, which is not discussed in the Petition for claim 10 (Petition, 68), Calderon acknowledges that step H for Example 1 is replaced with a self-correct in Example 2 based on a "linear least squares fit" to X and Y, which are removed in Example 3. *See* EX1009, 9:17-19, 9:23-26. Further, step H in Example 1 "compares the recorded z-axis positions" and thus is not "based upon a number of contact force measurements." *See* EX1009, 7:64-67. Thus, the Reply does not cure the Petition's

deficiencies. As Dr. Osswald explained, a POSITA would have understood that while Calderon's Example 3 finds a z-start position, it does not detect planarity. EX2027, ¶286.

H. No Teaching of Claim 12

For claim 12, the Response explained that the combination does not teach a specified contact force or instruction for achieving such a force. POR, 61-62. The Reply argues that there must be a threshold force to determine "when you run into something." Reply, 24-25. However, the Reply does not cure the Petition's deficiencies. As Dr. Osswald explained, RepRap20208 teaches watching for a bolt-tension change "when you run into something" and not a comparison to a threshold force. EX2027, ¶290. Thus, there is no instruction for achieving a specified contact force.

IV. PETITIONER'S REPLY DOES NOT CURE GROUND 2B'S DEFECTS

A. The Reply Does Not Show A Motivation to Combine Calderon, RepRap20208, and Napadensky, and No Teaching of Claim 11

Ground 2B introduces Napadensky to the combination of Ground 2A. The Response explained that there is no motivation for the combination. POR, 64-65. The Reply abandons the Petition's obviousness theory and discusses a porous substrate. *Compare* Reply, 25 *with* Petition, 73-74. Petitioner cannot cure its failure to show a motivation to combine in the Petition by citing previously unidentified

portions of Calderon and providing new motivation for the first time in Reply. *See Ariosa*, 805 F.3d at 1367–68; *Wasica*, 853 F.3d at 1286–87; 37 C.F.R. § 42.104(b)(5).

The Reply also repeats the purported benefits addressed in the Petition for rigid substrates. However, Petitioner fails to address the Response. Petitioner does not contest that there is no motivation to pursue Napadensky's leveling device as Calderon already provides his own solution and that Dr. Wolfe misinterpreted the differences between Napadensky and the '698 Patent. POR, 64-65. Thus, there is no motivation to combine.

For claim 11, the Reply again relies on new arguments about a foam substrate that are not addressed in the Petition. *Compare* Reply, 25 *with* Petition, 74. Petitioner does not contest that Napadensky's leveling operation is performed on an already formed layer and thus there is no teaching of fabricating a layer that decreases one or more irregularities. POR, 66; EX2027, ¶¶299-302.

Respectfully submitted,

Dated: June 22, 2026

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CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), I certify that this Sur-Reply complies with the type-volume limits of 37 C.F.R. § 42.24(c)(4) because it contains 5,585 words, excluding the parts that are exempted by 37 C.F.R. § 42.24(a), according to the word processing system used in preparation of this Sur-Reply.

Dated: June 22, 2026

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e)(4), the undersigned certifies that on June 22, 2026, a complete copy of the foregoing Patent Owner's Sur-Reply was served on Lead and Back-up Counsel for Petitioner at the service address provided in Petitioner's Mandatory Notices:

Email: IPR56224-0008IP1@fr.com

Dated: June 22, 2026

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